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**BEFORE THE**
**POSTAL RATE COMMISSION**

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| **POSTAL RATE AND FEE CHANGES, 2006** | : | **DOCKET NO. R2006-1** |

**RESPONSES OF UNITED PARCEL SERVICE WITNESS NEELS**
**TO INTERROGATORIES OF UNITED STATES POSTAL SERVICE**
**(USPS/UPS-T1-21 through 34)**
**(October 17, 2006)**

Pursuant to the Commission's Rules of Practice, United Parcel Service hereby files the responses of UPS witness Kevin Neels to the following interrogatories of the United States Postal Service: USPS/UPS-T1-21 through 34.

Respectfully submitted,

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**USPS/UPS-T1-21.** Please refer to your testimony, UPS-T-1, Table 20 (page 52). Please also refer to your testimony from Docket No. R97-1, UPS-T-1 at page 46, lines 17-19 (Docket No. R97-1, Tr. 28/15632), where you stated:

> I therefore recommend dropping the threshold "scrub." For similar reasons, I would recommend against adoption of Bradley's 'productivity" scrub.

a. Does the above passage from your Docket No. R97-1 testimony still reflect your views? If not, please explain why not.

b. Please confirm that the samples you employed in your alternative variability models, as described in Table 20 of your current testimony, impose both "threshold" and "productivity" screens. If you do not confirm, please explain.

c. Please confirm that your "strict" sample imposes more stringent "threshold" and/or "productivity" screens than those employed in the Postal Service's BY 2005 models. If you do not confirm, please explain.

**RESPONSE:**

a. Yes. However, I must note that, although Dr. Bozzo refers to his "scrubs" using the same words employed by Dr. Bradley in his Docket No. R97-1 mail processing testimony, Dr. Bozzo's screening procedures differ significantly from those of Dr. Bradley.

Dr. Bradley's productivity screens were designed to eliminate from each of his regression equation samples a pre-specified percentage of observations from the upper and lower ends of the distribution resulting when observations were ranked in order of pieces sorted per hour.[1] In my Docket No. R97-1 testimony, I criticized this screen, citing the lack of external evidence indicating that these observations lying on the tails of

[1] Docket No. R97-1, USPS-T-14, p. 32.

the distribution were in fact erroneous.[2] In his Docket No. R2000-1 testimony, Dr. Bozzo also criticized Dr. Bradley's productivity screen, pointing out that "if fewer than two percent of the observations are clearly erroneous, Dr. Bradley's procedure will remove some observations that are merely unusual" and 'to the extent that more than two percent of the observations are clearly erroneous, removing only the two percent of observations in the productivity tails leaves some number of erroneous observations in the regression sample."[3] Dr. Bozzo went on to obtain from Postal Service operational experts estimates of the maximum and minimum reasonable throughput rates for the various sorting operations that he examined.[4] Rather than eliminating a fixed percentage of observations with extreme values, he instead eliminates observations with reported throughput rates falling outside these bounds. Assuming that these bounds have been set correctly, this procedure addresses the deficiencies I pointed out in this aspect of Dr. Bradley's Docket No. R97-1 mail processing analysis.

The threshold screen raises different and more complex issues. Dr. Bradley justified his threshold screen by arguing that "the work hour and piece handling data reflect a ramping up activity, not a normal operating environment. Data from these startup periods should be eliminated."[5] I disagreed with this argument in Docket No. R97-1, and I continue to disagree with it now. As I have shown in my testimony from Docket Nos. R2000-1 and R2006-1, the installation of a new sorting activity at a site and the

[2] Docket No. R97-1, UPS-T-1, p. 26 (Tr. 28/15612).
[3] Docket No. R2000-1, USPS-T-15, p. 102.
[4] Docket No. R2000-1, USPS-T-15, pp. 101-02, 110-12.
[5] Docket No. R97-1, USPS-T-14, p. 30.

ramping up of that activity occur all the time, and are a normal feature of the operating environment whose cost variability Drs. Bradley and Bozzo have attempted to measure.[6] There is no justification for discarding such observations.

In Docket No. R2000-1, Dr. Bozzo changed the justification for the threshold screen and altered its implementation. Rather than eliminating observations during ramping-up periods, he instead sought to eliminate sources of "noise."[7] He offered no external evidence that the observations eliminated from his sample are in fact erroneous other than his comment that the threshold he employed is "very low."[8] Dr. Bozzo altered the implementation of this screen again in his Docket No. R2001-1 testimony based upon criticisms of his Docket No. R2000-1 methodology by Postal Service witness Greene.[9] Dr. Bozzo's current approach in principle corrects the conceptual error of systematically eliminating observations from the start-up phases of MODS sorting activities. I remain troubled by the lack of reliable external criteria for determining which of the observations eliminated by this screen are truly erroneous, but elected in the end to retain this screen in my own work.

b. Confirmed.

c. Confirmed, in the sense that the "strict" sample applies to these screens at the weekly and accounting period levels.

