Postal Rate Commission
Submitted 10/18/2006 3:36 pm
Filing ID: 54228
Accepted 10/18/2006

UNITED STATES OF AMERICA
Before The
POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268-0001

Postal Rate and Fee Changes, 2006) Docket No. R2006-1

RESPONSES OF OFFICE OF THE CONSUMER ADVOCATE WITNESS MARK J. ROBERTS TO INTERROGATORIES OF UNITED STATES POSTAL SERVICE (USPS/OCA-T1-35-44) (October 18, 2006)

The Office of Consumer Advocate hereby submits responses of Mark J. Roberts to interrogatories USPS/OCA-T1-35-44, dated October 4, 2006. Each interrogatory is stated verbatim and is followed by the response.

Respectfully submitted,

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RESPONSE OF OCA WITNESS MARK J. ROBERTS
TO INTERROGATORIES USPS/OCA-T1-35-44

USPS/OCA-T1-35. Please refer to section II of your testimony, OCA-T-1, and your response to USPS/OCA-T1-3(b).

a. Please describe the process by which you arrived at the theoretical model(s) underlying your work, and the empirical implementations of them in your 2002 paper, your March 2006 paper, and/or your current testimony. Please describe specifically how you view the roles of the various sorting technologies in the Postal Service's mailstreams and the intermediate output(s) of those technologies. Also, please describe how you weighed operational or engineering relationships between the MODS piece handling measures and workhours at various levels of aggregation with other considerations in empirically specifying the mail processing "output" variables corresponding to your theoretical model, and describe any alternative formulations of your models you considered but have not previously reported. If you estimated any such alternative models, please summarize the results and explain why you chose not to present the results.

b. Please identify all other experts that you consulted in the process of developing your theoretical and empirical mail processing models, other than sources cited in your earlier papers or in OCA-T-1.

RESPONSE.

(a) The steps I have taken to develop my theoretical and empirical models have been well documented in my three papers, two seminar presentations and question-answer sessions at the Postal Rate Commission. All of this material is available at the OCA website http://www.prc.gov/OCA/OCApapers.htm. In particular, see Roberts (2002), Sections II and III and Roberts (2006), Sections II, III, and IV. With respect to the specification of output, I have explained this in writing several times. For the most recent discussion, see Roberts (2006), Section IV.A for discussion of FHP as an output measure and Section IV.B and IV.C for discussion of TPF. A common feature of the models I have developed is that they are designed to measure the plant-level relationship between labor hours and the volume of mail received by the plant for processing. This is what is needed to measure the marginal processing cost of a piece of mail. The plant is viewed

as a set of technologies that are used in varying proportions to process the overall volume of mail. Some of the operations are used in sequence, such as when mail moves from OCR to BCS operations. Others, such as manual and BCS, are used as substitutes. The model allows both of these types of interactions. In particular, the model allows for all the pathways outlined in USPS-T-12, Figures 1 and 2. Since I directly rely on plant-level volume data, I recognize that the mix of these operations can depend on the volume of mail handled in the plant. Since I model the plant as an integrated whole, rather than a set of distinct, stand-alone operations, my model also recognizes that the relationship between mail volume and hours in each operation depends on the whole technology configuration, particularly the type and quantity of capital stocks, in the plant. Intermediate outputs from different sorting operations are not defined or measured and play no role in my analysis. Defining them requires more restrictive assumptions on the technology (see Roberts, Section III, page 17 for a discussion of the role of separability and the correct definition of an intermediate output). More importantly, they are unnecessary for measuring the relationship between the volume of mail received in the plant and the labor hours used in sorting. Over time, I have worked to further refine the measure of mail volume that I use in the analysis. In Roberts (2002) I only separated mail volume by shape. In Roberts (2006) I separated volume by shape and whether it was receiving incoming or outgoing processing. In OCA-T-1 I further separated incoming and outgoing letters into those that could be entered directly into BCS operations. Each of these generalizations allows the estimated relationship between the volume of mail received in the plant and labor hours to be more general. In particular, it recognizes that two pieces will have different marginal costs if they are entered at different points in the sorting stream. My written work and seminar presentations fully document the

development of my thinking and all factors that influenced the choice of my preferred model.

(b) I have spoken casually with colleagues in my department at The Pennsylvania State University about general econometric or modeling issues that have come up in the course of my work.

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USPS/OCA-T1-36. Please refer to your response to USPS/OCA-T1-3(c). Please explain to what extent the test results you report in your response address the subjects of the separability of capital input, the appropriate level of aggregation of your FHP output measures, and/or your choice of MODS piece handling measure as "output."

RESPONSE.

It is unclear in this question what is meant by the “separability of capital input.” In my original answer, and the references given there, I explained what these test results imply about the separability of the production process into independent sorting operations. I don’t have anything to add to what I have already said. I do not draw any conclusions from the test results regarding the aggregation or use of FHP as a measure of output.

