POSTAL RATE AND FEE CHANGES, 1997

Docket No. R97–1

RESPONSE OF UNITED STATES POSTAL SERVICE WITNESS BRADLEY TO INTERROGATORIES OF UNITED PARCEL SERVICE (UPS/USPS–T14—1-3, 5–9, 11–20)

The United States Postal Service hereby provides responses of witness Bradley to the following interrogatories of United Parcel Service: UPS/USPS–T14—1-3, 5–9, 11–20, filed on August 1, 1997. Interrogatories UPS/USPS–T14—4, 10 were redirected to the Postal Service.

Each interrogatory is stated verbatim and is followed by the response.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

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Response of United States Postal Service Witness Bradley
to
Interrogatories of UPS

UPS/USPS-T14-1. Please confirm that your workpapers and associated Library References include all data collected (prior to scrubs), whether it was ultimately used by you in your analyses or not, during the course of the analyses performed in your direct testimony. If not confirmed, please provide this data.

UPS/USPS-T14-1 Response:

Confirmed.

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UPS/USPS-T14-2.   Please confirm that your workpapers and associated Library References provide, in electronic and in hard copy form, all computer programs, spreadsheets, etc., used to scrub the data as well as the programs that generated the analyses and results in your direct testimony.   If not confirmed, please provide this information.

UPS/USPS-T14-2 Response:

Confirmed for the analyses and results that I relied upon in my testimony. Not confirmed

for the alternative models that I did not use. For the alternative models that I did not use,

I provided, in my testimony, a statement of the reasons for rejecting the alternative; an

identification of any differences between the alternative and the preferred model with

respect to variable definitions, equation forms, data, or estimation methods; and the

computed econometric results for the alternative.

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UPS/USPS-T14-3. Please refer to page 7 of your direct testimony where you state that "non-MODS offices do not submit piece-handling data to the corporate data base."

a.   Please explain in detail the differing characteristics, if any, between MODS offices and non-MODS offices and how those differences affect or bias the results of your costing analyses.

b.   What specific criteria are used to determine whether a particular facility is designated as a MODS office or as a non-MODS office?

UPS/USPS-T14-3 Response:

a.& b. For a discussion of the process of designating offices as MODS facility, please see the Postal Service's response to UPS/USPS-T14-10.

In practice, I believe that most plants with automated equipment are part of the MOD system. Because I estimate variabilities for mail processing activities at MODS offices, omitting the non-MODS offices from the analysis cannot bias the results for the MODS office group. I recommend applying the estimated variabilities from selected MODS activities as proxy variabilities for the non-MODS office group because no data are available for econometric estimation of mail processing variabilities at non-MODS offices. The operational mix varies between MODS and non-MODS offices (and even within MODS offices), but I believe that there is not

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a substantial difference between MODS and non-MODS offices in the nature of the

activities themselves.

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UPS/USPS-T14-4.

a.   Please provide a descriptive list of all data available through MODS and PIRS.

b.   What are the qualitative differences between MODS and PIRS?

c.   How are the data that are available through both MODS and PIRS collected?

d.   What are the potential sources of collection or reporting error for (1) MODS and (2) PIRS?

e.   How is the data scrubbed or audited for (1) MODS and (2) PIRS?

f.   How are MODS and PIRS data processors trained?

g.   Please discuss the data quality of (1) MODS and (2) PIRS.

This interrogatory was redirected.

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UPS/USPS-T14-5. Please refer to page 16 of your direct testimony, where 9213 is chosen as the "kink" in the technology time trend. Please explain how this time period was chosen.

UPS/USPS-T14-5 Response:

The break in the time trend was selected because 9301 was the first period under which

mail processing operations were reorganized under the general Postal Service

restructuring of that time.

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UPS/USPS-T14-6. Please confirm that the manual ratio and the technology variable contain much of the same information. If so confirmed, please list that information; if not so confirmed, explain.

UPS/USPS-T14-6 Response:

Not confirmed. Because of the panel nature of the data set, the manual ratio and the time

trend variables do not contain the same information. The manual ratio reflects the site-

specific changes in mail processing flows, which vary from site to site, and the time trend

reflects the progress of the automation program and other changes in mail processing

operations for the Postal Service as whole.

