

BEFORE THE  
POSTAL REGULATORY COMMISSION  
WASHINGTON, D.C. 20268-0001

REPORT TO CONGRESS AND THE PRESIDENT  
ON UNIVERSAL POSTAL SERVICE AND THE  
POSTAL MONOPOLY

Docket No. PI2009-1

INITIAL COMMENTS OF THE UNITED STATES POSTAL SERVICE  
ON THE COMMISSION REPORT  
(February 17, 2009)

**I. INTRODUCTION**

The Postal Service commends the Commission on its completed *Report on Universal Postal Service and the Postal Monopoly*. The Postal Service understands the enormous effort this report required and believes that it is a valuable input to the ongoing dialogue about the Postal Service's universal service obligation (USO) and the postal monopolies (i.e., the letter mail monopoly set forth in the Private Express Statutes (PES) and the mailbox rule). Befitting the fact that only Congress and the President can make changes to the statutes that set forth the USO, the PES, and the mailbox rule, the report focuses on providing Congress with potential policy options that it could consider, as well as providing recommendations on certain matters. The Postal Service understands that the discussion of policy options represents an exercise in theoretical possibilities rather than recommended actions. As such, the Postal Service generally does not address those options in these comments. Rather, these comments address certain of the more prominent interpretations and recommendations made by the Commission with which the Postal Service disagrees.<sup>1</sup> For instance, the

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<sup>1</sup> Furthermore, it must be emphasized that the report, and its appendices, contains numerous statements or opinions with which the Postal Service may not agree. Simply because a particular statement, interpretation, or opinion is not addressed in these comments should not be understood as Postal Service concurrence with that statement. As discussed above, these comments address only certain of the more prominent parts of the report. For example, these comments do not address the Commission's discussion of its authority under section 601(c) of title 39, which can be read as asserting the authority to issue regulations that define the term "letter" in a manner that is inconsistent with the definition set forth in 39 C.F.R. Part 310. Commission Report at 37, 187-88. To the extent that the Commission believes it can

Commission expresses some views concerning the mailbox rule that could negatively affect the Postal Service's ability to provide the American public with affordable universal service and ensure the safety and security of the mail.

These comments should not obscure the fact that the Postal Service generally agrees with the Commission's recommendation that fundamental changes to the USO or to the postal monopolies are not needed at this time. In particular, the Commission correctly concluded that the Postal Service "has functioned effectively for the better part of two centuries and continues to fulfill its mission to provide universal service under a flexible USO supported by the monopolies," and that, given the current financial environment and industry trends, the Postal Service "requires the flexibility afforded by the postal monopolies and a flexible, qualitative USO."<sup>2</sup> In this regard, one point in which the Commission, the Postal Service, and the majority of mailers seem to agree is the need for flexibility. In light of the current economic and financial crisis, there has never been a more essential time for flexibility. The current USO gives the Postal Service, for the most part, much needed flexibility to operate. Given that the American public is satisfied, as the Commission noted, with the level of service provided by the Postal Service under the current, flexible, USO standards, there appears to be no reason for Congress to make changes that would decrease the Postal Service's ability to make operational decisions. Rather, any changes that are made to the law should be to give the Postal Service additional flexibilities, as these may be needed in order for the Postal Service to remain financially viable and continue to provide affordable universal service to the American public. For example, in recent testimony before a Senate oversight committee Postmaster General Potter discussed the possibility of giving the Postal Service the flexibility to deliver less than six days a week. This is discussed below in Part V.

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change the fundamental scope of the letter monopoly in such a manner, the Postal Service would disagree, because the language and history of the PAEA indicates that such a policy decision is reserved to Congress. However, because it is not clear whether this is in fact the Commission's interpretation of section 601(c), and because the Commission does not recommend any changes to the letter monopoly, there is no need to address those important issues here. Also, the Postal Service does not feel it necessary to address George Mason's conclusion in Appendix C that the letter monopoly only covers personal correspondence, because this view was not endorsed, or even addressed, by the Commission in the report. Needless to say, however, the Postal Service vehemently disagrees with the legal conclusions reached by that Appendix.

<sup>2</sup> Commission Report at 200-01.

Finally, the Commission recommended that if Congress desires to make any changes to the USO or to the monopoly, it must carefully consider those changes in light of the Postal Service's financial position. This point is particularly well-taken. The Postal Service would like to stress that, before Congress considers potential changes to the USO, the PES, or the mailbox rule, it should fully consider, study, and analyze the impact of any changes. In particular, Congress should take into account information included in both the Commission and the Postal Service reports on USO and the postal monopoly, as well as information from other sources, including the mailing community.<sup>3</sup> At the same time, no potential change should be seen as being undeserving of consideration, study, and analysis.

## **II. THE POSTAL SERVICE DISAGREES THAT THE USO APPLIES TO COMPETITIVE PRODUCTS**

### **A. The statute does not support applying the USO to competitive products.**

In its report, the Commission notes that “[v]arious commenters, including the Postal Service, take the position that only market-dominant products should be considered as part of the Postal Service’s USO.”<sup>4</sup> The Commission concludes to the contrary, arguing “that the range of products covered by the USO includes all mail matter, not just preferential classes or market-dominant products.”<sup>5</sup> The Commission states that it “has reached this conclusion in part because, on its face, the statute *expressly* refers to a broad array of postal items as being subject to the USO.”<sup>6</sup> The obvious flaw in this logic is that there is no “express” reference in the statute to the USO at all. Rather, to support its conclusion, the Commission cites a number of general statutory provisions in chapters 1 and 4 of title 39 that do not distinguish between market-dominant and competitive mail, and argues that because they do not draw such a distinction, they necessarily refer to both types of mail. These provisions seem to

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<sup>3</sup> The Postal Service’s full report is located at <http://www.usps.com/postallaw/universalpostalservice.htm>.

<sup>4</sup> Commission Report at 23.

<sup>5</sup> *Id.* at 25.

<sup>6</sup> *Id.* (emphasis added).

refer, however, to services that are now classified as “market-dominant” products (to the extent that they can be said to refer to specific “products” at all).

For example, the Commission cites section 101(a), which “gives the Postal Service ‘the obligation to provide postal services to bind the Nation together through the *personal, educational, literary, and business correspondence* of the people,’”<sup>7</sup> section 403(a), which “directs the Postal Service ‘to receive, transmit, and deliver... *written and printed matter, parcels, and like materials,*” and section 403(b)(2), which “requires the Postal Service ‘to provide *types of mail service to meet the needs of different categories of mail and mail users.*”<sup>8</sup> The Commission states that these “broad statements” regarding “the Postal Service’s obligation” “suggest that all forms of mail matter should be considered to be part of the Postal Service’s USO.”<sup>9</sup> However, the obligations set forth in these provisions are fully achieved through the various market-dominant products, which allow mailers to send letters (including “correspondence”), flats, and parcels, throughout the nation. Similarly, the statements in section 101 pertaining to “important letter mail” (*i.e.*, section 101(e), and the last sentence of section 101(f)) are both fully achieved through the provision of First-Class Mail. Thus, there is no basis to conclude that these provisions *obligate* the offering of the services classified as competitive. This is particularly true considering the fact that these provisions were placed in title 39 by the Postal Reorganization Act, and thus predate not only the PAEA, but also the establishment of almost all of the current competitive products.

The Commission also cites what it says is “the requirement in section 101(f) that the ‘highest consideration be given to the prompt and economical delivery of *all mail*” and argues that this provision “by its terms is applicable to both market-dominant products, such as First-Class Mail, and competitive products, such as Express Mail and Priority Mail.”<sup>10</sup> However, the scope of this portion of section 101(f) is limited by its own terms to “selecting modes of transportation.” It also simply requires that the Postal Service give “the highest consideration” to selecting modes of transportation so as to achieve the prompt delivery of all mail, phrasing that speaks to a general statement of

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<sup>7</sup> *Id.* at 23 (emphasis in original).

<sup>8</sup> *Id.* at 24 (emphases in original).

<sup>9</sup> *Id.*

<sup>10</sup> *Id.* at 25.

policy concerning operations, rather than anything approaching an obligation to provide a distinct set of products. Thus, section 101(f) does not seem relevant to determining the parameters of the Postal Service's USO.

**B. Including competitive products in the USO disregards the intent of the PAEA to create a fair and level playing field.**

The Commission's conclusion, based only on such *general* provisions, is also inconsistent with *specific* provisions that Congress introduced in the PAEA. The statute now establishes a clear bifurcation between market-dominant and competitive products, and imposes fundamentally different regulatory schemes concerning those products. The Commission provides no basis or explanation for its perfunctory dismissal of the market-dominant/competitive distinction as having been "established for specific purposes that are independent of the universal service concept."<sup>11</sup> Indeed, the bifurcation permeates the structure of the Act, and clearly seems relevant to understanding the Postal Service's USO. For instance, the statute only requires (at section 3691) that service standards be established for market-dominant products, rather than for competitive products.<sup>12</sup>

The bifurcation of market-dominant and competitive products in the PAEA was meant to create a more level playing field between the Postal Service and its private sector competitors, in part by allowing those competitive products to be market- and profit-driven, rather than constrained by the type of policy considerations, such as a USO, that are logically applicable to market-dominant products. The very nature of competitive products is that they are offered in a fully developed competitive market. There is simply no need for federal law to *obligate* any party, including the Postal Service, to offer a product that is already being offered to the public in the marketplace.

The Postal Service should be allowed to offer competitive products in a manner similar to private firms, including offering competitive products in a limited geographic area or with a lower frequency of delivery. For example, Parcel Select competes directly with products from UPS and FedEx. Requiring the Postal Service to provide

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<sup>11</sup> *Id.*

<sup>12</sup> The discussion of a prior version of section 3691 clearly demonstrates a general understanding that the USO only applied to market-dominant products. See SEN. REP. NO. 108-318 at 22-23 (2004).

Parcel Select a specific number of days of the week puts it at a distinct competitive disadvantage. In addition, for some competitive products, the financial viability of the product relies on the flexibility to target the geographic market in which it is offered. For example, Global Express Guaranteed (GXG) is only offered in major markets, albeit this includes 190 countries. Because the product guarantees date-certain delivery, it is only feasible to provide this product in certain areas. The same logic applies to international money transfer services, which are only offered in markets where there is a high demand. Nothing in the law seems to preclude the Postal Service from limiting the geographic scope of its competitive products.

The Commission suggests that the Postal Service should be viewed as “a carrier of last resort for all mail matter in the event of a market failure.”<sup>13</sup> Certainly, the Postal Service must generally provide service to all areas of the country. This does not mean, however, that this service must necessarily be in the form of one of the current competitive products. Competitive products, by their very definition under section 3642 of title 39, have alternatives. Therefore, the Postal Service is not needed as a carrier of last resort.<sup>14</sup> Furthermore, as discussed above, market-dominant products include a variety of types of mail including options for letters, flats, and parcels, so it is unclear what public need would not be met if the USO only applied to market-dominant products. And if, for some reason, it was determined that the public had an unfulfilled mailing-related need, the fix would be to create a market-dominant product to fulfill that need, rather than force all competitive products under the USO.

In addition, is not at all clear that the mailbox statute is a significant hindrance to competitors of competitive products. Most packages do not fit within a typical mailbox, and many expedited letters require a signature. Moreover, the confusion that would arise in the minds of mailbox owners as to who was entitled to access, and the necessarily great increase in the potential for theft from the mailbox resulting from this confusion, would plainly outweigh any marginal competitive effects.

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<sup>13</sup> Commission Report at 195.

<sup>14</sup> If, indeed, the Postal Service were to become the carrier of last resort for products which are currently categorized as competitive, the statute provides that such products could be moved to the market-dominant category. 39 U.S.C. 3642.

### **III. PRODUCTS INCLUDED IN THE USO SHOULD NOT BE LINKED TO MAILBOX RULE**

In its report, the Commission recommended that the USO should apply to all postal products, and if Congress determines that competitive products are not part of the USO, then Congress should consider repealing the mailbox monopoly.<sup>15</sup> The link between these two items is a *non sequitur*. The Commission justifies the link by rationalizing that, if the Postal Service is not willing to provide competitive products to certain areas (i.e., to be the sender of last resort for expedited products to those areas), then private sector providers of expedited services to those areas should have access to the mailbox. However, given security and cost issues discussed in the RAND report,<sup>16</sup> it does not make sense to do away with a restriction on access to the mailbox that principally benefits market-dominant, and especially, letter mail. Elimination of the mailbox monopoly would actually harm universal service of market-dominant products by increasing costs and could lead to the elimination of the mailbox as an access point.

#### **A. Elimination of the mailbox rule would reduce security for market-dominant products and impact the safety of postal customers.**

Elimination of the mailbox rule would significantly impact the security of market-dominant products. Mailbox security is essential to the Postal Service brand. Losing this security would most likely result in loss in volume and revenue and would ultimately result in lower service and higher prices for all market-dominant products. As discussed in the Postal Service's *Report on Universal Postal Service and the Postal Monopoly*, if the mailbox rule were diluted or diminished, the ability of the Inspection Service to protect the sanctity of the mail would be impeded. In fact, in its study on the impact of potential changes to the mailbox rule, the RAND Corporation found that changing or eliminating the mailbox rule would negatively impact security of mail in several ways.

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<sup>15</sup> Commission Report at 195.

<sup>16</sup> The RAND Report, *The Role of the United States Postal Service in Public Safety and Security: Implications of the Proposed Relaxation of the Mailbox Monopoly*, was included as Appendix E to the Postal Service's *Report on Universal Postal Service and the Postal Monopoly*. The RAND Report can be found at <http://www.usps.com/postallaw/universalpostalservice.htm>.