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USPS/OCA-T1-37. Please refer to your response to USPS/OCA-T1-4. Please also refer to USPS-T-12, Appendix A, especially page 107, lines 11-18, and equation (A5').

a. Please describe what you believe to be the final output(s) of the Postal Service.

b. Please explain your understanding of how the Postal Service's final output(s) are measured by the Postal Service's data systems. In particular, please state whether, in your view, MODS FHP handlings represent the final output(s) of the Postal Service (and, moreover, not of its sorting operations).

c. Please confirm that the elasticity of TPF (or TPH) with respect to ODIS-RPW system volume for a given class, subclass, or rate category (i.e., the number of unique pieces entered by mailers into the postal system) may be decomposed into the product elasticity of TPF (or TPH) with respect to FHP (i.e., "plant's volume"), and the elasticity of FHP with respect to ODIS-RPW system volume. If you do not confirm, please explain fully.

d. Please confirm that it is not possible to determine the proportionality of TPF (or TPH) and ODIS-RPW system volume solely from elasticities of TPF with respect to FHP. If you do not confirm, please show (in a manner similar to USPS-T-12, Appendix A) how it is possible.

e. Please confirm that you have not estimated elasticities of FHP with respect to RPW volumes. If you do not confirm, please explain fully, describe in detail your methodology, and provide all results, including econometric estimation code and output logs.

RESPONSE.

(a) Pieces of mail delivered.

(b) As I said my answer to USPS/OCA-T1-24, I have not worked with the ODIS-RPW data and do not know enough about its sampling methodology to comment on how well it measures mail volume in the whole postal system. MODS FHP represents the number of pieces of mail received in a plant. It is the appropriate variable for measuring the relationship between mail volume and labor hours in a processing plant, which is what my model estimates. It is not a measure of the number of pieces

of mail that are delivered, since a piece of mail can receive multiple FHP counts during its processing.

(c) One difficulty in answering this question is that the verbal description in the question does not match the math that is referenced in lines 11-17. The verbal description refers to FHP as "plant volume" while the math has an i subscript on the FHP variable, Fi, implying that it is the FHP in cost pool i. The latter does not make sense to me, see my answer to USPS/OCA-T1-3(b), but it is hard to know what is intended. More importantly, the multi-step process outlined in equations A3' to A5' is both restrictive and unnecessary. It is restrictive because it is based on a separable production model. All of the steps from cost to cost driver to FHP are unnecessary if we can directly estimate the relationship between labor hours (cost) in an operation and the volume of mail received in the plant. This is exactly the purpose of the empirical model I have developed. Once the relationship between mail volume in the plant and hours is measured and cost pools are constructed, there is still a question of distributing the cost pool across rate classes. As I explain in my response to USPS/OCA-T1-24 this can be done by constructing a distribution key that gives the share of each rate class in overall plant mail volume (or the volume of mail in each output category if there are multiple outputs).

(d) Confirmed, but it is also not necessary to estimate elasticities of TPF with respect to FHP in order to implement the framework I developed.

(e) Confirmed. In my response to USPS/OCA-T1-24 I explain how to construct a distribution key that could allocate cost pools (defined over output categories) across rate classes.

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USPS/OCA-T1-38. Please refer to your testimony, OCA-T-1, at page 18, lines 1-5.

a. Please describe in full the criteria you employed to identify the "64 plants [that] do not report FHP or capital stocks consistently over time."

b. Please describe in full the criteria you employed to identify "obvious errors" in FHP, "total labor hours," and "the division of labor hours across sorting categories."

c. With respect to your responses to parts (a) and (b) of this interrogatory, please specify to what extent the level(s) of aggregation at which you screen the Postal Service's data differ from the level(s) at which you analyze the data in your econometric models.

d. To the extent that your response to part (c) indicates that you screened the data at different level(s) of aggregation from that used in your econometric models, please explain:

(i) why the different level of screening was necessary (e.g., why aggregation neither corrected nor attenuated the errors with which you were concerned), and

(ii) why you consider, given your use of estimation methods that are presumably intended to be robust to measurement error and which therefore do not require data which are error-free in all respect, the different level of screening to be necessary.

RESPONSE.