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UPS/USPS-T14-7. Please refer to page 16, lines 4-5, of your direct testimony, where you state that "it is the advent of automation that embodies the technological change."

a.   In your opinion, does advancing technology lead to increased automation? Please explain your answer.

b.   Are technology and automation correlated? Please explain how and by what degree the results of your costing analyses are affected by the existence or lack of a correlation.

UPS/USPS-T14-7 Response

a.   In my opinion, automation is part of the application of advancing technology. I do not know to what degree technological change permits greater automation or to what degree the desire for automation leads to improvement in technology change. Both are possible.

b.   As automation technology has improved, the degree of automation has increased. However, the schedule and pace of automation deployment varies significantly from site to site. Therefore, the two are not perfectly correlated and it is appropriate to include a variable that reflects the site-specific effects of automation (the manual ratio) as well as one that reflects the system-wide effects (the trend terms).

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UPS/USPS-T14-8. On page 12 of your direct testimony, you state that in estimating elasticity equations for direct activities, mail processing hours is the preferred dependent variable. Please confirm that hours worked is not the preferred dependent variable in estimating elasticity equations for indirect activities. Please explain your answer.

UPS/USPS-T14-8 Response:

Not confirmed. Hours would be the preferred dependent variable for allied activities for the

same reasons it is preferred in the direct activities.

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to
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UPS/USPS-T14-9. You state on page 22, lines 17-18, of your direct testimony that "[h]ours are available from the MOD system for the registry activity but no piece handling counts are recorded."

a.   Why are piece handling counts for registry activities not available on MODS?

b.   How does the RPW Registry mail volume differ from MODS in terms of accuracy and method of reporting?

c.   Please explain how the difference between RPW data and MODS data affects the results of your costing analyses.

d.   Please explain if equations estimated with MODS data are more or less accurate than equations estimated with RPW data. To what extent does your analysis account for the variation in accuracy?

UPS/USPS-T14-9 Response:

a.   The registry activity involves a collection of functions that do not involve the sorting

of mail. It is my understanding that MODS does not have a consistent method of

establishing workload when this the case. Although piece handlings are

occasionally reported by certain sites, they are considered to be unreliable and

should not be used.

b.   The RPW data are available only on a national basis (not by office) and are

available only quarterly. Therefore, much less data are available than from MODS.

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I am not familiar with measures of accuracy for the RPW data, so I cannot make the desired comparison.

c.   Because of the smaller amount of data available, I must estimate a much simpler specification. In addition, I must estimate a pure time series model, because RPW data are not available by site.

d.   There are no reliable workload data available for the registry activity from MODS so it is impossible to compare the accuracy of a MODS-based equation with the equation estimated on RPW data. The RPW data are the best data available.

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UPS/USPS-T14-10. Please explain the process by which a site is designated as a MODS facility or a PIRS facility. Please discuss any selection bias with respect to the sites chosen.

This interrogatory has been redirected.

Response of United States Postal Service Witness Bradley
to
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UPS/USPS-T14-11.

a.   Please provide descriptive statistics for all observations dropped from the data: for example, the number of observations (by activity) that are dropped; the number of sites dropped; the number of sites dropped for missing one or two data points versus the number of sites dropped for missing many data points; the number of sites (and observations) dropped due to the presence of outliers.

b.   Please explain if the eliminated sites were in a specific geographic area or whether they were of similar size (in either hours worked or volume).

c.   Please explain if a larger percentage of the data dropped was for direct activities, allied activities, or other activities.

UPS/USPS-T14-11 Response:

a.   For the MODS direct activities, the number of observations dropped is given in

Library Reference H-148 at Table H148-1 on page H148-7. This table provides the

number of observations lost for periods in which there was no activity reported, the

number of observations lost for periods in which there were missing data, and the

number of observations lost as a result of the continuity and outlier scrubs. For

example, for the manual letter observation there are 29,711 observations for which

sites report activity. There were 1,063 observations dropped because of missing

data, 57 observations dropped because of the threshold scrub and 3,501

observations dropped as a result of the outlier and continuity scrubs. This left a

total of 25,090 observations for estimating the econometric equation.

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The numbers of observations lost for the MODS allied operations are available in individual programs in Workpaper WP-3, but I present them here in tabular form for convenience.