RAND found that the main risk would be mail-related theft – including identity theft, credit card theft, and theft of payments such as pension checks, and that this risk would be higher if loss of the mailbox monopoly resulted in fewer locked mailboxes.<sup>17</sup>

RAND also found that an increase in the number of carriers accessing the mailbox would make it difficult to determine who is legally allowed access, which is especially important when delivery is being made to otherwise secure buildings.<sup>18</sup> Furthermore, there could be an increase in hazardous or dangerous materials placed into the mailbox,<sup>19</sup> as the Postal Service is generally better at detecting and stopping suspicious items prior to delivery than are private couriers.<sup>20</sup> Other entities would require training by the Postal Service, and it is not clear how that would be feasible. The loss of the mailbox rule also would have the potential to increase merchandise fraud, as it would be difficult to determine if merchandise were stolen or simply not delivered.<sup>21</sup>

RAND found that relaxing the mailbox rule would also impact the policing of mailbox crimes. First, the Inspection Service would be limited to investigating crimes in which mail was involved, rather than all matter in the mailbox.<sup>22</sup> Second, having other matter in the mailbox would make it more complicated and costly for the Inspection Service to police mail crimes that stay in their jurisdiction, and the increase in cost would be significant.<sup>23</sup>

Federal jurisdiction over certain crimes would be reduced if the mailbox rule were relaxed, including mail-fraud schemes, sexual exploitation of children, visual representation of sexual abuse on children, use of weapons of mass destruction, and counterfeiting. The Federal jurisdiction over these crimes is defined by either the use of the mails or interstate commerce, so Federal jurisdiction would not apply to items carried intrastate by private couriers and deposited in mailboxes.<sup>24</sup>

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<sup>17</sup> RAND Report at 62.

<sup>18</sup> *Id.* at 60.

<sup>19</sup> *Id.*, at 61.

<sup>20</sup> *Id.*, at 64.

<sup>21</sup> *Id.* at 63.

<sup>22</sup> *Id.* at 70.

<sup>23</sup> *Id.* at 72.

<sup>24</sup> *Id.* at 75.



RAND also concluded that loss of the mailbox rule could have a negative impact in public awareness campaigns. If the Inspection Service's loss in jurisdiction resulted in a loss of budget, there might be fewer funds to put towards public awareness.<sup>25</sup>

Furthermore, opening the mailbox for access by other parties is not as simple as merely empowering other parties to place matter in boxes. Some mailboxes are located in locked office and apartment buildings, where keys are needed to gain access to the mailboxes. Currently, the Postal Service, as a trusted agency, works closely with the Inspection Service to ensure that those keys are kept secure. It is unclear how these keys would be shared with numerous other entities without harming the security of those buildings. In fact, RAND determined that the logistical complexity of providing keys to all carriers for multi-mailbox receptacles would be so great that there would be a de-facto mailbox monopoly on these types of receptacles.<sup>26</sup>

**B. Elimination of the mailbox rule would hinder the provision of market-dominant products.**

Elimination of the mailbox rule would harm the universal service of market-dominant products, the very products that the USO was meant to ensure. If other items were in the mailbox, carriers could have difficulty putting mail in the mailbox. In some cases, the carriers might be forced to either deliver the mail to the door or redeliver the following day. Additional time at each box impacts the service of mail delivery in two ways. First, extra time equates to extra costs.<sup>27</sup> Given that the Postal Service is constrained by a price cap, and cannot pass on the additional costs through increased prices, these additional costs could lead to a decline in service. Second, extra time at each mailbox would lead to later delivery times for all mail. Moreover, if the carrier were unable to deliver mail due to a full mail receptacle, there would be an added day on delivery times. Therefore, elimination of the mailbox rule would actually be counter-productive to ensuring that the American public receives good service.

Furthermore, the existence of other items in the mailbox would make it more difficult for the postal carriers to pick up outgoing mail. This would increase the costs of

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<sup>25</sup> *Id.* at 61.

<sup>26</sup> *Id.* at 62.

<sup>27</sup> This is discussed further in Part VIII, below.

the Postal Service, and the operational difficulties and additional cost might force the Postal Service to eliminate or curtail picking up outgoing mail from mail receptacles. This would have a significant detrimental impact on access by virtually eliminating 150 million access points. Even if the Postal Service did not eliminate mail pick-up, the decreased security of the mailbox could deter customers from placing outgoing mail in mailboxes.

#### **IV. ACCESS INCLUDES MORE THAN BRICK AND MORTAR RETAIL**

In its report, the Commission suggests an alternative to the current appropriations language on the closing of small and rural post offices. The Commission suggests as an alternative that Congress could put into statute “standards reflecting the numbers of nearby residents or distance from an optional facility.”<sup>28</sup> The Postal Service appreciates the Commission’s views on ways to amend the USO so as to effectuate its purposes, while also giving greater flexibility to the Postal Service. While the Postal Service is not necessarily against replacing the current language with language similar to the Commission’s suggestion, extreme caution should be used in development of any alternative language, as any such alternative could inadvertently cause more harm than good. For example, strict language requiring a Post Office to be located every “X” number of miles could potentially lead to the existence of Post Offices where they are not needed to provide access.

Furthermore, the Commission’s report seems to imply that any new language should be focused on brick and mortar retail outlets. This goes against the intent of the PAEA to increase access through alternate channels.<sup>29</sup> Any potential rules or regulations surrounding access points need not focus solely on brick and mortar retail outlets; they need to take into account all the various means of alternate access available to customers. There are numerous ways in which the Postal Service provides alternate access. Postal customers can access many services, including stamp purchases, Click-N-Ship (parcel postage payment), and Carrier Pickup, through [www.usps.com](http://www.usps.com). Other alternate access channels include PC Postage (through partners), contract postal units (CPUs), stamps by mail, Automated Postal Centers

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<sup>28</sup> Commission Report at 183.

<sup>29</sup> See section 302(d) of the PAEA.

(kiosks), ATMs, and rural carrier transactions. Inclusion of alternate access as a means of meeting any USO requirement enables the Postal Service to meet the public's needs for access, when and where they want it, while giving the Postal Service much needed flexibility to maintain an efficient network. This is especially true going forward, because the ability to meet customers' needs through alternate access channels will only increase as technologies advance.

## **V. THERE IS NO NEED FOR CONGRESS TO ACT ON DELIVERY FREQUENCY UNLESS IT IS TO REDUCE THE MINIMUM REQUIREMENT**

In its report, the Commission states that the current appropriations language on frequency of delivery is subject to several interpretations, and that, regardless of the interpretation, constrains one element of USO without considering the other elements. The Commission suggests that Congress may want to reexamine this requirement, balancing it with other aspects of the USO.<sup>30</sup> The Postal Service appreciates the Commission's recognition that any requirement regarding frequency of delivery should be made in the context of balancing all the aspects of the USO. And the Postal Service agrees that the current language is open to interpretation. However, the Postal Service wishes to emphasize that the only changes that should be made to this language should be in the form of reducing the minimum days of delivery, as recently discussed by Postmaster General Potter in testimony before Congress.

While the Postal Service understands that reducing the number of delivery days in a week could have a significant impact on the mailing community, the current economic crisis is dire enough that the Postal Service is considering the potential impact of reducing the frequency of delivery, even if only during select low volume periods of the year. If given the flexibility to do so, the Postal Service would only reduce days of delivery after weighing the cost savings benefits, with the potential impacts on the mailing community and the potential impacts on mail volume.

The Postal Service believes that, if any new requirement were put in place, it should be viewed as a minimum, rather than as a guarantee that the Postal Service would reduce the days of delivery. In some other countries, such as Canada, Italy, and

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<sup>30</sup> Commission Report at 196.

Sweden, the minimum requirement is 5 days a week, but the operators are free to provide greater services as a matter of business judgment. Similarly, as Postmaster General Potter noted, the Postal Service simply desires to have the flexibility to reduce the number of delivery days to 5 days a week when it makes business sense. Given the strong public support for the Postal Service's track record in providing service under USO that is in most respects flexible, the Postal Service should not be restricted by a statute that precludes it from exercising its business judgment with respect to the number of days for delivery, especially given current financial conditions.

## **VI. THE COMMISSION'S "ENFORCEMENT" OF THE USO IS CONSTRAINED BY THE PAEA**

The Postal Service is concerned by the inclusion of what the Commission both calls "user rights" and the "enforcement mechanism" as the seventh attribute of the USO. The Commission characterizes section 3662 of title 39 as providing this necessary "enforcement mechanism." In particular, the Commission notes that it has proposed a two-track compliant mechanism, one of which would deal with individualized service complaints. The Postal Service has previously addressed this proposal in its Reply Comments in Docket No. RM2008-3. In those Comments, the Postal Service noted that section 3662 provides the Commission with the jurisdiction to hear complaints alleging a statutory violation of certain specified provisions of title 39, and does not authorize the Commission to adjudicate disputes that do not rise to the level of a complaint that the Postal Service has violated one of those provisions of the statute. Furthermore, as the Postal Service noted, run-of-the-mill service complaints would not logically rise to the level of an allegation that the Postal Service has in fact violated the standards of the statute, and instead are more appropriately handled by the Postal Service.

In addition, section 3662 does not accord the Commission the authority to hear complaints alleging violations of several provisions that generally set forth the USO.<sup>31</sup> Thus, section 3662 can at most be characterized as creating an enforcement

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<sup>31</sup> Such as section 101(a), 101(b), or section 403(a) of title 39.

mechanism for certain *elements* of the USO (such as service performance), rather than the USO more generally.

Furthermore, the limited scope of section 3662 reflects the fact that there are numerous mechanisms in place to ensure that the mailing community, both businesses and individuals, have a voice if they feel they are not receiving adequate service. These include the Postal Service itself through its many outreach activities, the GAO, the OIG, the Inspection Service, and Congress. While these oversight mechanisms are undoubtedly a result of law, the Postal Service does not believe that they are part of the USO.

## **VII. SECURITY OF THE MAIL IS AN IMPORTANT ASPECT OF THE USO**

One of the aspects the Postal Service believes is missing in the Commission's report is a recognition of the importance of the security of the mail. In fact, the importance of mail security was mentioned so often during the public hearings held by the Commission that, during the workshop held in Washington D.C, Chairman Blair stated "It was made clear that preserving the security and sanctity of the mail remains an integral part of providing universal mail service."<sup>32</sup>

As the Vice President of the National Rural Letter Carriers Association stated: "[P]ostal customers believe that what I put in their mailbox is safe. It doesn't matter if it's a check, a passport, a new credit card, medicine, or they are simply buying stamps from me; they trust their mailbox's security."<sup>33</sup> This belief in security is an important element of the Postal Service brand.<sup>34</sup> The Postal Service has been rated in the top ten most trusted organizations for privacy by the Ponemon Institute, a rank held by the Postal Service since the study began since 2005.<sup>35</sup> It is hard to understand why the Commission's report excludes this important attribute.

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<sup>32</sup> Docket No. PI2008-3, Transcript: Universal Service Obligation Workshop, at 10 (June 12, 2008).

<sup>33</sup> Docket No. PI2008-3, Transcript: Washington, D.C. Field Hearing, at 24 (July 10, 2008).

<sup>34</sup> As discussed above, elimination of the mailbox rule will be detrimental to the security of the mail.

<sup>35</sup> Ponemon Institute's Privacy Trust Study of the United States Government.

## **VIII. THE QUANTITATIVE INVESTIGATION IN THE REPORT WOULD BE ENHANCED BY INCLUDING SOME IMPORTANT PARTS OF A COMPLETE ANALYSIS**

The Commission's report would be enhanced by including some important parts of an overall analysis of the Postal Service's USO and monopoly that it currently omits. Because some important parts are left out, the report's values for the cost of the USO and the monopoly are likely to be understated. In this section, the Postal Service identifies and undertakes the omitted analyses, and thus attempts to enhance the record and aid the Commission in its consideration of these important issues.

### **A. The Commission's report does not include estimation of an essential part of the cost of a uniform price USO.**

An important part of the USO is the requirement to charge uniform prices. Price uniformity plays a key role in assuring equity in the use of the nation's postal network. In evaluating the Postal Service's USO, the report presents two different, but related concepts of a uniform price universal service obligation. The first relates to the traditional "one price to go anywhere" concept of uniform prices.<sup>36</sup>

"Uniform pricing" is used to describe two related, but distinct, types of restrictions. The first, and most general, interpretation is that a uniform rate must be charged nationwide for a particular class of mail, regardless of where it originates or destines. This condition is reflected in the Postal Service's current pricing of First-Class Mail.

A similar description of this relatively well known uniform price constraint is also offered by the Commission's consultant:<sup>37</sup>

The term uniform pricing constraint is used to describe two related, but distinct, types of restrictions. The first, and most general, interpretation is that a uniform national rate is required for certain categories of mail. This condition is certainly satisfied by the Postal Service's pricing of single piece mail.

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<sup>36</sup> See Commission Report at 117.

<sup>37</sup> See George Mason University, Appendix F, Section 2 at 17.

The second approach to a uniform price USO is also discussed by the report. This approach is said to be “less restrictive” and relates to geographic uniformity in the use of the delivery network.<sup>38</sup>

The second, less restrictive, interpretation, is that prices are allowed to vary by distance, but in a consistent way, regardless of where the mail originates or destines. For example, if the Postal Service were to introduce “local” and “non-local” rates, uniform pricing would require that the two rates be the same throughout the country.

This approach was explained in a bit more detail by the Commission’s consultant:<sup>39</sup>

The second, less restrictive, interpretation is that zonal, or distance-based, prices are allowed, but the rate schedule must be geographically uniform. For example, if the Postal Service introduces “in town” and “out of town” rates, uniform pricing would require that the two rates be the same throughout the country. Similarly, any “over two thousand mile” rate would have to be the same for pieces mailed in Boston destined for Los Angeles or mailed in the Maine woods and destined for the Olympic Peninsula.

This discussion makes clear that the “less restrictive” approach to a uniform price allows for dropship discounts for all products, but expressly prohibits geographic-specific pricing. In other words, the Postal Service is required to charge the same rate for delivery to all addresses in the country. For example, under the USO the Postal Service is prohibited from establishing a schedule of surcharges for delivery in high cost areas as some of its private sector competitors do. Note that these surcharges are based upon the ZIP Code where the product is delivered, not the distance it covers. High cost delivery areas are based upon the characteristics of delivery in the area such as business/residential or the geographical density of delivery points.

Because they are somewhat different concepts of the uniform price USO, the computations of the costs of these two approaches follow two different algorithms. Nevertheless, they both share the same philosophical underpinning, application of the “profitability approach” to measuring USO costs.<sup>40</sup>

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<sup>38</sup> See Commission Report at 117.