(a) My general approach to identifying the sample of observations I use in the estimation followed 3 steps. First, I identified plants that do not report the most basic necessary output variables: total FHP in letters and flats. I also identified plants that never reported capital stocks in the DBCS or FSM operations. I examined these lists, which have a great deal of overlap in the plants they contain, and eliminated 64 plants that did not report these variables in all years. Often, the FHP variables or capital stock variables were never reported in any year for these plants. I did not use these plants in any of my analysis which left me with the starting group of 304 plants. There is a list of

these plants at the top of the basic data construction program: OCA-LR-L-2\DATA\LABORDEMAND\dataprep304.do

(b) The second step I followed was to look more closely at the disaggregated FHP variables (FHP_{IN} and FHP_{OUT}) and the data on total labor hours in letters and flats. For each of these variables I expressed each observation as a deviation from the mean of the variable for the same plant. I then examined these plant-mean deviations both graphically and by sorting the variables and printing them. I have found this method to be very effective in identifying quarterly observations that are outliers for a plant. Starting with the largest deviations I then went back to the original plant data and examined the whole time series for that variable and related variables for the plant. For example, if I found an outlier in the total hours in letter sorting, I would look at the reported hours in all of the letter-sorting operations in all years for that plant. In this way I was able to identify outliers for the plants in both the total hours and the hours in individual sorting operations. I also found a number of cases in which the FHP data was not appropriately disaggregated between incoming and outgoing operations. In general, when I found observations that I judged to be outliers for one of these key output or hours variables, I eliminated all the observations for the plant in the same year. This was partly for practical reasons based on the time limits I was working under but also because I did not want the sample to be constantly changing based on the sorting operation or level of aggregation (i.e number of outputs) I was using. This process of identifying outliers is tedious and time consuming and I did it interactively while working at the computer. I kept a record of my decisions and have included a complete list of all observations that were eliminated as a result of this process in the beginning of all the estimation programs in OCA-LR-L-2\ESTIMATION.

The third step in the sample selection process involves some computer screening of the data. Hours or output variables that are zero are eliminated automatically when logs are taken. I also eliminate observations that have TPF or hours in an operation that are reported to be positive while capital stocks in the operation are zero. This will lead to differences in the number of available observations across regressions and I try to keep this kind of autonomous sample selection to a minimum.

(c) In general I have screened the data at the level at which the primary models are estimated, labor hours by sorting operation and FHP divided into incoming and outgoing operations.

(d)(i)-(ii) See my answer to part (c). It should be noted, however, that the use of IV estimation methods that are robust to measurement error of an explanatory variable is not a substitute for correcting or eliminating errors in either the explanatory or dependent variables in a regression.

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USPS/OCA-T1-39. Please refer to your testimony, OCA-T-1, at page 18, lines 20-21. Please explain what you mean by "...different data collection system for part of the time period."

RESPONSE.

In the data file site_type_coded.xls that I received from the USPS (and which is included as a Stata dataset in OCA-LR-L-2 \DATA\LABORDEMAND\site_type_coded.dta) had one variable (c7 in the Stata dataset) that identified nine different designations for the processing plants that were included in the USPS-LR-L-56 data sets . One of these types was “MD2.” I asked the Postal Service for an explanation of this and the answer I received is “MD2 is an obsolete designation going back to the days when there was data processing distinction between PC-MODS (aka MOD 2 facilities) and PSDS (mainframe) MODS.” When I examined the MODS data I found that, of the observations identified as MD2 facilities, 34.5% (560 out of 1624 observations) did not report FHP. In contrast, the observations labeled as P&D did not report FHP for only 4% of the observations (280 out of 6916). As one sensitivity check for the letters models, I deleted all observations for the facilities identified as MD2. The results are reported in OCA-T-1, Table 4, Panel D.

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USPS/OCA-T1-40. Please refer to your testimony, OCA-T-1, at page 20, lines 17-22, where you discuss criticism of your model concerning "its ability to account for differences in the depth of sorting undertaken in the plant." You note that "[t]here is not a conceptual problem with the definition of output." Do you agree that the practical problem is what data best correspond to the conceptual definition of output? If not, please explain.

RESPONSE:

I have discussed this issue at length in my papers. See OCA-T-1, Section V.C. Also, see Roberts (2006), Section IV for a complete discussion of the practical issues involved in measuring the volume of mail in the plant.

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USPS/OCA-T1-41. Please refer to your testimony, OCA-T-1, at page 27, lines 14-23. Please also refer to Prof. William Greene's testimony from Docket No. R2000-1, USPS-RT-7, at page 5 (line 27) to page 6 (line 9). Prof Greene stated:

> The intervenors in [Docket No. R2000-1] have thrown up an array of criticisms of the data set that raise a standard that could never be met. Apparently, the MODS data were not created for the purpose for which they were used in this proceeding. But that is usually the case with large micro level data sets. Nonetheless, it does seem reasonable to assert that there is useful information in the MODS data for the determination of volume variability. I would suggest that the Commission take the view that researchers should extract from these data what useful information they contain, not go to great lengths to discredit the data, and then discard them and the analysis based on them. Do you agree with Prof. Greene? If not, please explain in detail why not.

RESPONSE.