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[6] Docket No. R2000-1, UPS-T-1, pp. 5-16 (Tr. 27/12777-12788; Docket No. R2006-1, UPS-T-1, pp. 38-43.
[7] Docket No. R2000-1, USPS-T-15, p. 108.
[8] Docket No. R2000-1, USPS-T-15, p. 109.
[9] Docket No. R2001-1, USPS-T-14, pp. 53-54.

**USPS/UPS-T1-22.** Please refer to your testimony from Docket No. R97-1, UPS-T-1, at page 40 (line 15) to page 44 (line 3) (Docket No. R97-1, Tr. 28/15626-15630). At the conclusion of a discussion of purported advantages of cross-section models over the fixed-effects model, you stated:

> [T]he cross-sectional results provide a more appropriate basis for the attribution of mail processing labor costs.

a. Does the above passage from your Docket No. R97-1 testimony still reflect your views? If not, please explain why not.

b. Please confirm that your alternative model in this proceeding employs a panel data, fixed-effects, instrumental variables estimation approach. If you do not confirm, please explain fully.

**RESPONSE:**

a. In my Docket No. R97-1 testimony, I emphasized the importance of focusing on the long-run response of costs to changes in volume. I used the term "long-run" to refer not to a specific time interval, but rather to refer to the change in cost that results when the Postal Service has had the chance to respond fully to a change in volume. As I noted in my Docket No. R97-1 testimony, "one would expect decisions regarding staffing levels, degree of automation, layout of processing flows, and other significant factors affecting the volume variability of processing costs to be closely related to the volumes [of mail] typically processed at a facility."[10] I did not believe then that Dr. Bradley's analysis adequately addressed this panoply of factors. Given a choice from among the limited set of econometric results that were in the record at that time, I felt

[10] Docket No. R97-1, UPS-T-1, p. 42, ll. 4-6 (Tr. 28/15628).

that the results of the cross-sectional models were closest to the true variabilities. It is still my view that these results came closer to the truth than any of the other results in the record at that time.

b. Confirmed.

**USPS/UPS-T1-23.** Please refer to your testimony from Docket No. R2000-1, UPS-T-1 at page 63 (line 1) to page 71, line 10 (Docket No. R2000-1, Tr. 27/12835-12843). In a section entitled "Time Series Analysis of System-wide Mail Processing Costs," you describe an aggregate time series model as "a conceptually superior alternative to the MODS-level analysis presented by Dr. Bozzo." Is the above passage from your Docket No. R2000-1 testimony still your view? If not, please explain why not.

**RESPONSE:**

I still believe that the time series approach is conceptually superior to other approaches in that it encompasses the full effect of volume changes on the structure, organization and costs of mail processing. All of the panel data approaches, for example, implicitly hold the number of plants constant. The time series approach, in contrast, can readily account for the effect on costs of adding plants in response to growth in volume, or alternatively, reducing the number of plants and consolidating processing at the remaining plants in response to reductions in volume.

These conceptual advantages must be weighed against a number of practical difficulties. Chief among them are the limited number of degrees of freedom that the time series offers, and the large number of parameters that must be estimated to account for the separate effects on mail processing costs of different subclasses and presort options.

**USPS/UPS-T1-24.** Please refer to your testimony at page 52, lines 4-5, and to Table 20. You state:

> To deal with the problem of measurement error in the volume variables, I have used an IV fixed effects estimation method.

Given your use of an estimator that is in principle robust to the presence of measurement errors, please explain why you find it necessary to eliminate large numbers of potentially usable observations due to measurement errors?

**RESPONSE:**

I do not believe that the instrumental variables estimator can eliminate the effects of all of the types of errors identified in the MODS data. In particular, I question whether, given the finite sample sizes that are available, this estimator will be robust with respect to the presence of extreme outliers. In addition, reporting gaps for specific operations are common in the MODS data. Ignoring such gaps when constructing plant-level aggregates would impart a systematic downward bias to volumes and labor hours. Finally, some types of errors – reporting gaps, for example – could be expected to affect not just the regressors, but also the instrumental variables themselves, calling into question their ability to eliminate the effects of measurement error.