<sup>39</sup> See George Mason University, Appendix F, Section 2 at 17.

<sup>40</sup> See Commission Report at 118.

When analyzing either of these versions of the uniform pricing constraint, one must analyze the profit effect of removing that constraint by carefully specifying the condition of the market that is assumed to pertain after the constraint is removed. As discussed above, most of the Commission's analyses of USO costs are carried out assuming that USO constraints are removed from the status quo condition.

Under this broad approach, each of the two approaches to the uniform price USO has its own set of calculation requirements. Each one has its own constraint that must be relaxed for the computation to be made. Calculating the cost for the "one price to go anywhere" uniform price restriction requires relaxing the constraint that one product must have a uniform price regardless of its origin and destination. For the Postal Service, this means allowing differential pricing of First-Class Mail. Calculating the USO cost for the second, "less restrictive" uniform price constraint requires relaxing the restriction that prices must be geographically uniform. For the Postal Service, this means allowing rates to follow schedule of charges and discounts for delivery to specific geographic areas, most likely ZIP Codes.

As it turns out, the Commission's consultant provided an estimate of only the cost of the first type of USO restriction and did not provide an estimate of the second type.<sup>41</sup>

GMU calculates the additional profit that the Postal Service would earn if it were to eliminate the requirement (under a plausible interpretation of section 404(c) of the PAEA) that rates for First-Class Mail not vary with distance. GMU notes that if the First-Class Mail rates could vary with distance while the letter and mailbox monopolies remain intact, the Postal Service could be expected to offer dropship discounts for bulk First-Class Mail similar to those that it offers for Standard Mail. GMU assumes that this would increase profits by diverting a significant amount of low-margin dropshipped Standard Mail to high-margin dropshipped First-Class Mail. It also assumes that the discounts offered for dropshipping would cause some single-piece First-Class Mail to convert to dropshipped First-Class Mail, and would cause some additional growth in First-Class Mail volume due to its own-price elasticity.

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<sup>41</sup> See *id.* at 139. This analysis could be considered to be only part of what is needed to measure the cost of a uniform price for First-Class Mail because it excludes any consideration of geographically differential prices for that product.



Applying the volume and revenue forecasting model last made available in Docket No. R2006-1, GMU estimated the profit impact of offering First-Class Mail SCF dropship discounts of 1.0 cents, 1.5 cents, and 2 cents, which mirror discounts now offered for dropshipping Standard mail to the SCF. It concludes that a discount in the mid-point of that range (1.5 cents) would generate \$130 million in additional profit.

To assist the Commission in its analysis of the USO, the Postal Service provides an estimate for the second approach to the uniform price USO, the “less restrictive” prohibition on geographically diverse pricing. Analyzing this aspect of the uniform price USO requires relaxing the assumption that prices for all products are geographically uniform. Obviously this requires, at a minimum, information on the distribution of volumes across geographic areas. In addition, if pricing differentiation is to be based upon relative costs, it also requires some measure of delivery cost by geographic area.

The IBM USO model contains measures of both delivery cost and delivered volumes for the 3-digit ZIP Codes across the country, thus supplying the key information required to estimate the cost of the second, “less restrictive” USO uniform price requirement. To facilitate the cost measurement, the Postal Service organizes the 3-digit ZIP Codes into quintiles by average delivery cost per piece. The Postal Service chose quintiles for practical reasons and did not investigate the profit-maximizing organization of ZIP Codes. For this reason, the Postal Service’s estimate is an understatement of the true USO cost of this uniform price restriction.<sup>42</sup>

The Postal Service then investigated various schedules of delivery charges and discounts across the five groups. Separate investigations were done for First-Class Mail and Standard Mail. This ensures that the results do not include any movements of volumes across classes, so as to not contaminate the estimated cost of this aspect of

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<sup>42</sup> In a similar fashion, this analysis assumes constant elasticities of demand across the five groups. Thus, it does not allow for another profit-gaining response for the Postal Service. This response is described in the report (at 118):

It would also likely choose to better exploit differences in the elasticity of demand among the now separated markets.

This is another reason why the estimate of this USO cost is an understatement.

the uniform price USO with the estimated cost for the first one. Finally, to ensure that the flexible pricing scheme does not raise revenue (and profit) simply by raising prices, the Postal Service constrains the total revenue under the flexible pricing scheme to be equal to the total revenue under the uniform pricing scheme.<sup>43</sup>

The Postal Service hypothesizes a schedule of delivery charges and discounts across the quintiles in Table 1. Note that group one is the highest cost quintile and group five is the lowest cost quintile. The difference in average delivery cost per piece between the most expensive quintile and the least expensive quintile is about seven cents per piece. Table 1 shows that the difference between the delivery charge for the highest cost quintile and the discount for the lowest cost quintile is about seven and one half cents, a difference in the same order of magnitude as the average delivery costs. Note that the Postal Service did not attempt to ensure that these are the profit-maximizing schedules of charges and discounts for the two products. This leads to an underestimation of this part of the uniform price USO costs.

**Table 1: Hypothetical Delivery Charges and Discounts**

Quintile	First-Class	Standard
One	\$0.041	\$0.044
Two	\$0.022	\$0.021
Three	\$0.010	\$0.009
Four	-\$0.021	-\$0.008
Five	-\$0.036	-\$0.023

Given this schedule of charges and discounts, the cost of this aspect of the uniform price USO was calculated in the following way:

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<sup>43</sup> This ensures that the schedule of charges and discounts does not violate the Commission guideline that a new set of prices be revenue neutral. As stated in the report (at 118):

However, because the status quo is assumed to prevail in all respects but price uniformity, any price adjustments must continue to satisfy the original revenue cap.

- For each of the two classes, the proposed delivery charges and discounts were instituted. Then, following the Commission-approved approach to estimating the other part of the uniform price USO, the established elasticities were used to compute the resulting changes in volumes. This was done individually for each of the 3-digit ZIP Codes in the model. It was also done by product and shape.<sup>44</sup> As expected, volumes increased in 3-digit ZIP Codes in the low cost quintiles and decreased in 3-digit ZIP Codes in the high cost quintiles.
- The new prices by quintile, inclusive of the charges and discounts, were then multiplied by the new volumes by 3-digit ZIP Code to calculate the implied new revenues by 3-digit ZIP Code. The total flexible-price revenue was then found by summing the computed revenues across the individual 3-digit ZIP Codes. This total revenue was checked to ensure it did not exceed the old revenue.
- In similar fashion, the new volumes were used to calculate the new delivery costs. As with the old volumes, the new volumes within each 3-digit ZIP Code were multiplied by the average delivery cost per piece for that 3-digit ZIP Code. The new contribution over delivery costs was then calculated by subtracting the flexible price delivery costs from the flexible price revenue.
- The difference in contribution over delivery cost under flexible prices and under uniform prices is the estimate of the cost of this aspect of the uniform price USO. The results are presented in Table 2:

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<sup>44</sup> For example, for First-Class Mail, separate calculations were done for Single Piece Letters, Single Piece Flats, Presort Letter, Presort Flats and Parcels.

**Table 2**  
**Effects of Relaxing the Uniform Price Restriction on Standard Mail**

	<b>Total Revenue For All Products</b>	<b>Total Delivery Cost For All Products</b>	<b>Total Volume for All Products</b>	<b>Contribution over Delivery Cost</b>
Uniform Price	\$61,739,691	\$22,618,133	196,824,884	\$39,121,558
Flexible Price	\$61,739,691	\$21,941,014	192,846,943	\$39,798,677
Difference	\$0	(\$677,119)	(3,977,940)	\$677,120

**Effects of Relaxing the Uniform Price Restriction on First-Class Mail**

	<b>Total Revenue For All Products</b>	<b>Total Delivery Cost For All Products</b>	<b>Total Volume for All Products</b>	<b>Contribution over Delivery Cost</b>
Uniform Price	\$61,739,691	\$22,618,133	196,824,884	\$39,121,558
Flexible Price	\$61,739,691	\$22,482,896	196,455,996	\$39,256,795
Difference	\$0	(\$135,237)	(368,888)	\$135,237

*Revenue, cost and contribution are in thousands of dollars. Volume is in thousands of pieces. Note that total revenue and total cost are less than the corresponding CRA magnitudes because the analysis includes only delivered volumes and excludes international mail.*

Note that the institution of flexible prices leads to a net reduction in volume. In the calculations, the Postal Service did not reduce upstream costs for this volume reduction, and thus underestimates the profit gain. This measure is just the change in contribution over delivery costs. This omission leads the estimates to understate the true USO costs. Putting the two analyses together, the combined USO cost for both Standard Mail and First-Class Mail for this aspect of the uniform price USO is estimated to be \$812 million per year.

**B. The Commission’s report does not include the effect of an important part of the USO cost of six day delivery.**

In its analysis of the USO cost of six day a week delivery, the report recognizes that “network” costs would be saved by reducing the number of delivery days but fails to accept that “attributable” costs could be saved. The report bases its skepticism on four assertions about the nature of costs in carrier delivery. However, careful consideration of each of these assertions shows that while they may sound plausible, each is actually a bit off point. In fact, the corrected versions of these assertions show that attributable cost savings are not only plausible, but likely.

To assist the Commission in its determinations, the Postal Service reviews the assertions, explains why they are not quite correct, and then discusses the nature and possible size of attributable cost savings from reduced days of delivery.

**Assertion 1: Economies of density cannot be used to explain or justify the absorption of variable costs.**

The report states:<sup>45</sup>

Economies of density means that some activities that serve a route take a fixed amount of time, and that the cost of the fixed activity is spread over more pieces as the number of pieces increases.

And:<sup>46</sup>

The notion of “economies of density” (the spreading of overhead) is not adequate to explain a prediction of such a dramatic change in cost behavior, since economies of density can imply falling, constant, or rising costs at the margin, depending upon whether the resource being analyzed (such as a carrier case) is under-utilized, fully utilized, or over-utilized.

This assertion on the inadequacy of “economies of density” may be based upon a misunderstanding, as it seems to mischaracterize the concept. Economies of density are actually not the “spreading of overhead,” and economies of density are not

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<sup>45</sup> See Commission Report at 127.

<sup>46</sup> *Id.* at 129. Please note that, formally speaking, “economies of density” can not imply constant or rising costs at the margin. For example, rising costs at the margin are known as “diseconomies of density.” Constant costs at the margin are identified by a lack of economies of density.

determined by variations in overhead or fixed costs. Instead, economies of density are defined as a situation in which an increase in volume results in a less than proportional increase in total cost, holding network size constant.<sup>47</sup>

In the postal context, economies of density arise when there is an increase in volume, without a change in delivery points, resulting in an increase in volume per delivery point. This means that postal economies of density are not the spreading of overhead, but a characteristic of the way the variable cost changes as volume changes. The existence of economies of density is determined by the nature of production in a network industry. Mathematically economies of density occur when:

$$\left. \frac{\Delta\% \text{ Total Cost}}{\Delta\% \text{ Vol}} \right|_{DP=\overline{DP}} < 1.$$

In this inequality, DP stands for delivery points. Because, by definition, fixed costs do not vary as volume changes, economies of density necessarily are describing how variable costs change as volume change.

Finally, as suggested in the report, it is theoretically possible to have diseconomies of density, but in the context of postal delivery just the opposite has been found empirically and “diseconomies of density” would be considered highly unusual and counter intuitive. This suggests that in carrier delivery economies of density are just the theoretical concept useful for explaining attributable cost savings from reducing the number of delivery days. The volume of mail delivered to the fixed number of delivery points will increase as, say, Saturday’s mail is now being delivered on other days. As the above inequality demonstrates, under economies of density the percentage increase in total (and thus variable) cost is less than the percentage

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<sup>47</sup> See Nauges, C., and van den Berg, C., “Economies Of Density, Scale And Scope In The Water Supply And Sewerage Sector: A Study Of Four Developing And Transition Economies,” *Journal of Regulatory Economics*, Vol. 34, No. 2, October 2008; Caves, D.W., Christensen, L.R. and Tretheway, M., “Economies Of Density Versus Economies Of Scale: Why Trunk And Local Service Airline Costs Differ,” *Rand Journal of Economics*, Vol. 15, No.4, Winter 1984.

increase in volume. This means that some of the total (thus variable) cost is absorbed when delivery days are reduced.

**Assertion 2: The variability of city street time already takes into account the “fixed portions” of street activities and therefore there are no more economies to be achieved**

The report states:<sup>48</sup>

In the Commission’s view, however, the fixed components of street delivery are largely accounted for in the estimate that serves as the starting point for IBM’s analysis—that carrier costs overall (on city routes) are about 52 percent volume variable and 48 percent fixed. . . . Therefore, to the extent that “economies of density” exist in the delivery function due to activities such as accessing addresses, they have already been accounted for in the modeled results that aggregate to 49 percent variability.

The argument in the report is that the estimated variability currently used for the delivery activity essentially reflects the division of activities into “fixed” and “variable” and the existence of the “fixed” activities cannot be used to explain the existence of economies of density. While it is true that fixed costs cannot be used to explain economies of density, it turns out to be inaccurate to suggest that the carrier street time variability reflects just the existence of fixed activities. If it did, one could model carrier street time cost as a straight line, with a positive intercept capturing fixed cost and a straight line reflecting constant marginal cost. This assumption is illustrated in Figure 1:

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<sup>48</sup> See Commission Report at 128.