Data Progression For the Allied Activities at MODS Offices				
	PLATFORM	OPENING PREF	OPENING BBM	POUCHING
Starting Number	30,828	30,828	30,828	30,828
Periods in which there was no reported activity	4,472	4,470	10,011	9,399
Initial Data Frame	26,356	26,358	20,817	21,429
Observations with no piece handlings in one of the direct activities	6,672	6,524	3,257	4,307
Sub total	19,684	19,834	17,560	17,122
Observations lost in the outlier/continuity Scrubs	2,032	2,978	3,123	2,263
Analysis Data Set Size	17,652	16,856	14,437	14,859

Because of the smaller amount of data eliminations for BMCs, I did not keep track of the number of observations lost at each step. However, an enumeration of the total number of observations lost due to the scrubs is presented below. Please recall that, as described in Library Reference H148, there is no threshold scrub for the BMCs.

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Data Progression For the BMC Activities				
Operation	Starting Number	Observations Lost Because of No Reported Activity	Observations Eliminated By Scrubs	Size of Analysis Data Set
Primary Parcel Sorting	2094	0	196	1898
Secondary Parcel Sorting	2094	25	211	1858
Sack Sorting	2094	178	159	1757
Sack Opening	2094	0	511	1583
Irregular Parcel Post	2094	62	367	1665
NMO	2094	0	267	1827
Platform	2094	0	318	1776
Floor Labor	2094	0	435	1659

The scrub programs are structured to investigate and eliminate observations, not

sites. It is therefore much more difficult to provide site-specific information.

Nevertheless, to provide some insight, in response to your interrogatory, about how

the presented information on elimination of observations relates to the elimination

sites, a laborious manual investigation of one operation was pursued. I am

presenting the progression of data sets for the manual letter activity. I chose that

activity because it has the largest number of sites. Below is a table that provides

the individual steps in the creation of the analysis data sets and the number of sites

lost at each step.

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Data Progression for the Manual Letter Sorting Activity	
Sites reporting data in at least one operation for at least on AP	446
Sites eliminated because they have less than 39 observations.	110
Subtotal	336
Sites eliminated because of missing data.	21
Subtotal	315
Sites eliminated by the threshold scrub.	1
Subtotal	314
Sites eliminated by the continuity and outlier scrubs.	5
Sites in analysis.	309

b.   The scrub programs do not have regional or size identifiers built into them. I cannot

provide information on the geographical or size profile of the facilities eliminated

c.   The percentages of data dropped from direct activities are provided in Table H148-1

in Library Reference H-148. The percentages dropped for allied activities can be

calculated from the values presented in the table on allied activities provided in

response to part a. of this interrogatory.

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UPS/USPS-T14-12. On page 31, lines 2-3, of your direct testimony you state that "[t]he first scrub requires that a site have at least thirty-nine continuous observations in any activity." Please explain how the criterion of 39 consecutive data points was chosen.

UPS/USPS-T14-12 Response:

The criterion of 39 observations was chosen to ensure that each site has at least three years of data. This criterion ensures that seasonal patterns can be accurately identified and provides more than enough time for measurement of the response in cost to a sustained increase or decrease in volume. Although this is a relatively strict standard, given the size of the data base, it ensures the production of a high quality data set without significantly limiting the amount of data. If the data set was not so large, a standard of only 26 observations (two complete years) would be a serious alternative.

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UPS/USPS-T14-13.

a.   Please confirm that for a site with 78 consecutive data points, only the most recent 39 were chosen. If not confirmed, please explain how the 39 data points were chosen.

b.   If confirmed, please confirm that the older data was eliminated for no other reason than that it was older. If reasons other than the age of the data are cited, please explain in full why the older data was eliminated.

UPS/USPS-T14-13:

a.   Not confirmed. A site was required to have 39 observations but not limited to 39 observations. If a site had 78 consecutive observations, the full set of 78 consecutive observations was used.

b.   Not applicable.

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UPS/USPS-T14-14. Was any consideration given to interpolating missing data for a site that was missing only a few observations? If such consideration was given, why was the interpolation of missing data not used?