**USPS/UPS-T1-25.** Please refer to your testimony, UPS-T-1, at page 56, lines 22-23, where you state that "the Postal Service's study does not address in any way the two-thirds of mail processing costs that fall outside of direct sorting operations." Given the scope of the workhours incorporated in your alternative model presented in Section 6, please confirm that your statement from page 56, lines 22-23, is also true of your model. If you do not confirm, please explain how your results address mail processing costs that fall outside the operations you modeled without actually modeling them.

**RESPONSE:**

Confirmed. I requested information that would have permitted me to address these costs. See UPS/USPS-T12-48 and UPS/USPS-T12-49. The Postal Service objected to the production of this information.

**USPS/UPS-T1-26.** Please refer to your response to USPS/UPS-T1-3.

a. Please describe and provide any analysis, including econometric code and output log(s), you performed to demonstrate that clocking errors in workhours are correlated with the explanatory variables of mail processing labor demand models you have studied.

b. Please confirm that the "intercept" terms you mention in response to USPS/UPS-T1-3(c) appear in the calculation of volume-variability factors from the various mail processing labor demand models (the Postal Service's, your Section 6 models, Prof. Roberts's models). If you do not confirm, please explain fully.

**RESPONSE:**

a. I have not performed such an analysis.

b. Not confirmed. Volume variability is calculated by computing the partial derivative of the logarithm of hours with respect to the logarithm of volume. The "intercept" terms do not appear in the formula, regardless of whether one is considering the Postal Service's models, my Section 6 models, or Dr. Robert's models.

**USPS/UPS-T1-27.** Please refer to your response to USPS/UPS-T1-4(d).

a. Please confirm that IOCS tally processing assigns an "administrative" operation code (field F260=10) for clocking in or out (activity code 6522), regardless of the employee's clocked-in operation. If you do not confirm, please explain.

b. Is it anomalous to observe the clocking in or out activity in a mail processing operation? Please explain any affirmative answer fully.

c. Please confirm that, for the sorting and cancellation operations covered by the Postal Service's models, as well as your model presented in Section 6 of UPS-T-1, the "administrative" tallies (weighted to cost pool dollars) are as follows:

| Cost Pool | Total Cost ($000), USPS-LR-L-55, Table I-2-Plants-Poolcost | Clocking in or out (a/c 6522) | Other Administrative op. code (F260=10 or 17) |
|---|---|---|---|
| D/BCSINC | 1,090,377 | 30,838 | 5,385 |
| D/BCSOUT | 391,639 | 12,150 | 1,960 |
| OCR/ | 201,547 | 6,706 | 1,086 |
| AFSM100 | 538,794 | 13,246 | 1,890 |
| FSM/1000 | 218,122 | 7,003 | 582 |
| SPBS OTH | 410,170 | 15,141 | 1,576 |
| SPBS PRIO | 145,691 | 5,188 | 1,100 |
| MANF | 239,251 | 8,157 | 2,146 |
| MANL | 917,249 | 28,629 | 9,359 |
| MANP | 83,115 | 2,133 | 865 |
| PRIORITY | 317,740 | 11,300 | 3,598 |
| 1CANCEL | 307,118 | 7,940 | 3,259 |
| Total | 4,860,813 | 148,433 | 32,806 |

Costs in thousands of dollars, tally weights (field F9250) adjusted to cost pool dollars using the factors in USPS-LR-L-55, file DOLWGT.rtf.

If you do not confirm, please provide the results you believe to be correct and provide any computer programs and associated output logs you use to develop the figures.

d. Do you regard the 0.7 percent of costs (32,808/4,860,813) in the "Other administrative op. code" column as quantitatively significant? If so, please explain.

**RESPONSE:**

a. Confirmed for mail processing tallies.

b. No. If I read the table correctly, it appears that the Postal Service spends over $148 million dollars – a large sum – just on employees clocking in and clocking out.

c. Confirmed.

d. Many people would regard $32.8 million as a considerable sum of money. However, as the interrogatory points out, it represents less than one percent of the costs of sorting and cancellation operations.

**USPS/UPS-T1-28.** Please refer to your response to USPS/UPS-T1-4(d). You state:

> What is surprising is that for such a large portion of the time, workers found to be performing those administrative tasks were clocked into mail processing MODS codes, rather than administrative MODS codes.