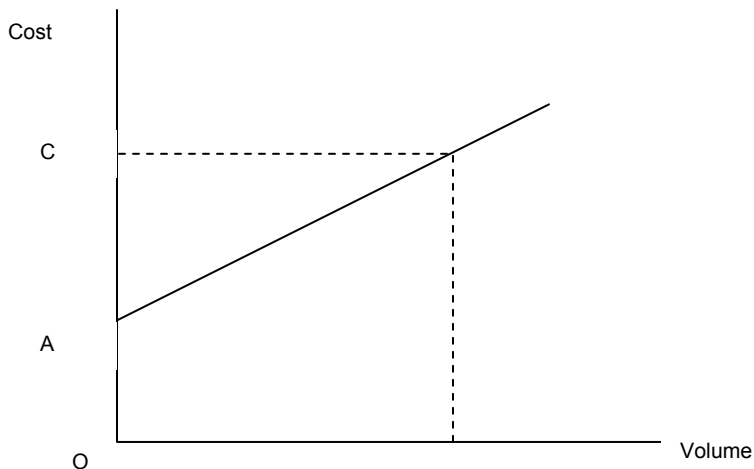
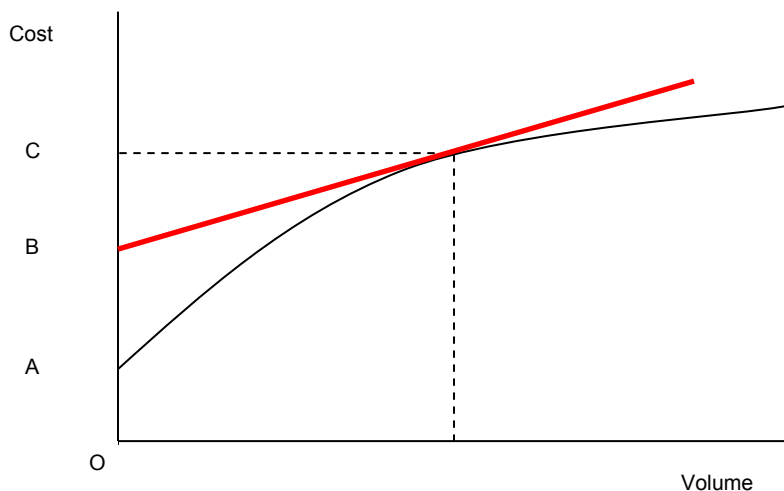


Figure 1

In Figure 1, the fixed cost is given by the vertical distance between the origin and A, and the attributable (or volume variable) cost is given by the distance between A and C. When marginal cost is constant, there are no economies of density. However, this assumption is in strong contrast to previous econometric and engineering work on carrier delivery that shows the street time cost surface to be curved, indicating that marginal cost falls as volume rises.<sup>49</sup> The traditional case of a nonlinear delivery cost surface is illustrated in Figure 2:



<sup>49</sup> For example, both the “coverage” function and the “load time” function relied upon by the Commission in previous cases were highly nonlinear. See PRC Op., R90-1, at III-85.



## Figure 2

In this figure, the fixed cost is given by the vertical distance between the origin and A, but the institutional cost is given by the vertical distance between the origin and B as institutional cost also includes the “inframarginal” cost of delivery. The attributable (or volume variable) cost is given by the distance between B and C.

In sum, a city carrier delivery time variability actually captures two things: the fact that some street time costs may be essentially fixed (like network time) and that the other variable costs (like load time) rise at a rate which is less than proportional with volume. Ultimately, this is an empirical question and the empirical evidence is discussed in the next assertion below.

### **Assertion 3: Previous econometric work indicates that there are no economies of density in the variable costs**

The report states:<sup>50</sup>

Models of volume-variable carrier delivery time that the Commission and the Postal Service had relied on in the past analyzed the variability of this time by the functions performed. For example, the carrier sorts the mail and pouches it in the office before going out on the street (labeled “in-office” time). This time was assumed to vary almost in direct proportion to volume. In-office time was very similar to “elemental load time.” This was the label given to the activity of stopping at a delivery point, sorting through the mail pouch for items for that address, and loading the items in the mailbox. Econometric models of “elemental load time” found that it, like “in-office” time, varied almost in direct proportion to volume.

To buttress its argument that city carrier street time can be modeled as a fixed intercept, straight line function, the report argues that the variable portion of street time varies virtually proportionately with volume. For example, as shown above, it argues that load time (the time loading mail into the receptacle) is like carrier casing and is essentially proportional to volume, meaning that it has a variability of 100 percent.

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<sup>50</sup> See Commission Report at 128.

This assertion is surprising in light of previous and current econometric work on street time activities, including the Commission's own work. For example, when the Commission estimated its own load time function, it found the estimated variability to fall below 100 percent:<sup>51</sup>

The overall variability for elemental load time that we calculate from the Commission's unrestricted models is 59 percent.

Such a low variability implies that total load time rises much less proportionately than volume and is evidence of material economies of density in delivery. Load time provides an excellent example of how economies of density arise in a nonlinear context. For example, because pieces can be "bundled" for delivery into a mailbox, the additional variable labor time required to deliver an additional piece falls as the number of pieces put into the box rises.

**Assertion 4: Economies of density (absorption) requires "accelerating productivity" and "dramatic changes" in marginal cost.**

The report states:<sup>52</sup>

Assuming that marginal costs (not average costs) decline as volume rises is the equivalent of assuming that the efficiency with which mail is sorted and delivered by carriers not only rises, but accelerates, as volume increases

And:<sup>53</sup>

GMU's estimate of the profit impact of reducing the frequency of delivery from 6 to 5 days does not rest on the premise that the direction of marginal costs would change dramatically.

Importantly, the report does not provide any evidence to support these relatively strong assertions, thus leaving their validity an open question. In this section of its

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<sup>51</sup> See PRC Op., R90-1, at III-85.

<sup>52</sup> See Commission Report at 129.

<sup>53</sup> *Id.* at 131.

comments, the Postal Service attempts to assist in evaluation of this assertion by producing the empirical evidence required. The Postal Service examines empirically whether the existence of economies of density, and thus the absorption of variable costs, requires either “accelerating” productivity or “dramatic changes” in marginal cost. The Postal Service finds that for reasonable values of absorption, no dramatic changes in productivity are required and the marginal costs in city carrier street time vary smoothly over the range of volume changes associated with a one-day reduction in the number of delivery days.

The Postal Service examines the absorption, marginal costs, and productivities for two widely empirical cost surfaces, the translog surface and the quadratic surface. Both have been used to estimate carrier cost equations in the past and are widely used in the empirical cost literature. Two functional forms were tested to ensure the results were not specific to a particular form. The translog equation was estimated on official Postal Service city carrier data as part of testimony in Docket No R2005-1.<sup>54</sup> Those data underlie the current Commission-approved method of attributing city carrier street time costs. The quadratic analog was not estimated as part of that case, but can easily be estimated on the same data. The estimated model is included in the technical appendix to these comments.

Once the cost surface has been estimated, the absorption factor can be straightforwardly derived. The mathematical details are in the technical appendix, but conceptually the absorption factor measures the percentage reduction in variable cost associated with reducing delivery days from six to five. While the variable cost per delivery day rises, unless it rises by 20 percent (the amount of the volume per day increase) the total variable cost will fall because the number of delivery days falls from six to five.

For example, suppose that the variable delivery time per day under six day delivery is 100 hours. If one delivery day is eliminated and there is no change in volume, then the average volume on the remaining days increases by 20 percent. This

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<sup>54</sup> See, Direct Testimony of Michael D. Bradley on Behalf of the United States Postal Service, USPS-T-14, Docket No. R2005-1, at 55.

increases variable cost.<sup>55</sup> Suppose that the increase in volume per day increases variable delivery time to 116 hours a day. Despite the fact that variable cost per day has increased, total variable cost has fallen. Under six day delivery total variable cost was 600 hours, 100 hours per day times six days. Under five day delivery total variable cost is 580 hours. This is 3.33 percent reduction in variable cost. The absorption factor is the ratio of the percentage change in cost divided by the percentage change in volume per day. In this example, the absorption factor is 16.67 percent (.0333/.20).

Calculation of the absorption factors for the translog and quadratic cost surfaces yields absorption factors of 26.6 percent and 19.1 percent, respectively. Both estimated cost surfaces suggest that there are material economies of density in delivery and that a shift from six day delivery to five day delivery would lead to a savings in attributable cost.

Given that both cost surfaces produce evidence of material absorption, they both provide excellent opportunities for investigating the assertions that the requisite economies of density require dramatic changes in marginal cost and productivity. The report is correct to suggest that economies of density imply a declining marginal cost and an increase in productivity (pieces delivered per minute of variable time), but the key question is whether these changes are so dramatic as to render them unreasonable.

To investigate this issue, the Postal Service calculates the marginal cost (in terms of carrier time) at the mean daily volume under six day delivery for both cost surfaces. The Postal Service then recalculates the marginal cost at the 20 percent large volume per day that arises under five day delivery. The following table shows that the resulting changes in marginal cost (in seconds of carrier time) are modest and feasible. The translog surface produces a decrease in marginal cost of less than one-tenth of a second and the quadratic surface produces a decrease in marginal cost of less than one-fifth of a second. Both decreases are less than 10 percent of the marginal time under six day delivery.

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<sup>55</sup> If there are economies of density, however, the increase in variable cost per day is less than proportional.

**Estimated Marginal Costs Under Different Delivery Days**

	<b>Five Day</b>	<b>Six Day</b>	<b>Change</b>
Translog	1.23	1.15	-0.08
Quadratic	1.48	1.34	-0.14

*Costs are measured in seconds of carrier time.*

Both cost surfaces can also be used to calculate the number of pieces delivered per minute of variable time under six day and five day delivery.<sup>56</sup> This is done in a manner similar to that for calculating marginal costs, calculating productivities at mean volume per day and 20 percent above mean volume per day. The calculated values are given in the following table.

**Estimated Productivities Under Different Delivery Days**

	<b>Five Day</b>	<b>Six Day</b>	<b>Change</b>
Translog	34.38	36.32	1.93
Quadratic	32.68	33.98	1.30

*Productivities are measured in pieces delivered per minute of variable time*

The implied increases in productivity are both feasible and modest. For example, the increase of 1.3 pieces per minute in variable time in the quadratic case is only a 4 percent increase in productivity. Thus, for both productivities and marginal costs, the empirical evidence indicates that, under measured economies of density, the implied changes are not dramatic.

In sum, the Postal Service has carefully reviewed assertions put forth in the report to justify excluding consideration any savings in attributable cost from a reduction in delivery days to see if they are supported either by economic theory or by empirical

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<sup>56</sup> The report does not dispute that there will be savings in fixed time, and thus increases in productivity in terms of pieces delivered per minute of fixed time. The appropriate measure of productivity to investigate the assertion about economies of density is the pieces per minute of variable time.

evidence. The Postal Service believes that the results presented above support the contention that economic theory, econometric evidence, and operational practice indicate that delivery of the same volume to a fewer number of stops could well save not only network costs but also some attributable costs. More difficult, of course, is estimating how much attributable cost would be saved by reducing mail delivery by one day. Existing evidence on carrier street time suggest that at least 20 to 25 percent of variable time could be saved without any change in operations. For example, absorption rates of 10 percent of the additional daily attributable city carrier office time, 25 percent of the additional daily attributable city carrier street time, and 15 percent of the additional daily attributable rural carrier time would save the Postal Service about \$400 million per year. (This is about 3.5 percent of attributable carrier time.) To the degree that the Postal Service could operationally exploit the higher volumes per stop to better utilize the carrier network, additional attributable cost savings would occur.

**C. The Commission’s report does not include a potentially important aspect of the value of the mailbox monopoly.**

One of the gains to the Postal Service from exclusive rights to use the mailbox is the efficiency with which it can be used. Both delivery costs and collection costs per piece are lower because the Postal Service is the unique depositor into and collector from the mailbox. Consequently, some of the value of the mailbox monopoly is comprised of the additional efficiencies the Postal Service gains from exclusive access. Removal of the mailbox monopoly would increase Postal Service collection and delivery cost. Surprisingly, the report (and the GMU analysis) does not consider this straightforward and potentially important aspect of the mailbox monopoly.

A review of the report reveals that the exclusion of this effect may be based upon an incomplete or unclear explanation of how the effect occurs. In this section, the Postal Service attempts to improve that explanation, carefully lay out the reasons behind the existence of the effect, and provide an example of how it occurs. The Postal Service also demonstrates why it thinks that the report’s objections are based upon a misapprehension of how the effect works.

The loss in efficiency from losing exclusive mailbox access has been termed the “congestion effect,” although a better label might be the “pollution effect.” The

Commission's explanation reveals that it mistakenly associates the existence of a congestion effect with a change in the amount of volume in the mailbox.<sup>57</sup>

The basic logic behind the congestion effect needs to be clarified. The volumes modeled by IBM are characterized as "diverted" volumes, whether existing competitors or new entrants contribute the volume. If these volumes are, in fact, diverted from the Postal Service rather than new volume, it would seem that this should have some ameliorating effect on congestion in the mailbox. If, on the other hand, these volumes are primarily new volume and would have substantial congestion effects, they would have a significant impact on the volume variability of delivery and collection costs. Each additional piece would be expected to increase congestion, and thereby increase, rather than decrease, unit marginal costs.

The report's confusion on this issue thus appears to come from linking the congestion effect to the total amount of mail in the box. While this may have been how the effect was discussed, the congestion effect is not based solely upon the amount of volume in the mailbox but the "ownership" of that volume. If the mailbox rule is relaxed, then non-mail material can be placed in the box. It is the existence of this non-Postal Service material that creates additional cost for the collection and delivery of mail. Note that this is true even if the same total amount of material is in the mailbox.

This is perhaps best explained through a simple example. Consider a mailbox that is receiving 8 pieces of mail: 3 letters, 4 flats, and 1 small parcel. Under the mailbox rule, all of this volume is delivered by the Postal Service. This means that the carrier can wrap the letters and small parcel with the flats, create a single bundle, and put the entire bundle into the empty box as a unit. This is very efficient and saves delivery time relative to having to place the letters, flats, and small parcel in the box separately.

Now suppose that the mailbox rule is lifted and 2 of the flats and the small parcel are delivered by an entrant. Now when the carrier comes to deliver the "mail" (3 letters and 2 flats) he or she must fit them into a box that already contains two flats and a parcel. The requirement to examine what is already in the box and move the non-mail material aside before putting the mail into the box adds to the time it takes to load the

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<sup>57</sup> See Commission Report at 152.

box. In addition, the existence of non-mail in the box may preclude the carrier from bundling the letters, flats, and small parcels which makes mailbox delivery efficient. Thus, if a carrier must separately enter letters, flats, and parcels because of difficulty finding space in the box, the productivity of delivery will fall and costs of delivery will rise.<sup>58</sup>

Similarly, if there is both delivered non-mail and mail to be collected in the mailbox, the time for collection of the mail will increase. Under the mailbox monopoly, the carrier can assume that everything in the box is waiting for collection and can simply remove the mail from the box. In contrast, if the mailbox is open the carrier must first sort through the material in the mailbox to determine which material is for delivery by an entrant and which material is awaiting collection by the Postal Service.