UPS/USPS-T14-14 Response:

Yes, I considered interpolation, but two factors mitigate against doing so. First, even without interpolation, I typically end up with somewhere between 15,000 and 25,000 observations to estimate the econometric equation. Thus, eliminating discontinuous data does not cause a problem with the efficiency of the estimates. Second, there is no single "right" method of interpolation. Any attempt at interpolation would raise a host of questions, such as: Should the arithmetic average of the nearby observations be used or should the geometric average be used? What about seasonality? How should the seasonal patterns be used? Should the value for the same AP in the previous year be part of the interpolation? What should be done if there is a gap of two periods? How many times can a series be interpolated before it is no longer acceptable? If there was a shortage of data, it may be appropriate to address these questions, but given the data available here, it is not necessary to do so.

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UPS/USPS-T14-15. For how many periods were start-up sites eliminated from the data? Please explain how this number was chosen and what evidence there is to support the choice.

UPS/USPS-T14-15 Response:

Iti is not that sites were eliminated for being in start up periods, but rather observations

from start up sites were dropped. After discussions with operations experts, a threshold

value of 100,000 piece handlings was used for letter and flat operations and a threshold

value of 15,000 piece handlings was used for parcel and Priority operations. Observations

from sites with fewer piece handlings than these thresholds were eliminated as startup

observations.

The number of observations dropped as a result of the threshold scrub is provided in

Library Reference H-148 in Table H148-1 on page H148-7. For example, 57 observations

were dropped in the manual letter activity. No threshold scrubs were applied to the allied

and BMC activities.

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UPS/USPS-T14-16. On page 34, lines 9-11, of your direct testimony, you state that "there were sufficient data remaining after the scrubs for the estimation of eight BMC activity equations."

a. Please explain how many BMC equations and what BMC equations could not be estimated because "some observations were lost when the data [was] scrubbed."

b. To what activities did the data apply?

c. Describe the data that were lost in the scrubs (please refer to the examples set forth in question 13, above).

UPS/USPS-T14-16 Response:

a. Equations for two BMC activities could not be estimated. There was not enough data to estimate equations for the Bulk Business Mail Letter Tray Activity and the Bulk Business Mail Flat Tray Activity.

b. The Bulk Business Mail Letter Tray Activity and the Bulk Business Mail Flat Tray Activity.

c. The BMC's did not report enough data for estimation of these equations. It is not just that they lost data during the scrubs, but that there were relatively few data from the beginning. In fact, the BMCs reported only reported only 753 observations

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for the Bulk Business Mail Letter Tray Activity and 569 observations for the Bulk

Business Mail Flat Tray Activity. After the scrubs there were only 499 observations

from approximately 8 sites for the Bulk Business Mail Letter Tray Activity and 321

observations from approximately 6 sites for the Bulk Business Mail Flat Tray

Activity.

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UPS/USPS-T14-17.

a.   Please explain why a second order translog equation was chosen for estimation as
      compared to other available flexible forms, such as the AIM, Box-Cox, and Minflex-
      Laurent.

b.   Please discuss the inherent bias in the translog equation in its restrictions of
      elasticities of substitution. Include in your discussion the basis for the choice of a
      second order expansion.

c.   Please explain to what degree the second order expansion leads to correlation of
      the regressors. Discuss the significance of this result.

d.   Please explain any other functional forms estimated. If there are any, please
      provide and explain the results.

UPS/USPS-T14-17 Response:

a.   The translog form was chosen because it has been successfully used to model

      costs in a wide variety of industries, it is suitable for the estimation task at hand, and

      it has been adopted by the Commission in the past.[1] For example, the translog has

      been used to model costs for banking (Pully & Braunstein, 1992), telephony

      (Charnes, Cooper and Sueyoshi, 1988), electricity (Koh, Berg and Kenny, 1996),

      universities (deGroot, McMahon and Volkwein, 1991), hospitals (Sinay and

      Campbell, 1995) and trucking (Ying 1990).

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[1]   See, PRC OP., R87-1, at page 309.

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Also, the translog is well suited for the particular estimating task in this analysis. For example, there are no instances of zero output on the right-hand-side, so the Box Cox transformation is not required. The AIM (Aysmptotically Ideal Model) approximates abritrary cost functions by estimating the parameter of a kth order polynomial in the input prices. Because input prices are constant across sites, (a single national wage scale is followed), the attractiveness of using an AIM specification is limited.