Please explain whether you consider it "surprising" for "administrative" tasks such as those described in USPS/UPS-T1-4(c) to be recorded under the following MODS operation codes:

| MODS Operation | Description |
|---|---|
| 340 | STANDBY - MAIL PROCESSING |
| 341 | QWL COORDINATOR - NONSUPER EMPS |
| 547 | SCHEME EXAMINERS |
| 554 | OFFICE WORK & RECORDS-MAIL PROC |
| 555 | OFFICE WORK & RECORDS-MAIL PROC |
| 560 | MISC ACTIVITY-MAIL PROC |
| 561 | MISC ACTIVITY-MAIL PROC |
| 562 | MISC ACTIVITY-MAIL PROC |
| 563 | MISC ACTIVITY-MAIL PROC |
| 564 | MISC ACTIVITY-MAIL PROC |
| 577 | PREP & VERIFY DELV BILLS-INTERNAT |
| 607 | STEWARDS - CLERKS - MAIL PROC |
| 612 | STEWARDS-MAIL HANDLER-MAIL PROC |
| 630 | MEETING TIME-MAIL PROC |
| 677 | ADMIN & CLER - PROCESSING & DISTRIB |
| 681 | ADMIN & CLER - PROC & DIST INTERNTL |
| 697 | ADM & CLER-MAIL.REQ & BUS.MAIL ENT |

If so, please explain.

**RESPONSE:**

No.

**USPS/UPS-T1-29.** Please refer to your testimony, UPS-T-1, Table 16 (page 37). Please also refer to UPSWP-1, files Table of Fixed Effects.xls, and WP_Fixed effects.do, and to USPS-LR-L-56, file varmp_tpf_OTHAUTO_by2005.out.

a. The output log for WP_Fixed effects.do does not appear to have been provided in UPS-WP-1. Please provide it.

b. The regression output in the 'nonmanual_results' tab of "Table of Fixed Effects.xls" does not appear to match the results of the Postal Service models in USPS-LR-L-56. For example, you report a coefficient on "lntph04" of 1.788, whereas the coefficient from the Postal Service model (on "CLNTPH04") is 2.06859 (according to varmp_tpf_OTHAUTO_by2005.out). Similarly, you report 1.201 for the coefficient on "lntph06," versus 1.28372. Please explain the discrepancies fully. Please also provide an update of Table of Fixed Effects.xls that is consistent with the Postal Service regression results, or explain why you are unable to do so.

c. For any updated results you provide in reponse to part (b), and for each cost pool reported in Table 16, please provide the mean, standard deviation, median, first quartile, and third quartile of the fixed effects terms you analyzed, in addition to the minimum and maximum.

d. Using the method you employed for Table 16, please provide the mean, standard deviation, median, first quartile, third quartile, minimum and maximum for the fixed effects terms from:

> (i) Your model from Section 6 of UPS-T-1, for both the "strict" and "loose" samples.
>
> (ii) Each of the shape-level models you estimated, as you mentioned in response to USPS/UPS-T1-5(b).

Please provide a spreadsheet with the fixed effects terms and the calculations of the requested statistics.

**RESPONSE:**

The programs and worksheets used to compute these statistics are found in Library

Reference UPS-LR-4 in the folder "output fixed effects."

a. In the course of preparing the response to this interrogatory, I discovered an

error in my workpaper in the portion of the program *WP_fixed effects.do* that calculates

the fixed effects for automated operations. The corrected versions of the program and log file are called *WP_fixed effects.do* and *WP_fixed effects.log* and can be found under "Analysis of USPS models\Fixed Effects," in a revised version of UPS-T1-Neels-WP-1, which will be filed with the Commission shortly.

b. The discrepancies stem in part from the programming error discussed in part a. Correcting this error reduces but does not eliminate the discrepancies. The remaining discrepancies stem from differences in the implementation of the AR(1) correction. In particular, Dr. Bozzo and I differ in how we treat gaps in the data. Dr. Bozzo and I both begin by estimating a serial correlation coefficient. We then use this estimate to form a second stage GLS estimator. Dr. Bozzo transforms his dependent and independent variables by subtracting from each observation the product of the serial correlation coefficient (rho) and the lagged value of the variable. Observations for which the lagged values are unavailable are dropped from his second stage estimation sample. These dropped observations include the first valid observation for each facility, as well as the first valid observation following a gap in the data. I use a different approach based on the method of Baltagi and Wu.[11] This method recognizes that the error terms associated with observations on either side of a data gap will be correlated, with the strength of the correlation inversely related to the size of the gap. It results in a GLS estimator that can retain as part of the estimation sample observations without valid data for the preceding observation.

[11] Badi H. Baltagi and Ping X. Wu, "Unequally Spaced Panel Data Regressions with AR(1) Disturbances," *Econometric Theory*, 15, 1999, pp. 814-823.