These effects are enhanced if the volume of non-mail grows. If, for some reason, mail is not only diverted to entrants but also the total amount of material put into the box grows, the congestion effect is increased. In this way, the report's statement that, "Each additional piece would be expected to increase congestion, and thereby increase, rather than decrease, unit marginal costs," has merit. Note, however, that this is because the existence of non-mail is causing a shift in the Postal Service's delivery curve, not a movement along it. If anything, the diversion of mail away from the Postal Service would cause its own volumes to fall and would lead to a move up its own cost curve leading to higher marginal costs.<sup>59</sup>

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<sup>58</sup> Unlike what is suggested in the report, these effects are not a matter of "moving along" a given delivery cost function and thus changing the marginal cost of delivery. Rather, it is a shift in the function, because the time effort required to deliver the mail has gone up. If there were new non-mail volume, the congestion effect could take place even if mail volume stays the same.

<sup>59</sup> This confusion also seems evident in the report's attempt to use the congestion effect as a way of undermining the absorption analysis in the delivery day USO calculation. In footnote 95 on page 152 of the report, the Commission states:

In addition, IBM's estimate of the effect of reducing the frequency of delivery involves substantial increases in the volume of mail delivered in ZIP Codes on the remaining delivery days. If these increases in volume are as substantial as those assumed by IBM in its analysis of the mailbox monopoly, it implies that there might be increasing unit marginal costs under IBM's reduction-in-delivery-days scenario that need to be taken into account.

However, this statement appears to be confusing a movement down the Postal Service's delivery cost curve due to more volume (which would lower Postal Service marginal delivery cost) with a shift in that curve due to the presence of non-mail in the box (which would increase Postal Service marginal delivery



**D. The GMU model relied upon by the Commission does not include an essential part of a complete analysis of valuation of the Postal Service’s monopolies.**

A well known response to relaxation of monopoly restrictions for a firm with universal service obligations is known as “cream skimming.” Entrants provide service in those geographic areas with low costs and high profits. This leaves the incumbent with responsibility of providing service in the less profitable, higher cost areas. A complete valuation of the monopoly thus includes an assessment of impact of cream skimming on the incumbent.

The GMU model does not include the geographic diversity of delivery costs as it assumes the same delivery cost structure for all routes included in its analysis.<sup>60</sup> This is a serious limitation for a model that is trying to value the Postal Service monopolies and this limitation was highlighted by the Commission:<sup>61</sup>

The GMU analysis needs to be refined to model geographic and delivery characteristics of the network at the local level. By adding ZIP Code-specific data to the route-level data that GMU used, it could have associated the volumes, revenues, and costs of the routes analyzed with their geographic location.

And:<sup>62</sup>

Finally, geographically-specific data for routes would have allowed GMU to take into account local differences in real wages between the Postal Service and a potential entrant’s carriers (indicated by local differences in the cost of living).

To assist the Commission in its determinations, the Postal Service analyzes the GMU “baseline” scenario in a model that does allow for geographic differences and associates the volumes, revenues, and costs of routes with their geographic location. In

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cost). The former effect is caused by reducing the number of delivery days. The latter effect is caused by removing the mailbox monopoly.

<sup>60</sup> According to its documentation, the GMU model also suffers from some other serious limitations. For example, despite the facts that there are far more city routes than rural routes, and there is much more volume delivered on city routes than rural routes, the GMU model includes virtually all rural routes but only 10 percent of city routes. This unusual structure likely leads to a distortion in representing national delivered volumes. In addition, in calculating costs for city routes, the model appears to be using delivery costs per RPW piece. Not all pieces are delivered on city routes -- or delivered at all, rendering this cost calculation questionable.

<sup>61</sup> See Commission Report at 147.

<sup>62</sup> *Id.*

addition, the model allows for local differences in costs of living. The Postal Service starts by identifying the key parameters the GMU model specified for its base case (the one adopted by the Commission’s report):<sup>63</sup>

In our opinion, realistic ranges for the input variables and the base case are the mid range of the values. The base case for the combined letter/mailbox monopoly is as follows:

- 10 percent -- Discount*
- 3 -- Number of days per week that the entrant delivers*
- 10 percent -- Entrant’s cost advantage (labor cost and efficiency)*
- 100 percent of contestable volume available*

Note that this scenario includes both relaxation of the PES and the mailbox monopoly.

The Postal Service next calibrates the IBM model so that it replicates the GMU baseline scenario. The calibration parameters are given below:

**GMU Baseline Scenario for Valuing the Postal Monopoly**

	GMU Model	IBM Model
Entrant Discount	10%	10%
Number of Delivery Days	3	3
Contestable Volume (billions)	55.3	55.4
<i>First-Class Presort</i>	<i>10.8</i>	<i>10.8</i>
<i>Standard Regular</i>	<i>13.3</i>	<i>13.3</i>
<i>Standard ECR</i>	<i>28.3</i>	<i>28.3</i>
<i>Periodicals</i>	<i>2.9</i>	<i>2.9</i>
Entrant Cost Advantage	10%	10%*

\* Model allows for local cost of living effects. National average entrant cost advantage is 10%

The two models are calibrated to run the same scenario, indicating that differences in results would arise from differences in the ways the models work, not from alternative specifications of the scenario being analyzed. The primary differences in the model include: the IBM model allows for differential costs of living across the

<sup>63</sup> See George Mason University, Appendix F, Section 4, at 10 (emphasis in original).

country to affect entrant wages, but the GMU model does not; the IBM model includes all city carrier delivery routes and the GMU model includes only 10% of city carrier routes; the IBM model computes the feasibility of entry at the ZIP Code level but the GMU model computes the feasibility of entry at the route level; and the IBM model incorporates differences in delivery cost by geographic area but the GMU model assumes the same cost of delivery for all geographic areas. These differences lead to material differences in the estimate of the value of the monopoly for the GMU scenario. The GMU model produces a value for the monopoly (lost profits from entry) of \$3.48 billion, while the IBM model produces a value for the monopoly of approximately \$4.5 billion for the same scenario.

A similar exercise can be performed for valuing just the mailbox monopoly. The following table presents the parameter values specified for the GMU model’s baseline scenario for analyzing the mailbox monopoly:

**GMU Baseline Scenario for Valuing the Mailbox Monopoly**

	GMU Model	IBM Model
Entrant Discount	10%	10%
Number of Delivery Days	1	1
Contestable Volume (billions)	22.8	22.8
<i>First-Class Presort</i>	0	0
<i>Standard Regular</i>	0	0
<i>Standard ECR</i>	19.9	19.9
<i>Periodicals</i>	2.9	2.9
Entrant Cost Advantage	10%	10%*
Congestion Effect	0	0

\* Model allows for local cost of living effects. National average entrant cost advantage is 10%

As with the pervious case, the Postal Service finds that there is a material change in the estimated value of the mailbox monopoly. For its baseline scenario, the GMU model produces a value of the mailbox monopoly of \$1.33 billion, whereas the IBM model produces a value of \$1.67 billion. Also, as discussed above, this scenario

excludes any impact of non-mail material being placed in the mailbox by new entrants. The existence of non-mail has the potential to impact the value of the mailbox monopoly in an important way. For example, if one assumes that the pollution of the mailbox raises Postal Service delivery costs by just 5 percent, the estimated value of the mailbox monopoly in this scenario increases from \$1.67 billion to \$1.90 billion.

**E. The GMU Model on which the report relies does not include an analysis of customer response to changes in the PES.**

An essential part of the quantitative analysis of the cost of the Postal Service's USO, or of the value of the postal monopoly, is forecasting the change in volume caused by changes in the postal environment. The report recognizes this with respect to possible changes in the number of delivery days, and recommends that the Postal Service analyze customer response to that service change. In contrast, the report does not rely upon such responses when considering the effects of a relaxation of the PES. Rather, the report adopts the GMU approach of attempting to identify "contestable" mail by making assumptions about how much of an existing portion of that mail could be diverted to new entrants under a lifting of the PES. In essence, this approach substitutes the judgment of the analyst for the judgment of the mailers.<sup>64</sup> Given the importance of these assumptions in determining the cost of the USO and the monopoly, it seems essential to augment this *a priori* approach with information from mailers. In other words, it would be helpful to the Commission to contact mailers and carefully elicit their forecasts of how they would respond to a change in the PES. The responses to such a study can then be used to identify the amount of diversion that would take place under a relaxation of the PES.

In this section of its comments, the Postal Service outlines a study of mailers undertaken by the Postal Service, and summarizes the responses. This study reveals that the potential diversion of both First-Class Mail and Standard Mail could be larger (in fact, substantially larger) than the 22 percent hypothesized in the GMU report.

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<sup>64</sup> The GMU approach to identifying contestable mail claims to be based upon "an analysis of how mailers and third party consolidators presort and dropship mail." See Appendix F at 4. However, there are no references or citations to any information obtained from a presorter, a consolidator, or even mail market professional. In short, the GMU report presents no evidence of any study being done to support its estimates of contestable mail, and the analysis of contestable mail seems to rely solely on undocumented opinion.

**GMU Model's Estimated Diversions From Elimination of the PES and Mailbox Monopolies**

	Baseline Case Diverted Volumes (billions)	FY2007 CRA Volumes (billions)	% Diverted
First-Class Presort Letters and Cards	5.9	53.634	11.0%
Periodicals	1.7	8.795	19.3%
Standard	28.7	103.515	27.7%
<b>TOTALS</b>	<b>36.3</b>	<b>165.944</b>	<b>21.9%</b>
Sources: GMU numbers from "Sum_allcases_combindedmonopoly.xls" and CRA numbers from USPS 2007 CRA			

The amount of volume diversion that can occur under relaxation of the monopoly is an important input in estimating both the value of the monopoly and the cost of the USO in a liberalized environment. This is because the amount of volume a new entrant can obtain determines whether it will achieve economies of scale and density necessary for profitable operation. It also is a key determinant of whether the entrant can earn enough revenue to cover its network costs.

In the original IBM report, estimates of volume diversion were derived from a Delphi survey of postal industry experts. For example, the estimates of volume diversion used in the original Low Entry scenarios represented the lower range of the diversion predicted by these experts. Although the Delphi Method of developing diversion estimates is well-established and provided useful insights into entry, the Postal Service recently conducted quantitative market research of its existing customer base in order to estimate volume diversion for a number of monopoly relaxation scenarios. This market research covered both First-Class Mail and Standard Mail. Results from this market research show that both the IBM Delphi-based estimates and the GMU diversion estimates are both likely to be *underestimating* the real potential for diversion should the monopoly be relaxed.

**Study Methodology**

On behalf of the Postal Service, Opinion Research Corporation (ORC) conducted a survey of nearly 1,000 USPS customers across all of its business customer segments.

The table below shows the number of interviews conducted by segment and class of mail.

**Table D-1: Sample Design**

Segment	Description	Class of Mail		Total
		First-Class Mail	Standard Mail	
National	200 Largest Customers	35	27	62
Premier	Next 1000 Largest	148	150	298
Preferred	Medium and Small Businesses (Non Retail)	150	149	299
Micro	SOHOs (Can use retail)	150	150	300
<b>Total</b>		<b>483</b>	<b>476</b>	<b>959</b>

In order to estimate volume diversion under monopoly relaxation, customers were provided with scenarios that represented new mail products that a reputable entrant might offer if the monopoly were relaxed. These scenarios included a reasonably detailed description of the service offering. Specified dimensions of the new product offering included its specific price point relative to the Postal Service’s current prices, and the delivery characteristics offered (such as 3-day a week day-certain delivery or 5-day a week delivery). For example, one such possible new competitor was for Standard Mail; the competitor would deliver three days a week to mailboxes at a price ten percent lower than USPS’ current Standard Mail prices. For each of the potential new product scenarios, customers were first asked to indicate how likely they would be to switch their existing mail volumes to the new entrant. Possible responses were: Definitely Would, Probably Would, Might or Might Not, and Never. Customers then provided further detail on which subclasses they would switch.

Converting these responses into quantitative estimates of diversion required three steps. First, numerical factors were applied to reflect the likelihood of switching. These factors capture the percentage of volume that would be switched by the responded. For example, if a customer indicated its Likelihood to Switch was “Definite,” 100 percent of its volume was considered eligible for diversion. The full set of numeric factors is:

- Definitely: 100% of volume eligible
- Probably: 75% of volume eligible
- Might or Might Not: 50% of volume eligible
- Never: 0% of volume eligible.

Second, volume diversions for each customer segment (National, Premier, Preferred, and Micro) were then estimated by summing the volume of those customers who indicated a propensity to switch and dividing by the total volume for all customers in the segment.

Finally, volume diversion proportions for each sampled segment were applied to the actual national volume for that segment.<sup>65</sup> This algorithm produces the estimated total diverted volumes by segment. The diverted segment volumes were then summed to get total diversion volume by product. The diverted volumes are divided by total national volume (by product) to calculate diversion percentages.

### **Key Findings**

While the majority of the market research results are obviously confidential because they would offer a road map to the Postal Service's actual and potential competitors into potential future market offerings, key qualitative insights and aggregate diversion results are presented here:

#### **First-Class Mail:**

- In a scenario with a new product offering similar to First-Class Mail in delivery characteristics, but priced 10 percent lower than the Postal Service's current price, First-Class Mail diversion is estimated to be 30 percent.
- Product offerings at 20 percent lower than the Postal Service's current price resulted in only a modestly higher diversion percentage compared to the 10 percent lower price point.

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<sup>65</sup> Total volumes for each segment by subclass were obtained from the following data systems: CBCIS and RPW.

- Customers indicate a willingness to switch in response not just to price, but also to an offer that would include enhanced service features even at a premium price relative to the Postal Service's First-Class Mail.
- Medium and small business customers indicate a higher willingness to switch both their Single-Piece and Presort First-Class Mail than larger customers do.
- Some Priority Mail volumes would also be diverted in response to new entrant product offerings that compete with First-Class Mail. Although this effect is not included in the quantitative results presented below, the loss of Priority Mail volumes should be considered as part of the impact of relaxing the PES.