Finally, the translog is well known and widely accepted. As explained by Greene[2]:

> The literature has produced something of a competition in the development of exotic functional forms. However, the translog function has remained the most popular, and by one account, Guilkey et. al. (1983) is the most reliable of several available alternatives.

b. There are two types of elasticity of substitution that are derived from the translog cost function, the elasticities of factor substitution and the own price elasticities of demand for inputs. Both of these quantities measure the responsiveness of factor demands to changes in input prices. However, because input prices (wages) are

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[2]See, William H. Greene, Econometric Analysis, 1993 Macmillan Publishing, New York, at page 504.

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constant across sites, such elasticities cannot and should not be estimated. Therefore any bias, or lack thereof, in their estimation is not relevant for specifying the functional form.

c. In estimation of a multi-product cost function, the presence of second order terms raises the possibility of correlation among the regressors. If large firms produce more of all of the outputs than do small firms, then it is possible that the various outputs are correlated. Second order terms would intensify this possible correlation. For the direct operations, this is not an issue, because there is only a single measure of output, the relevant piece handlings. It is a potential concern for the allied operations, because there are five output measures in those equations. In practice however, the problem is mitigated by the availability of thousands of data points across numerous sites.

d. Because of the reasons enumerated in part a, above, the translog function is appropriate and adequate for the current estimation task. Thus, I did not estimate any other functional forms.

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UPS/USPS-T14-18. Refer to pages 49 through 51 in your direct testimony, where the a correction for serial correlation is discussed and the Baltagi and Li method is chosen.

a.   Was the Bhargava, Franzini and Narendranathan method attempted? Why or why not?

b.   What are the advantages of the Bhargava, Franzini and Narendranathan method?

c.   Does the use of the Baltagi and Li method as opposed to the use of the Bhargava, Franzini and Narendranathan method result in different conclusions? If so, what are the differences and how would they affect the conclusions of your analyses?

UPS/USPS-T14-18 Response:

a.   The Bhargava, Franzini and Narendranathan formula for ρ does not have a closed form solution and the computational algorithm is thus iterative. Experiments with the computational algorithm showed that it would not always provide a solution for a data set with the dimensions of the present one. Therefore, I substituted the Baltagi-Li method of calculation.

b.   The Bhargava, Franzini and Narendranathan value for ρ has no advantage asymptotically, and is harder to compute than the Baltagi-Li Method.

c.   No. Both methods produce similar values for ρ and would thus produce similar parameter estimates.

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UPS/USPS-T14-19. Please refer to page 61, lines 10-12, of your direct testimony, where you state that "[a]n autonomous decline in hours, in each of these activities, for the 1988-1992 period is replaced with an autonomous increase in hours for the 1993-1996 [period]."

a.   Please describe the basis for this result.

b.   Was there a structural change that leads to this result? In your opinion, what was the cause of this result?

c.   In your opinion, how can this be better modeled in the estimated equations?

UPS/USPS-T14-19 Response:

a.   The basis for this results is the negative coefficients on Time Trend 1 and the

       positive coefficient on Time Trend 2 in Table 7 on page 54 of my testimony.

b.   The econometric results indicate that there was a structural change. I think that the

       structural change resulted from the reorganization of the workroom floor that

       occurred in FY 1993.

c.   Because of the nature of the structural change I think it would be hard to model it

       better in an econometric equation. In this ideal, if a variable could be constructed

       that somehow measured the way in which an activity was managed, then that

       variable could be used to measure the degree of structural change.

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UPS/USPS-T14-20. To what extent have MODS facilities experienced a trend toward automation compared to BMCs? Please include in your answer percentages of automated volume over time.

UPS/USPS-T14-20 Response:

Until very recently, with the advent of placing barcode readers on parcel sorting machines,

BMCs have had not automation. Thus, BMCs have not had the historical experience with

growing automation that has taken place at the MODS facilities.

I do not have and could not find specific data on automated volumes. To calculate

percentages of automated piece handlings, compute the following ratio on the data

provided in Library Reference H-148:

$$\frac{Automated}{Ratio} = \frac{OCR\ PH + BCS\ PH}{OCR\ PH + BCS\ PH + LSM\ PH + Manual\ Letter\ PH},$$

where PH stands for piece handlings.

DECLARATION

I, Michael D. Bradley, declare under penalty of perjury that the foregoing

answers are true and correct, to the best of my knowledge, information, and belief.

Dated: _August 15, 1997_

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon all

participants of record in this proceeding in accordance with section 12 of the Rules of

Practice.

Eric P. Koetting

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August 15, 1997