The fixed effect estimates produced by Dr. Bozzo's method are actually equal to the fixed effects coefficients $\beta_{1k}$ shown on pages 52 and 53 of his USPS-T-12 testimony, multiplied by one minus rho, where rho is the estimated serial correlation coefficient. To recover the true fixed effect coefficients, I have divided the raw estimates produced by Dr. Bozzo's method by one minus rho. The table containing these results is contained in the file *fixed effects op level model like bozzo.xls* under "Analysis of USPS models\Fixed Effects\output" in Library Reference UPS-LR-4.

c. The requested results produced by the corrected version of the program implementing my AR(1) correction are shown below.

| **Cost Pool** | **Mean** | **Std. Dev.** | **Median** | **25%** | **75%** | **Min** | **Max** | **Implied Productivity Differential** |
|---|---|---|---|---|---|---|---|---|
| OCR | 1.027 | 0.287 | 0.987 | 0.838 | 1.163 | 0.532 | 2.980 | 560% |
| FSM1000 | 1.016 | 0.459 | 0.942 | 0.654 | 1.331 | 0.245 | 2.658 | 1084% |
| SPBS | 1.050 | 0.352 | 1.022 | 0.808 | 1.255 | 0.284 | 2.048 | 722% |
| BCS_IN | 1.034 | 0.290 | 1.021 | 0.842 | 1.209 | 0.397 | 2.528 | 636% |
| BCS_OUT | 1.038 | 0.320 | 0.967 | 0.840 | 1.187 | 0.449 | 2.905 | 647% |
| MANUAL FLATS | 1.116 | 0.340 | 1.058 | 0.895 | 1.240 | 0.541 | 3.425 | 633% |
| MANUAL LETTERS | 0.929 | 0.292 | 0.872 | 0.697 | 1.123 | 0.421 | 2.119 | 503% |
| MANUAL PARCELS | 0.924 | 0.560 | 0.740 | 0.561 | 1.108 | 0.233 | 3.743 | 1607% |
| MANUAL PRIORITY | 1.240 | 0.423 | 1.171 | 0.942 | 1.454 | 0.443 | 2.821 | 637% |
| CANCELLATION | 1.130 | 0.632 | 0.977 | 0.689 | 1.361 | 0.274 | 5.013 | 1828% |

d.

i. See below.

| Cost Pool | Mean | Std. Dev. | Median | 25% | 75% | Min | Max | Implied Productivity Differential |
|---|---|---|---|---|---|---|---|---|
| Strict Sample | 0.756 | 0.427 | 0.657 | 0.416 | 0.981 | 0.194 | 2.042 | 1054% |
| Loose Sample | 0.769 | 0.255 | 0.713 | 0.578 | 0.923 | 0.347 | 1.709 | 492% |

ii. See below.

| Cost Pool | Mean | Std. Dev. | Median | 25% | 75% | Min | Max | Implied Productivity Differential |
|---|---|---|---|---|---|---|---|---|
| Letters Strict Sample | 0.883 | 0.246 | 0.847 | 0.705 | 1.006 | 0.492 | 1.984 | 403% |
| Flats Strict Sample | 0.728 | 0.332 | 0.624 | 0.490 | 0.895 | 0.208 | 2.380 | 1142% |
| Parcels Strict Sample | 0.251 | 0.745 | 0.079 | 0.043 | 0.170 | 0.018 | 10.085 | 56850% |
| Priority Strict Sample | 1.301 | 2.565 | 0.629 | 0.410 | 1.286 | 0.149 | 33.281 | 22318% |

**USPS/UPS-T1-30.** Please refer to your testimony, UPS-T-1, at page 47, line 13, to page 48, line 2 (Section 5b). Please also refer to USPS-T-12 at page 24 (line 19) to page 25 (line 17).

a. Do you agree that more highly presorted mail enters the Postal Service's sorting operations, relative to otherwise similar but less-presorted mail, at "downstream" processing nodes and thereby avoids some sort handlings? If not, why not.

b. Do you agree that the marginal cost difference between more- and less-presorted mail is the marginal cost of the avoided handlings? If not, why not?

c. Do you agree that the avoided sorts would, in principle, be reflected in avoided total piece handlings (TPH)? That is, TPH in principle measures all sort handlings in distribution operations? If not, please explain fully, and indicate how your response is consistent with the definition of TPH.

d. Do you agree that FHP does not, in general, capture all avoided handlings for presorted mail? That is, since FHP handlings are a subset of total handlings, some avoided handlings do not result in FHP avoidance? If not, please explain fully, and indicate how your response is consistent with the definition of FHP.

e. Do you agree that required depth of sort, automation compatibility, or other characteristics may affect the marginal cost of an FHP? If not, please explain fully.

f. Please confirm that your model, presented in Section 6, does not distinguish FHP by depth of sort, entry point (e.g., incoming operations, outgoing operations), automation compatibility, or any other characteristic. If you do not confirm, please explain how information on the characteristic(s) survived your FHP aggregation process.