### **Standard Mail:**

- In a scenario with a new product similar to Standard Mail in delivery characteristics, but priced at 10 percent lower than the Postal Service's current price, total Standard Mail diversion is estimated to be 40 percent.
- In a scenario with a new day-certain product offering that is delivered three days a week<sup>66</sup> to the mailbox priced at 10 percent lower than the Postal Service's current price, total Standard Mail diversion is estimated to be 20 percent.
- Product offerings at 20 percent lower than the Postal Service's current price resulted in a moderately higher diversion percentage compared to the 10 percent lower price point.
- In response to a competitor offering a three-day a week, day-certain product, customers displayed a willingness to switch not only a significant percentage of Standard ECR volumes but also a significant percentage of Standard Regular volumes. This willingness to switch existed even when the new product excluded delivery to the mailbox. This customer based response is in contrast to

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<sup>66</sup> Day-certain delivery would be provided if customers submit their mail at least one week in advance.



assumptions made in the GMU analysis that only a very narrow subset of Standard Mail would be impacted by the relaxation of the mailbox monopoly.

### **Implications for Value of the Monopoly**

Overall, the results for the survey show that customers have a propensity to switch a substantial amount of mail volume for what they perceive to be a better offer, especially in the long-run. The results also demonstrate that one should not underestimate customers' willingness to switch volume across Postal Service products and possibly change their mailing behaviors to do so. In addition to price incentives causing diversion, it is likely that competitors may not have similar preparation requirements or define routes in the same way as the Postal Service, but rather define these requirements in a way that is most likely to provide them the greatest competitive and price advantages. Below, the Postal Service presents several examples of scenarios in which customers would be likely to divert volumes that do not fall in the subset of "contestable mail" as defined by the GMU analysis.

#### **Example 1: Non-Dropshipped Mail Diversion**

One example of understating the amount of diversion is that the Commission's list of contestable mail seems to eliminate any mail that is not dropshipped to the SCF or DDU. However, there would be no legal restriction to prevent non-dropshipped mail from being diverted. In the Delphi survey, experts envisioned partnerships in which presort bureaus would team with local delivery companies to provide a lower-cost end-to-end service for mailers who do not currently dropship:<sup>67</sup>

"Partnerships between large presort/mail fulfillment operations and delivery companies/integrators likely combine successful portions of market abilities in high density, high value markets."

#### **Example 2: High-Density Saturation Mail Diversion**

Another example of potentially eligible mail excluded by the Commission analysis of the mailbox monopoly is Standard Mail ECR High-Density mail. A current high-

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<sup>67</sup> IBM Delphi Study Result, April 2008.

density mailing that covers three-fourths of a route may not qualify for ECR saturation rates. However, because that mailing covers all residents in an area, it could still be delivered by an entrant.

### **Example 3: Total Market Coverage Mailing Diversion**

Similarly, consider a current Total Market Coverage (TMC) mailing that supplements a newspaper insert in a certain area. Such a mailing would at first seem to be not “contestable” under a relaxation of the mailbox rule because it is non-randomly destined for certain individuals (non-subscribers) in that area. However, this overlooks the fact that without a mailbox monopoly, a delivery company could now deliver the insert directly to all residents in an area. In this circumstance, the TMC becomes contestable.

The market research findings underscore the position that relaxation of the monopoly will have significant effects on the Postal Service’s financial position and possible changes to the monopoly should not be undertaken without serious consideration of the long-term effects. To provide some quantitative implications of the survey, the Postal Service re-runs the GMU baseline scenario using diversion numbers derived from the survey. This is to provide an important sensitivity analysis of the GMU results. All estimates of the value of the monopoly depend upon uncertain forecasts of volume losses, so it is important to provide a range of value estimates over reasonable sets of forecasts. This helps policymakers identify the risk associated with selecting any individual value.

The following table presents the results from the GMU baseline scenario and two scenarios based upon the survey of customers. The first applies the estimated percentages of possible diversion to delivered volumes and the second applies those percentages to total volumes. The survey-based scenarios differ from the GMU estimate in one regard. To be consistent with the questions asked in the survey, the scenario is adjusted to calculate entrant costs based upon 5 days of delivery per week instead of 3 days of delivery per week.

### Diverted Volume Forecasts and Value of the Monopoly Estimates

	GMU Baseline	Survey Proportions Applied to Delivered Volume	Survey Proportions Applied to All Volume
First-Class Presort Letters and Cards	11.0%	25.5%	29.6%
Periodicals	19.3%	19.6%	21.4%
Standard	27.7%	34.8%	40.0%
<b>TOTALS</b>	<b>21.9%</b>	<b>31.0%</b>	<b>35.7%</b>
Delivery Days per Week	3	5	5
Estimated Value of the Monopoly	\$3.48B	\$5.47B	\$6.30B

This analysis shows that alternative reasonable estimates of volume diversions can provide materially different estimates of the value of the monopoly and emphasizes the importance of carefully assessing potential diversion when evaluating the value of the Postal Service monopoly.

Finally, the results of the survey can also be used to estimate the cost of the uniform price aspect of the USO under monopoly relaxation. Estimates of this cost under the monopoly were discussed above. If the monopoly were to be relaxed, this USO cost would increase because the inability to react to competition becomes a potentially major problem for the incumbent operator. Thus, it is worth re-estimating the cost of a uniform price USO under relaxation of the monopoly. Previously, it was estimated that if the PES were relaxed to allow delivery of Standard Mail (but not First-Class Mail) then the cost of the uniform rate aspect of the USO was about \$1.4 billion per year.<sup>68</sup> Using the survey results, an estimate can now be made for complete relaxation of the PES that allows delivery of both First-Class Mail and Standard Mail. Despite the general relaxation, the Postal Service assumes that only presorted First-Class Mail and dropshipped Standard Mail would be affected.<sup>69</sup> Based upon the two scenarios used to estimate the value of the monopoly (applying the survey proportions

<sup>68</sup> See Commission Report at 141.

<sup>69</sup> The methodology is the same as the one used previously but the scenario settings are based upon the GMU baseline case.

to just delivered volume and to all volume), the USO cost of uniform prices are \$3.6 billion and \$4.3 billion per year, respectively.

It is essential not to overlook the importance of these results. These USO costs would occur in addition to those already identified by the Commission in the event of a relaxation of the Postal Service's monopoly. If one were to argue for relaxation of the monopoly based upon the size of the USO under monopoly conditions, one would understate the impact on Postal Service of continuing its USO requirements. In addition, one would overstate the likelihood of the Postal Service being able to internally fund the USO; alternative sources of funding might have to be considered.

## **IX. CONCLUSION**

The Postal Service is committed to providing the American public universal service at affordable prices. The current flexibility in defining the USO gives the Postal Service much needed flexibility to operate. Given its current financial condition and the current economic situation of the United States and the world, the Postal Service needs at a minimum this flexibility, along with the PES and mailbox rule, in order to continue to fulfill its mission. Any additional restrictions would have dire consequences in the ability of the Postal Service to provide trusted affordable universal service to the country.

Respectfully submitted,

UNITED STATES POSTAL SERVICE  
By its attorneys:

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TECHNICAL APPENDIX

RESPONSE TO QUANTITATIVE INVESTIGATION IN THE COMMISSION'S REPORT

TECHNICAL APPENDIX

A. Estimation of the Quadratic Cost Surface

A quadratic model of the delivery cost surface specifies that delivery time is a function of total volume, delivery points and delivery density (delivery points per square mile). These are the same variables that were included in the estimated translog surface. The quadratic equation was estimated on the same data that are used to developing the PRC's current attributable costing methodology for city carriers. The SAS log and output listing for estimation of the quadratic model are presented below.

**SAS LOG**

```

1694 options linesize=80;
1695 options nocenter;
1696 options nodate;
1697 options nonumber;
1698 filename timedat 'c:\Timepool MData.prn';
1699 filename lfvol 'c:\LFVolume MData.prn';
1700 filename pavol 'c:\PAVolume MData.prn';
1701 filename dense 'c:\Density MData.prn';
1702
1703 *****;
1704 *** Read in Time Data *****;
1705 *****;
1706 DATA time1; infile timedat;
1707 Input date $ zip rt $ bud bed bnd bod rud red rnd rod mode $
1708         lfdt cudt ncdt vmdt cedt dmdt nst prt ttft ntt ddt trvlt
1709         rlt gct ect pdt adt padt oct nat;
1710
1711 *****;
1712 *** This section of the program converts alphabetic route numbers***;
1713 *** and constructs a unique Zip-Route ID for each route*****;
1714 *****;
1715

```

NOTE: The infile TIMEDAT is:  
File Name=c:\Timepool MData.prn,  
RECFM=V,LRECL=256

NOTE: 36655 records were read from the infile TIMEDAT.  
The minimum record length was 76.  
The maximum record length was 133.

NOTE: The data set WORK.TIME1 has 36655 observations and 32 variables.

NOTE: DATA statement used:  
real time 0.43 seconds  
cpu time 0.40 seconds

```

1716 Data time2; set time1;
1717 if rt = 'XX' then rt=99.9;
1718 if rt = '0A' or rt = '0B' or rt = '0D' or rt = '0E' or rt = '0W'
1719 or rt = '1A' or rt = '4A' or rt = '4B' or rt = 'A7' or rt = 'C2'
1720 or rt = 'C3' or rt = 'CA' or rt = 'CK' or rt = 'CT' or rt = 'CV'
1721 or rt = 'ES' or rt = 'EV' or rt = 'F1' or rt = 'G5' or rt = 'HK'
1722 or rt = 'IT' or rt = 'L1' or rt = 'L3' or rt = 'L7' or rt = 'MD'
1723 or rt = 'MF' or rt = 'O1' or rt = 'O2' or rt = 'O5' or rt = 'O7'
1724 or rt = 'OL' or rt = 'P1' or rt = 'P2' or rt = 'RE' or rt = 'UX'
1725 or rt = 'VY' or rt = 'W8' then nrt=11.1;
1726 else nrt=rt;
1727 rtind=nrt/100;
1728 ziprt=zip+rtind;
1729

```

## Technical Appendix

```
1730 ***** ;
1731 *** This section of the program eliminates ***** ;
1732 *** any duplicate Zip-route, day observations in the time data***** ;
1733 ***** ;
```

NOTE: Numeric values have been converted to character values at the places given by: (Line):(Column).  
1717:22

NOTE: Character values have been converted to numeric values at the places given by: (Line):(Column).  
1726:10

NOTE: There were 36655 observations read from the data set WORK.TIME1.

NOTE: The data set WORK.TIME2 has 36655 observations and 35 variables.

NOTE: DATA statement used:

```
real time      0.93 seconds
cpu time       0.09 seconds
```

```
1734 proc sort; by ziprt date;
```

NOTE: There were 36655 observations read from the data set WORK.TIME2.

NOTE: The data set WORK.TIME2 has 36655 observations and 35 variables.

NOTE: PROCEDURE SORT used:

```
real time      2.23 seconds
cpu time       0.21 seconds
```

```
1735 proc means noprint; by ziprt date; id zip mode;
1736 var  bud bed bnd bod rud red rnd rod
1737      lfdt cudt ncdt vmdt cedt dmdt nst prt ttft ntt ddtv trvlt
1738      rlt gct ect pdt adt padt oct nat;;
1739 output out=time3 mean=bud bed bnd bod rud red rnd rod
1740      lfdt cudt ncdt vmdt cedt dmdt nst prt ttft ntt ddtv trvlt
1741      rlt gct ect pdt adt padt oct nat  n=sobs;
1742
1743
1744 *****;
1745 ** Read in LF Volume Data *****;
1746 *****;
```

NOTE: There were 36655 observations read from the data set WORK.TIME2.

NOTE: The data set WORK.TIME3 has 36647 observations and 35 variables.

NOTE: PROCEDURE MEANS used:

```
real time      0.43 seconds
cpu time       0.43 seconds
```

```
1747 DATA lfvoll; infile lfvoll;
1748 input  zip  date $ rteno  dpsl  cal  cnl  cf  seq ;
1749
1750
```

```
1751 ***** ;
1752 *** This section of the program converts alphabetic route numbers*** ;
1753 *** and constructs a unique Zip-Route ID for each route***** ;
1754 ***** ;
1755
```

NOTE: The infile LFMVOL is:

```
File Name=c:\LFVolume MData.prn,
RECFM=V,LRECL=256
```

NOTE: 40668 records were read from the infile LFMVOL.

The minimum record length was 27.

The maximum record length was 42.

NOTE: The data set WORK.LFMVOL1 has 40668 observations and 8 variables.

NOTE: DATA statement used:

```
real time      0.39 seconds
cpu time       0.18 seconds
```

```
1756 data lfvoll2; set lfvoll;
```

## Technical Appendix

```
1757 cl=cal+cnl;
1758 nrteno=1*rteno;
1759 rtind=nrteno/100;
1760 ziprt=zip+rtind;
1761
1762 ***** ;
1763 *** This section of the program eliminates any duplicate***** ;
1764 *** Zip-route, day observations in the LF Volume data *****;
1765 *****;
1766
1767
```

NOTE: There were 40668 observations read from the data set WORK.LFVOL1.  
NOTE: The data set WORK.LFVOL2 has 40668 observations and 12 variables.  
NOTE: DATA statement used:  
real time 0.82 seconds  
cpu time 0.04 seconds

```
1768 proc sort; by ziprt date;
```

NOTE: There were 40668 observations read from the data set WORK.LFVOL2.  
NOTE: The data set WORK.LFVOL2 has 40668 observations and 12 variables.  
NOTE: PROCEDURE SORT used:  
real time 0.10 seconds  
cpu time 0.10 seconds

```
1769 proc means noprint; by ziprt date; id zip;
1770 var dps1 cl cf seq ;
1771 output out=lfvol3 mean=dps1 cl cf seq n=vobs;
1772
1773
1774 *****;
1775 ** Read in PA Volume Data *****;
1776 *****;
```

NOTE: There were 40668 observations read from the data set WORK.LFVOL2.  
NOTE: The data set WORK.LFVOL3 has 40653 observations and 10 variables.  
NOTE: PROCEDURE MEANS used:  
real time 0.17 seconds  
cpu time 0.17 seconds

```
1777 DATA pavoll; infile pavol;
1778 input zip rteno $ date $ pcl sprs act blk slf sli mlf mli sff sfi mff mfi
1778! exp pri othp;
1779
1780 ***** ;
1781 *** This section of the program converts alphabetic route numbers*** ;
1782 *** and constructs a unique Zip-Route ID for each route*****;
1783 *****;
1784
```

NOTE: The infile PAVOL is:  
File Name=c:\PAVolume MData.prn,  
RECFM=V,LRECL=256

NOTE: 47531 records were read from the infile PAVOL.  
The minimum record length was 47.  
The maximum record length was 65.  
NOTE: The data set WORK.PAVOL1 has 47531 observations and 18 variables.  
NOTE: DATA statement used:  
real time 1.78 seconds  
cpu time 0.28 seconds

```
1785 data pavol2; set pavoll;
1786 if rteno = "XX" then nrteno=99.9; else
1787 nrteno=1*rteno;
1788 if nrteno="." then nrteno=11.1;
```



## Technical Appendix

```
1789 rtind=nrteno/100;
1790 *****;
1791 ** Convert the collection mail volume from *****;
1792 ** feet and inches into piecess *****;
1793 *****;
1794 ziprt=zip+rtind;
1795 slfi=slf*12;
1796 mlfi=mlf*12;
1797 sffi=sff*12;
1798 mffi=mff*12;
1799 sl=slfi+sli;
1800 ml=mlfi+mli;
1801 sf=sffi+sfi;
1802 mf=mffi+mfi;
1803 sl=19*sl;
1804 sf=10*sf;
1805 ml=19*ml;
1806 mf=10*mf;
1807
1808 ***** ;
1809 *** This section of the program eliminates any duplicate***** ;
1810 *** Zip-route, day observations in the PA Volume data *****;
1811 *****;
```

NOTE: Character values have been converted to numeric values at the places given by: (Line):(Column).  
1787:10 1788:11

NOTE: There were 47531 observations read from the data set WORK.PAVOL1.

NOTE: The data set WORK.PAVOL2 has 47531 observations and 29 variables.

NOTE: DATA statement used:

```
real time      0.14 seconds
cpu time       0.13 seconds
```

```
1812 proc sort; by ziprt date;
```

NOTE: There were 47531 observations read from the data set WORK.PAVOL2.

NOTE: The data set WORK.PAVOL2 has 47531 observations and 29 variables.

NOTE: PROCEDURE SORT used:

```
real time      1.45 seconds
cpu time       0.34 seconds
```

```
1813 proc means noprint; by ziprt date; id zip;
1814 var pcl sprs act blk sl ml sf mf exp pri othp;
1815 output out=pavol3 mean=pcl sprs act blk sl ml sf mf exp pri othp;
1816
1817
1818 *****;
1819 ** Read in Density Data *****;
1820 *****;
```

NOTE: There were 47531 observations read from the data set WORK.PAVOL2.

NOTE: The data set WORK.PAVOL3 has 47531 observations and 16 variables.

NOTE: PROCEDURE MEANS used:

```
real time      0.26 seconds
cpu time       0.24 seconds
```

```
1821 DATA densel; infile dense;
1822 input zip pop units land water;
1823
```

NOTE: The infile DENSE is:  
File Name=c:\Density MData.prn,  
RECFM=V,LRECL=256

NOTE: 31913 records were read from the infile DENSE.  
The minimum record length was 14.  
The maximum record length was 33.

NOTE: The data set WORK.DENSE1 has 31913 observations and 5 variables.

## Technical Appendix

NOTE: DATA statement used:

```
real time      0.10 seconds
cpu time       0.10 seconds
```

```
1824 proc sort data=dense1; by zip;
1825
```

NOTE: There were 31913 observations read from the data set WORK.DENSE1.

NOTE: The data set WORK.DENSE1 has 31913 observations and 5 variables.

NOTE: PROCEDURE SORT used:

```
real time      0.06 seconds
cpu time       0.06 seconds
```

```
1826 data dense1; set dense1;
1827 if units= 0 then delete;
1828 if land=0 then delete;
1829
1830
1831 *****;
1832 *Combine Volume & Time Data *****;
1833 *****;
```

NOTE: There were 31913 observations read from the data set WORK.DENSE1.

NOTE: The data set WORK.DENSE1 has 31827 observations and 5 variables.

NOTE: DATA statement used:

```
real time      0.03 seconds
cpu time       0.03 seconds
```

```
1834 proc sort data=time3; by ziprt date;
```

NOTE: There were 36647 observations read from the data set WORK.TIME3.

NOTE: The data set WORK.TIME3 has 36647 observations and 35 variables.

NOTE: PROCEDURE SORT used:

```
real time      3.68 seconds
cpu time       0.18 seconds
```

```
1835 proc sort data=pavol3; by ziprt date;
```

NOTE: There were 47531 observations read from the data set WORK.PAVOL3.

NOTE: The data set WORK.PAVOL3 has 47531 observations and 16 variables.

NOTE: PROCEDURE SORT used:

```
real time      0.15 seconds
cpu time       0.15 seconds
```

```
1836 proc sort data=lfvol3; by ziprt date;
```

NOTE: There were 40653 observations read from the data set WORK.LFVOL3.

NOTE: The data set WORK.LFVOL3 has 40653 observations and 10 variables.

NOTE: PROCEDURE SORT used:

```
real time      0.12 seconds
cpu time       0.12 seconds
```

```
1837 data comb; merge pavol3(in=p) lfvol3(in=v) time3(in=s); by ziprt date;
1838 if p=1 and v=1 and s=1 then source='all';
1839
```

NOTE: There were 47531 observations read from the data set WORK.PAVOL3.

NOTE: There were 40653 observations read from the data set WORK.LFVOL3.

NOTE: There were 36647 observations read from the data set WORK.TIME3.

NOTE: The data set WORK.COMB has 53907 observations and 52 variables.

NOTE: DATA statement used:

```
real time      2.92 seconds
cpu time       0.40 seconds
```



## Technical Appendix

```
1870 if cf < 0 then cf = .;
1871 if dpsl < 0 then dpsl=.;
1872 if seq<0 then seq=.;
1873 if sprs<0 then sprs=.;
1874 if delt < 0 then delt=.;
1875 if dp < 0 then dep=.;
1876 if cv < 0 then cv = .;
1877 delt=lfdt+cudt+ncdt+vmdt+cedt+dmdt ;
1878 dp= bud+bed+bnd+bod+rud+red+rnd+rod;
1879 let=cl+dpsl;
1880 spr=sprs;
1881 cv=s1+m1+sf+mf+exp+pri+othp;
1882
1883
```

NOTE: Missing values were generated as a result of performing an operation on missing values.

Each place is given by: (Number of times) at (Line):(Column).  
15 at 1879:7

NOTE: There were 31041 observations read from the data set WORK.ALL.

NOTE: The data set WORK.ALL has 31041 observations and 62 variables.

NOTE: DATA statement used:

```
real time      0.18 seconds
cpu time       0.18 seconds
```

```
1884 proc sort; by zip date;
1885
1886
1887 *****;
1888 ** Elinat Zip Codes with data problems *****;
1889 *****;
```

NOTE: There were 31041 observations read from the data set WORK.ALL.

NOTE: The data set WORK.ALL has 31041 observations and 62 variables.

NOTE: PROCEDURE SORT used:

```
real time      5.98 seconds
cpu time       0.37 seconds
```

```
1890 data all; set all;
1891 if zip eq 1660939 then delete;
1892 if zip eq 8365476 then delete;
1893 if zip eq 3341404 then delete;
1894 if zip eq 8885626 then delete;
1895 if zip eq 3333330 then delete;
1896 if zip eq 6617639 then delete;
1897 if zip eq 7408660 and date eq '05/18/02' then delete;
1898
1899
1900 *****;
1901 ** Create Zip Code - Day Data Set for Estimation***;
1902 *****;
```

NOTE: There were 31041 observations read from the data set WORK.ALL.

NOTE: The data set WORK.ALL has 30087 observations and 62 variables.

NOTE: DATA statement used:

```
real time      1.68 seconds
cpu time       0.17 seconds
```

```
1903 proc means noprint; by zip date;
1904 var delt let cf seq spr cv blk dp units water land;
1905 output out=poolr sum = delt let cf seq spr scv blk dp units water land
1906          mean = adelt alet acf aseq aspr acv ablk adp aunits awater
1906!  aland n=nrts;
1907
1908
1909
1910 *****;
1911 **Construct Higher Order Terms **;
```

## Technical Appendix

```
1912 *****;
1913
```

```
NOTE: There were 30087 observations read from the data set WORK.ALL.
NOTE: The data set WORK.POOLR has 1545 observations and 27 variables.
NOTE: PROCEDURE MEANS used:
      real time          0.07 seconds
      cpu time           0.07 seconds
```

```
1914 data poolr; set poolr;
1915 cv=scv;
1916 let2=let**2;
1917 cf2=cf**2;
1918 seq2=seq**2;
1919 spr2=spr**2;
1920 cv2=cv**2;
1921 dp2 = dp**2;
1922 blk2=blk**2;
1923
1924 lf=let*cf;
1925 lse=let*seq;
1926 lcv=let*cv;
1927 lspr=let*spr;
1928 ldp=let*dp;
1929 fse=cf*seq;
1930 fcv=cf*cv;
1931 fspr=cf*spr;
1932 fdp=cf*dp;
1933 scv=seq*cv;
1934 sspr=seq*spr;
1935 sdp=seq*dp;
1936 cspr=cv*spr;
1937 cdp=cv*dp;
1938 spd=spr*dp;
1939 sqm=land;
1940
1941 dens=dp/sqm;
1942 dens2=dens**2;
1943 ldns=let*dens;
1944 fdns=cf*dens;
1945 sdns=seq*dens;
1946 cdns=cv*dens;
1947 spdns=spr*dens;
1948 dpdns=dp*dens;
1949 vol=let+cf+seq+cv+spr;
1950 vol2=vol**2;
1951 voldp=vol*dp;
1952 voldns=vol*dens;
1953
```

```
NOTE: There were 1545 observations read from the data set WORK.POOLR.
NOTE: The data set WORK.POOLR has 1545 observations and 62 variables.
NOTE: DATA statement used:
      real time          0.01 seconds
      cpu time           0.01 seconds
```

```
1954 proc means;
1955 var deltax let cf seq cv spr vol dp dens;
1956 output out=regmean mean=mdelt mlet mcf mseq mcv mspr mvol mdp mdens;
1957
1958
1959 *****;
1960 **Estimate the Pooled Regular Delivery Model **;
1961 **Full Quadratic Specification **;
1962 *****;
1963
```

```
NOTE: There were 1545 observations read from the data set WORK.POOLR.
NOTE: The data set WORK.REGMEAN has 1 observations and 11 variables.
```

## Technical Appendix

NOTE: PROCEDURE MEANS used:

```
real time      0.01 seconds
cpu time       0.01 seconds
```

```
1964 proc reg data=poolr outest=coef1;
1965 model delt= vol vol2 dp dp2 dens dens2
1966
1967          voldp voldns dpdns/vif tol acov ;
1968
1969
1970
1971 *****;
1972 **Calculate Variabilities for Regular Delivery Model **;
1973 **Full Quadratic Specification **;
1974 *****;
1975
```

WARNING: The variable \_NAME\_ or \_TYPE\_ exists in a data set that is not  
TYPE=CORR, COV, SSCP, etc.

NOTE: 1545 observations read.

NOTE: 1545 observations used in computations.

NOTE: The data set WORK.COEFL has 1 observations and 15 variables.

NOTE: PROCEDURE REG used:

```
real time      0.04 seconds
cpu time       0.04 seconds
```

```
1976 proc print data=coef1;
1977
```

NOTE: There were 1 observations read from the data set WORK.COEFL.

NOTE: PROCEDURE PRINT used:

```
real time      0.00 seconds
cpu time       0.00 seconds
```

```
1978 data elascal1; merge coef1 regmean (drop=_TYPE_);
1979 pdelt=intercept+vol*mvol+vol2*mvol*mvol+dp*mdp+dp2*mdp*mdp+dens*mdens+dens
1979! 2*mdens*mdens
1980      +voldp*mvol*mdp+voldns*mvol*mdens+dpdns*mdp*mdens
1981 ;
1982
1983 elasv=(vol*mvol +2*vol2*mvol*mvol+voldp*mvol*mdp+voldns*mvol*mdens)/pdelt;
1984
1985
1986 *elasd=(dp*mdp +2*dp2*mdp*mdp
1986! +ldp*mlet*mdp+fdp*mcf*mdp+sdp*mseq*mdp+cdp*mcv*mdp+spdp*mspr*mdp
1987          +dpdns*mdp*mdens )/pdelt;
1988
1989 *elasdns=(dens*mdens +2*dens2*mdens*mdens
1989! +ldns*mlet*mdens+fdns*mcf*mdens+sdns*mseq*mdens+cdns*mcv*mdens+spdns*mspr*
1989! mdens
1990          +dpdns*mdp*mdens )/pdelt;
1991
1992
```

NOTE: There were 1 observations read from the data set WORK.COEFL.

NOTE: There were 1 observations read from the data set WORK.REGMEAN.

NOTE: The data set WORK.ELASCAL1 has 1 observations and 27 variables.

NOTE: DATA statement used:

```
real time      0.01 seconds
cpu time       0.01 seconds
```

```
1993 proc print data=elascal1;
1994 var mdelt pdelt elasv ;
1995
1996 run;
```

## Technical Appendix

NOTE: There were 1 observations read from the data set WORK.ELASCAL1.