**RESPONSE:**

a. Yes.

b. Not necessarily. While I would expect the costs associated with avoided sorts to comprise part of the marginal cost differential between more and less highly presorted mail, there are also costs other than sorting costs that may need to be considered. More highly presorted mail may still need to be received, unloaded, and/or merged into the mailstream at the appropriate downstream point. It is possible that such non-

sortation related costs may comprise part of the marginal cost differential between these different categories of mail.

c. Yes.

d. Yes, some avoided handlings will fail to result in avoided FHP.

e. Yes.

f. Confirmed.

**USPS/UPS-T1-31.** Please refer to your testimony, UPS-T-1, at pages 38-42 (Section 4), at 45-47 (Section 5b), and at 50.

a. Do you agree that the technology mix employed in mail sorting operations will, in general, affect the costs of sorting mail, including (but not necessarily limited to) the marginal costs of sorting mailpieces with various physical characteristics? If not, please explain fully.

b. Please confirm that your alternative model presented in Section 6 includes no controls pertaining to capital or the mix of technologies employed at a plant. If you do not confirm, please identify the control variable(s) and provide citation(s) to your workpapers where you employ them.

c. Please confirm that failing to include controls if they are relevant, using suitable econometric techniques to identify the effects, will generally lead to bias in regression models. If you do not confirm, please explain fully.

d. Do you agree that the process of developing, testing, and deploying new postal sorting equipment involves decisions made some time (in most cases, more than a quarter) before new equipment actually is deployed? If not, what is the basis for disagreement?

e. Is it your testimony that excluding a control variable from a regression model is conceptually identical to treating it as “endogenous”? If so, please explain fully and provide citation(s) to authoritative source(s) that support your position.

f. Do you agree that, in systems of regression equations, the relevant distinction for the treatment of “endogenous” variables is between simultaneously determined variables and “predetermined” variables, where “predetermined’ variables include exogenous variables and lagged endogenous variables (see, e.g., George G. Judge et al., *The Theory and Practice of Econometrics,* New York: Wiley, 1986, at 564-565)? If not, please explain fully and provide citation(s) to authoritative source(s) that support your position.

**RESPONSE:**

a. Yes.

b. Confirmed, the model presented in Section 6 includes no controls for capital or the mix of technologies. I do not believe that it would be appropriate to include such

controls, because the amount of capital and the mix of technologies employed are themselves influenced by mail volume. By relating labor hours directly to the volume of mail processed, the model in Section 6 encompasses the effects of volume-related changes in capital and technology mix. To account for such changes in connection with a model that included explicit capital and/or technology mix variables it would be necessary to combine the labor hour equation with a system of capital and technology mix equations. The model presented in Section 6 can be regarded as a reduced form representation of that system.

c. I agree that exclusion of relevant control variables will often lead to bias. However, this is not always the case. Omission of relevant control variables will not lead to bias if the omitted variables are uncorrelated with the control variables that have not been omitted. In addition, in the context of a system of simultaneous equations, the omission of relevant endogenous variables from a specific regression equation may produce a biased version of that structural equation, while at the same time producing an unbiased version of the reduced form equation that summarizes the behavior of the system as a whole. In the present context, whether the omission of relevant capital and technology mix variables results in bias depends upon what one is trying to measure. If one is seeking to measure the effect on labor hours of changes in the volume of mail in the context of a set of plants with fixed capital stocks and fixed complements of sorting technologies, omission of the relevant control variables is likely to produce a distorted picture of the characteristics of *that* relationship. If, however, one is attempting to measure the *overall* effects of changes in volume on labor hours, including the effects

associated with volume-driven changes in capital stocks and technology mix, one can measure that overall relationship using a model that excludes capital stock and technology mix control variables.

d. Yes.

e. No. However, as I have noted above, estimation in a simultaneous equations context of a reduced form equation does involve the exclusion of endogenous control variables. This point is discussed in J. Johnston, *Econometric Methods*, Second Edition, McGraw Hill, 1972, pp. 350-351.

f. One cannot in general assume that lagged endogenous variables can be treated as exogenous variables that raise no simultaneity or bias issues. In a time series context one often encounters error terms that are correlated over time. Such serial correlation can give rise to situations in which there is correlation between a lagged endogenous variable that appears as a regressor and the error term of the equation in which it appears. In such a situation, OLS coefficient estimates will be biased. See Roger J. Bowden and Darrell A. Turkington, *Instrumental Variables*, Cambridge University Press, 1984, pp. 77-85.

**USPS/UPS-T1-32.** Please refer to your responses to USPS/UPS-T1-2 and USPS/UPS-T1-5(b).

a. Please list the Postal Service mail processing facilities you have visited, when you visited them, and approximately how much time you spent in each.

b. With respect to your discussion of runtime, please explain whether you believe that, for instance, the addition of a unit of flat-shape volume has a material effect on the mail mix within the letter-shape mailstream. If so, please explain.

c. Is it fair to characterize the cross-operation effect you describe for the "runtime" activity as primarily a cross-operation effect within a shape-based mailstream? If not, why not?

d. Please confirm that you did not investigate any models that explicitly depict crossoperation effects within a shape-based mailstream (e.g., some variation on the model presented in USPS-T-12, Section VII.D). If you do not confirm, please explain why you did not mention such models in your response to USPS/UPS-T1-5(b).

e. With respect to your discussion of container movement costs, please explain what you believe to be the relative importance of (i) the number of pieces to be transported, (ii) the physical layout of the plant (i.e., the locations of mail processing equipment and staging areas), and (iii) variations in "congestion" within the plant.

**RESPONSE:**

a. During Docket No. R97-1, I visited the BMC located in the Maryland suburbs of DC and the facilities co-located with it. This visit lasted approximately 3-4 hours.

b. Given the volumes typically processed in the Postal Service's plants, I would not expect the addition of one flat-shaped mail piece to have a material effect on the mix of mail in any mailstream, including the flat-shape mailstream.

c. It would be fair to describe the cross-operation effect described in my runtime response to USPS/UPS-T1-2 as primarily an effect operating across operations within the same shape-based mailstream.

d. Confirmed.

e. I am not entirely certain to which portion of my response to this interrogatory this question is directed. The only reference to containers in my response to USPS/UPS-T1-2 was in my discussion of "Waiting for Mail." In that part of my response I was not discussing the costs of container handling, but instead the costs incurred when employees clocked into sorting operations are waiting for the completion of the handling. I also note that the term "pieces" in the interrogatory is ambiguous, as it could potentially refer in this context to individual mail pieces, bundles of mail pieces, sacks or other items containing multiple mail pieces, or containers filled with sacks or other items containing individual mail pieces.

In an attempt to be responsive, I will say that I believe that container movement costs will reflect both the number of containers to be moved, and labor time or cost per container movement. I would expect the latter quantity to depend upon the layout of the plant and the degree of congestion. Volume, loosely defined, is in some sense the most important of these, since if there were no containers to be moved, there would be no container handling costs. I cannot say in general which of the other two factors (layout or congestion) is the next most important. I suspect that the answer may vary from plant to plant.

**USPS/UPS-T1-33.** Please refer to your testimony at page 44, lines 14-16.

a. Do you agree that the average of the "actual" handling paths for pieces of mail within an analytically distinct group would tend to converge to the "expected" path given a sufficient number of pieces?

b. Is it your testimony that changes in the "operational plan" do not affect the relationship between mail volumes and FHP, and/or between FHP and the costs of mail processing operations? If so, please explain how those relationships are invariant to the path a piece of mail takes through the system.

**RESPONSE:**

a. The answer to this question depends upon the meaning of the term "expected." Since this term comes from Dr. Bozzo's testimony, I must interpret this interrogatory in the context of what I understand him to be saying. If this term is being used in the statistical sense of expectation or expected value, the answer will be "yes," by definition. However, if the "expected" path refers to the path specified in the current operational plan, the answer will be no. Even though many (if not most) mail pieces may follow the paths specified in the current operational plan, there will be deviations from the operational plan. Such deviations could be triggered by, among other things, late mail arrivals, transient capacity constraints, or equipment breakdowns. I see no reason why deviations from plan for reasons such as these should become less frequent as mail volumes increase. I believe that Dr. Bozzo, in the section of his testimony upon which I was commenting, was using the term "expected" in the latter sense, to refer to the processing path specified in the current operational plan. Based upon this understanding, my answer to the question posed in this interrogatory is "no."

b. Every mail piece that requires sorting must be sorted for the first time somewhere, and so should generate one FHP count. I would not expect changes in the operational plan to alter this basic fact. Changes in the operational plan could have a big effect, however, on the specific operation in which that FHP occurs. In addition, to the extent that FHP counts the first handling that occurs in a specific plant, it is also possible that changes in the operational plan might change the number of plants through which a mail piece travels. In such a case changes in the operational plan could alter the total FHP count systemwide.