NOTE: PROCEDURE PRINT used:

```
real time      0.01 seconds
cpu time       0.01 seconds
```

```
1997
1998
      1999
2000
2001
2002 *****;
2003 **Calculate Variabilities for Regular Delivery Model **;
2004 **Restricted Quadratic Specification **;
2005 *****;
2006
2007 proc print data=coef2;
2008 data elascal2; merge coef2 regmean (drop=_TYPE_);
2009 pdelt=intercept+let*mlet+let2*mlet*mlet+cf*mcf+cf2*mcf*mcf+seq*mseq+seq2*m
2009! seq*mseq
2010      +spr*mspr+spr2*mspr+cv*mcv+cv2*mcv*mcv+dp*mdp+dp2*mdp*mdp+dens*mdens+
2010! dens2*mdens*mdens
2011      ;
2012
2013 elas1=(let*mlet +2*let2*mlet*mlet)/pdelt;
2014 elasf=(cf*mcf +2*cf2*mcf*mcf)/pdelt;
2015 elass=(seq*mseq +2*seq2*mseq*mseq)/pdelt;
2016 elasc=(cv*mcv +2*cv2*mcv*mcv)/pdelt;
2017 elasp=(spr*mspr +2*spr2*mspr*mspr)/pdelt;
2018 elasd=(dp*mdp +2*dp2*mdp*mdp)/pdelt;
2019 elasdns=(dens*mdens +2*dens2*mdens*mdens)/pdelt;
2020
2021
2022
2023 proc print data=elascal2;
2024 var mdelt pdelt elas1 elasf elass elasc elasp elasd elasdns;
2025
2026 run;
```

**OUTPUT LISTING**

The SAS System  
 The MEANS Procedure

Variable	N	Mean	Std Dev	Minimum	Maximum
delt	1545	222595.34	155029.70	2711.00	843493.00
let	1545	36007.95	26665.41	425.0000000	212665.00
cf	1545	11799.20	9984.98	103.0000000	61573.00
seq	1545	3528.40	6333.08	0	67595.00
cv	1545	4969.46	6975.64	0	88201.00
spr	1545	373.2679612	326.3759862	0	3470.00
vol	1545	56678.28	39546.92	704.0000000	264745.00
dp	1545	9462.31	5817.34	196.0000000	34378.00
dens	1545	71.4975563	105.9993942	0.4480750	738.8297872

The SAS System  
 The REG Procedure  
 Model: MODEL1  
 Dependent Variable: delt

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	9	3.062069E13	3.402299E12	804.94	<.0001
Error	1535	6.488123E12	4226790480		
Corrected Total	1544	3.710882E13			

Root MSE                    65014      R-Square            0.8252  
 Dependent Mean            222595      Adj R-Sq            0.8241  
 Coeff Var                    29.20716



Technical Appendix

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t	Tolerance
Intercept	1	-13001	5135.43009	-2.53	0.0115	.
vol	1	1.37782	0.16782	8.21	<.0001	0.06215
vol2	1	-0.00000619	0.00000139	-4.46	<.0001	0.02785
dp	1	19.16545	1.15199	16.64	<.0001	0.06096
dp2	1	-0.00043444	0.00006573	-6.61	<.0001	0.02532
dens	1	-60.58964	51.18910	-1.18	0.2367	0.09298
dens2	1	0.18971	0.08080	2.35	0.0190	0.13539
voldp	1	0.00010504	0.00001698	6.19	<.0001	0.01145
voldns	1	-0.00259	0.00060805	-4.26	<.0001	0.13331
dpdns	1	-0.00470	0.00339	-1.39	0.1657	0.10153

Parameter Estimates

Variable	DF	Variance Inflation
Intercept	1	0
vol	1	16.08923
vol2	1	35.90243
dp	1	16.40514
dp2	1	39.48844
dens	1	10.75470
dens2	1	7.38592
voldp	1	87.35041
voldns	1	7.50151
dpdns	1	9.84957

The SAS System

The REG Procedure

Model: MODEL1

Dependent Variable: delt

Consistent Covariance of Estimates

Variable	Intercept	vol	vol2	dp	dp2
----------	-----------	-----	------	----	-----

## Technical Appendix

Intercept	20231148.669	-333.0788727	-0.001835389	-2489.803105	-0.092324607
vol	-333.0788727	0.0432941038	-1.496285E-7	-0.13891283	4.9629591E-6
vol2	-0.001835389	-1.496285E-7	3.096266E-12	1.1528499E-6	6.307729E-11
dp	-2489.803105	-0.13891283	1.1528499E-6	1.3515657466	-0.000012243
dp2	-0.092324607	4.9629591E-6	6.307729E-11	-0.000012243	6.0435484E-9
dens	-51610.6731	-0.751307446	0.0000121012	3.8060668666	0.0002853482
dens2	-20.30257381	0.0028866641	-7.25095E-9	0.0033985993	3.1142775E-7
voldp	0.0547703521	-7.271875E-7	-3.26706E-11	-8.773832E-6	-1.500405E-9
voldns	0.8897854928	-0.000062049	7.961353E-11	0.0001356162	9.1194178E-9
dpdns	3.636198372	0.0001626465	-1.579293E-9	-0.001277267	-1.456935E-7

### Consistent Covariance of Estimates

Variable	dens	dens2	voldp	voldns	dpdns
Intercept	-51610.6731	-20.30257381	0.0547703521	0.8897854928	3.636198372
vol	-0.751307446	0.0028866641	-7.271875E-7	-0.000062049	0.0001626465
vol2	0.0000121012	-7.25095E-9	-3.26706E-11	7.961353E-11	-1.579293E-9
dp	3.8060668666	0.0033985993	-8.773832E-6	0.0001356162	-0.001277267
dp2	0.0002853482	3.1142775E-7	-1.500405E-9	9.1194178E-9	-1.456935E-7
dens	1552.0778478	-1.843737082	-0.000091639	-0.011599177	-0.003985337
dens2	-1.843737082	0.0033435759	-1.353728E-7	2.4120106E-6	-0.000012724
voldp	-0.000091639	-1.353728E-7	5.609652E-10	-6.9308E-10	3.2101199E-8
voldns	-0.011599177	2.4120106E-6	-6.9308E-10	6.7650257E-7	-2.175952E-6
dpdns	-0.003985337	-0.000012724	3.2101199E-8	-2.175952E-6	0.0000139246

The SAS System

Obs	_MODEL_	_TYPE_	_DEPVAR_	_RMSE_	Intercept	vol	vol2	dp
1	MODEL1	PARMS	delt	65013.77	-13000.61	1.37782	-.000006190	19.1655

Obs	dp2	dens	dens2	voldp	voldns	dpdns	delt
1	-.00043444	-60.5896	0.18971	.000105037	-.002589924	-.004703349	-1

The SAS System

Obs	mdelt	pdelt	elasv
1	222595.34	226950.96	0.37082

## Technical Appendix

### B. Calculating the Absorption Factor, Marginal Costs and Productivities for the Quadratic Model

The quadratic model has ten terms, an intercept and nine terms containing variables or combinations of variables. Its functional form is given by:

$$\begin{aligned} \text{Time} = & \beta_0 + \beta_1 V + \beta_2 V^2 + \beta_3 PD + \beta_4 PD^2 + \beta_5 DN + \beta_6 DN^2 \\ & + \beta_7 V * PD + \beta_8 V * DN + \beta_9 PD * DN \end{aligned}$$

Fixed time is defined as the time that occurs when volume is equal to zero. This can be found mathematically by setting volume equal to zero in the above equation:

$$\text{Fixed Time} = \beta_0 + \beta_3 PD + \beta_4 PD^2 + \beta_5 DN + \beta_6 DN^2 + \beta_9 PD * DN$$

Variable time can be found by subtracting fixed time from total time:

$$\text{Variable Time} = \beta_1 V + \beta_2 V^2 + \beta_7 V * PD + \beta_8 V * DN$$

Marginal cost, in terms of carrier time, is found by taking the partial derivative of total time with respect to volume:

$$\text{MC (time)} = \beta_1 + 2\beta_2 V + \beta_7 PD + \beta_8 DN$$

The variable time per day is found by inserting the daily volume into the variable time equation (along with the mean values for possible deliveries and density) and calculating the time. The variable time per week is then found by multiplying the daily time by the corresponding number of days. The formulas for calculating variable time per week for both six day and five day delivery are given below:

$$\text{Variable Time}_{6D} = 6 * (\beta_1 \bar{V} + \beta_2 \bar{V}^2 + \beta_7 \bar{V} * \bar{PD} + \beta_8 \bar{V} * \bar{DN})$$

$$\text{Variable Time}_{5D} = 5 * (\beta_1 (1.2 * \bar{V}) + \beta_2 (1.2 * \bar{V})^2 + \beta_7 (1.2 * \bar{V} * \bar{PD}) + \beta_8 (1.2 * \bar{V} * \bar{DN}))$$

The change in variable time is just the difference between the variable time for the six day week and the variable time for the five day week:

$$\Delta VT = \text{Variable Time}_{6D} - \text{Variable Time}_{5D}$$

Once variable time is calculated, it is straight forward to calculate the associated absorption factor:

Technical Appendix

$$Absorption = \frac{\% \Delta VT}{\% \Delta V}$$

Productivities, in pieces per second, are found by dividing the relevant volume by the relevant variable time. Those ratios are multiplied by 60 to produce pieces per variable minute.

The numerical values for the measures in the case of the quadratic cost service are presented below. Note the all measures are relative to a 5-digit ZIP Code. Unless otherwise mentioned, time is measured in seconds.

Results For the Quadratic Cost Surface

Fixed Time Per Day	122,908	
	6 Day	5 Day
Volume Per Day	56,678	68,014
Variable Time Per Day	104,046	120,082
Variable Time Per Week	624,274	600,412
$\Delta VT$	23,862	
$\% \Delta VT$ (Cost Reduction)	3.8%	
Absorption	19.1%	
Marginal Cost	1.48	1.34
Pieces Per Variable Minute	32.68	33.98

## Technical Appendix

### C. Calculating the Absorption Factor, Marginal Costs and Productivities for the Translog Model

The translog model has ten terms, an intercept and nine terms in the logs of the mean-centered variables. Its functional form is given by:

$$\begin{aligned} \ln(\text{Time}) = & \beta_0 + \beta_1 \ln\left(\frac{V}{\bar{V}}\right) + \beta_2 \left[ \ln\left(\frac{V}{\bar{V}}\right) \right]^2 + \beta_3 \ln\left(\frac{PD}{\bar{PD}}\right) + \beta_4 \left[ \ln\left(\frac{PD}{\bar{PD}}\right) \right]^2 + \beta_5 \ln\left(\frac{DN}{\bar{DN}}\right) \\ & + \beta_6 \left[ \ln\left(\frac{DN}{\bar{DN}}\right) \right]^2 + \beta_7 \ln\left(\frac{V}{\bar{V}}\right) * \ln\left(\frac{PD}{\bar{PD}}\right) + \beta_8 \ln\left(\frac{V}{\bar{V}}\right) * \ln\left(\frac{DN}{\bar{DN}}\right) + \beta_9 \ln\left(\frac{PD}{\bar{PD}}\right) * \ln\left(\frac{DN}{\bar{DN}}\right) \end{aligned}$$

Because the non-volume variables will always be evaluated at their means during the entire analysis, terms in these variables effectively drop out of the equation. (The log of one is zero). This permits analysis of a simpler, but equivalent form:

$$\ln(\text{Time}) = \beta_0 + \beta_1 \ln\left(\frac{V}{\bar{V}}\right) + \beta_2 \left[ \ln\left(\frac{V}{\bar{V}}\right) \right]^2$$

To convert the equation in log to levels, one takes the anti-log:

$$\text{Time} = e^{\beta_0} \left( \frac{V}{\bar{V}} \right)^{\beta_1 + \beta_2 \ln\left(\frac{V}{\bar{V}}\right)}$$

Because of the mathematical form of the translog equation, the equation is undefined at zero volume. Thus, to find fixed time one must find the amount of time at a very small value for volume. We use one percent of average volume for this purpose:

$$\text{Fixed Time} = e^{\beta_0} (.01)^{\beta_1 + \beta_2 \ln(.01)}$$

Once fixed time is derived, variable time can be derived by the subtraction method:

## Technical Appendix

$$\text{Variable Time} = e^{\beta_0} \left( \frac{V}{\bar{V}} \right)^{\beta_1 + \beta_2 \ln\left(\frac{V}{\bar{V}}\right)} - e^{\beta_0} (.01)^{\beta_1 + \beta_2 \ln(.01)}.$$

Marginal cost, in terms of carrier time, is found by taking the partial derivative of total time with respect to volume:

$$MC \text{ (time)} = \left[ \frac{\beta_1}{V} \right] e^{\beta_0} \left( \frac{V}{\bar{V}} \right)^{\beta_1 + \beta_2 \ln\left(\frac{V}{\bar{V}}\right)}$$

The variable time per day is found by inserting the daily volume into the variable time equation (along with the mean values for possible deliveries and density) and calculating the time. The variable time per week is then found by multiplying the daily time by the corresponding number of days. The formulas for calculating variable time per week for both six day and five day delivery are given below:

$$\text{Variable Time}_{6D} = 6 * \left[ e^{\beta_0} - e^{\beta_0} (.01)^{\beta_1 + \beta_2 \ln(.01)} \right]$$

$$\text{Variable Time}_{5D} = 5 * \left[ e^{\beta_0} (1.2)^{\beta_1 + \beta_2 \ln(1.2)} - e^{\beta_0} (.01)^{\beta_1 + \beta_2 \ln(.01)} \right]$$

The change in variable time is just the difference between the variable time for the six day week and the variable time for the five day week:

$$\Delta VT = \text{Variable Time}_{6D} - \text{Variable Time}_{5D}$$

Once variable time is calculated, it is straight forward to calculate the associated absorption factor:

$$\text{Absorption} = \frac{\% \Delta VT}{\% \Delta V}$$

Productivities, in pieces per second, are found by dividing the relevant volume by the relevant variable time. Those ratios are multiplied by 60 to produce pieces per variable minute.

## Technical Appendix

The numerical values for the measures in the case of the quadratic cost service are presented below. Note the all measures are relative to a 5-digit ZIP Code. Unless otherwise mentioned, time is measured in seconds.

### Results For the Translog Cost Surface

Fixed Time Per Day	106,697	
	6 Day	5 Day
Volume Per Day	56,678	68,014
Variable Time Per Day	98,906	112,366
Variable Time Per Week	593,433	561,831
$\Delta VT$	31,602	
% $\Delta VT$ (Cost Reduction)	5.3%	
Absorption	26.6%	
Marginal Cost	1.23	1.15
Pieces Per Variable Hour	34.38	36.32