**USPS/UPS-T1-34.** Please refer to your testimony, UPS-T-1, Table 19 (page 43).

a. Please describe fully the model of technology deployment underlying the logit analysis you present in Table 19. In particular, please explain how the underlying model generates the specified relationship between current-period TPH and the equipment deployment dummy variable.

b. Please describe fully any alternative specifications you explored to the logit models whose results you report in Table 19, summarize their results, and explain why you prefer the Table 19 specifications.

c. For each of the three models you provide in Table 19, please show how a 10 percent increase in the specified TPH for a median facility affects the probability that the site has the specified equipment. Show all of your calculations.

**RESPONSE:**

a. The logit analysis presented in Table 19 is not intended to describe a fully-articulated economic model of technology deployment. Rather, it is intended to demonstrate the general result that the technology deployment decisions of the Postal Service are influenced by the volume of mail processed at a facility.

b. In addition to the logit models whose results are presented in Table 19, I also conducted some graphical analyses in which I plotted the number of quarters from the start of the observation period to the point in time when the automated operation was installed against a measure of the volume of mail processed at the plant. In connection with these plots, I also ran linear regressions on volume of the number of quarters from period start to installation. I felt that the results provided by these linear regressions were distorted by censoring of the data. This censoring arose from the fact that one could not determine for plants where the automated operation was installed at the start of the observation period how long the automated operation had actually been in place.

In addition, the logit results seemed to me to be easier to discuss and understand. Finally, I felt that there was value in demonstrating that the relationships I documented in my Docket No. R2000-1 testimony continue to hold today.

c. The table below presents the calculations requested. The table illustrates a well known characteristic of the logistic distribution, which is that calculated probabilities are relatively insensitive to changes in values of the independent variables at the tails of the distribution. For example, the model shows that a plant with the median value for TPH of parcels already has a 99.9 percent probability of having SPBS machinery. A small change in the volume of parcels will not (and indeed, cannot) have a material affect on this calculated probability, which is already very high. A similar story can be told for the AFSM100. However, the logistic distribution *is* sensitive to changes in values of the independent variable when the predicted probability is near the center of the distribution. The second table below shows the effect of a 10 percent increase in the independent variable at the point where the predicted probability of a positive outcome is 50 percent. The second table shows much larger effects than the first table.

*UPS/USPS-T1-34(c) Table 1, Effect of 10 percent increase in volume measure at median.*

| | | FSM1000 | | AFSM100 | | SPBS | |
|---|---|---|---|---|---|---|---|
| [1] | | lntph_FLATS | 1.256 | lntph_FLATS | 5.792 | lntph_PARCELS | 4.882 |
| [2] | | Constant | -9.707 | Constant | -55.756 | Constant | -32.697 |
| [3] | Median of volume measure in regression sample | | 10824 | | 1595 | | 10824 |
| [4] | 10 percent increase in median | | 11906 | | 1754 | | 11906 |
| [5] | Probability of positive outcome at median | | 0.877 | | 0.000 | | 0.999997 |
| [6] | Probability of positive outcome at 110% of median | | 0.889 | | 0.000 | | 0.999998 |
| [7] | Increase in probability | | 1.24% | | 0.00% | | 0.00% |

Sources:

[1]-[2] UPS-T-1, Neels, Table 19 (p. 43)
[3] UPS-LR-4, *Logit Models/Logit analysis_marg.log*
[4] =[3] * 1.1
[5] = 1 / (1 + exp(-1*([2] + [1]*ln([3]))))
[6] = 1 / (1 + exp(-1*([2] + [1]*ln([4]))))
[7] = [6] - [5]

*UPS/USPS-T1-34(c) Table 2, Effect of 10 percent increase in volume measure at midpoint of logistic distribution.*

| | | FSM1000 | | AFSM100 | | SPBS | |
|---|---|---|---|---|---|---|---|
| [1] | | lntph_FLATS | 1.256 | lntph_FLATS | 5.792 | lntph_PARCELS | 4.882 |
| [2] | | Constant | -9.707 | Constant | -55.756 | Constant | -32.697 |
| [3] | Median of volume measure in regression sample | | 2272 | | 15159 | | 810 |
| [4] | 10 percent increase in median | | 2499 | | 16675 | | 891 |
| [5] | Probability of positive outcome at median | | 0.500 | | 0.500 | | 0.500 |
| [6] | Probability of positive outcome at 110% of median | | 0.530 | | 0.635 | | 0.614 |
| [7] | Increase in probability | | 2.99% | | 13.46% | | 11.43% |

Sources:

[1]-[2] UPS-T-1, Neels, Table 19 (p. 43)
[3] =exp( [2]/-[1])
[4] =[3] * 1.1
[5] = 1 / (1 + exp(-1*([2] + [1]*ln([3]))))
[6] = 1 / (1 + exp(-1*([2] + [1]*ln([4]))))
[7] = [6] - [5]