I do not know specifically what is contained in the array of criticisms that Dr. Greene refers to so I cannot comment on the first sentence of the quote. I agree with the part of his comment that reads “Apparently, the MODS data were not created for the purpose for which they were used in this proceeding. But that is usually the case with large micro level data sets. Nonetheless, it does seem reasonable to assert that there is useful information in the MODS data for the determination of volume variability. I would suggest that the Commission take the view that researchers should extract from these data what useful information they contain….” I do not have a problem with intervenors questioning and criticizing the data. That is part of the process that is necessary to uncover the strengths and weaknesses of the data.

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USPS/OCA-T1-42. Please refer to your testimony at page 27, lines 19-23, where you mention your use of plant fixed effects in your recommended models. Please also refer to Prof. William Greene's testimony from Docket No. R2000-1, USPS-RT-7, at page 5 (lines 1-4). Prof. Greene stated:

> The Commission should have taken a much more favorable view [of the fixed effects model] in 1997, and should at this time consider the panel data, fixed effects form of econometric analysis an appropriate platform for continuing work on developing a model for mail processing costs.

a. Do you agree with Prof. Greene? If not, please explain in detail why not.

b. Please see also Dr. Bozzo's response in this proceeding to POIR No. 10, question 6. (Tr. 10/2487-88). Is it your opinion that the "time-series variation within each plant" is the variation of greatest interest for mail processing labor demand analysis? If not, please explain fully why your opinion has changed.

c. Please confirm that if "plant fixed effects" are present, but an otherwise appropriate econometric model fails to control for them, the results of that model generally will be biased. If you do not confirm, please explain.

RESPONSE.

(a) Yes.

(b) I believe it is the variation of greatest usefulness for estimating the short-run (capital stocks fixed) labor demand elasticities that have been the focus of my analysis.

(c) This statement is too vague for me to confirm. The presence of bias will depend on the correlation between the omitted plant dummies and the included variables in the model. Some regression coefficients may be biased while others are unaffected. Also the magnitude of the bias will depend on the strength of the correlation between the omitted and included variables. If the correlation is weak the bias can be small.

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USPS/OCA-T1-43. Please refer to item (c) in your response to USPS/OCA-T1-9. You note that your tests "rejected the exogeneity condition in 9 of 13 sorting operations."

a. Table 1 reports elasticities for eleven sorting operations. Please identify the other two operations and provide all available Table 1 elasticities for those operations.

b. For each of the thirteen sorting operations you tested using your variations on the Postal Service models, please provide:

(i) The output elasticities from the non-instrumental variables models against which you tested,

(ii) The values of the test statistics, the corresponding p-values, and the critical p-value on which your statement is based.

c. Please provide all econometric code and output log(s) for the material you provide in response to parts (a) and (b), or please indicate where the material is provided in OCA-LR-2.

RESPONSE.

(a) I am referring to the results in my 2002 paper, Section VII.D. Table 13 in that paper is the relevant one and it contains 13 sorting operations. The discussion of the results of the exogeneity test begins on the bottom of page 82 and continues on page 83.

(b) (i)-(ii)Table 13 provides instrumented and non-instrumented parameter estimates. The test statistics for the exogeneity test is one of the few sets of results I did not report in the paper. The following table gives the Hausman test statistic (it is a t-statistic in this case) for the hypothesis that TPF is an exogenous variable. A large absolute value of the test statistic (low P-value) implies reject that TPF is exogenous.

Operation	First Difference – IV estimator	Fixed Effects – IV estimator
Manual flats	-9.28 (.000)	3.60 (.000)
FSM – all	-4.92 (.000)	3.11 (.002)
FSM 881	-5.89 (.000)	10.87 (.000)
FSM1000	-1.09 (.276)	2.14 (.032)
Manual letters	-7.82 (.000)	7.54 (.000)
LSM	-2.17 (.030)	1.58 (.115)
OCR	-5.96 (.000)	4.78 (.000)
BCS – all	-8.04 (.000)	7.21 (.000)
BCS	8.62 (.000)	0.25 (.801)
DBCS	-6.91 (.000)	4.67 (.000)
Manual Parcel	-1.65 (.099)	0.28 (.781)
SPBS	-0.90 (.369)	4.46 (.000)
Manual Priority	-3.00 (.003)	3.64 (.000)

(c) These results are all available with the documentation I provided for my 2002 paper. It is on the OCA website at http://www.prc.gov/OCA/OCApapers.htm The program and log files with all the results for table 13 are outputtpf.do and outputtpf.log

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USPS/OCA-T1-44. Please refer to item (d) in your response to USPS/OCA-T1-9. You note that you omitted quarterly dummy variables from your versions of the Postal Service models because "There is no evidence in the operational testimony that the methods used to sort the mail in an operation vary by quarter of the year."

a. Notwithstanding the absence of mention in the operational testimony, did you consider the possibility, or probability, of seasonal variations in staffing patterns and/or mail mix, before eliminating the quarterly dummy variables? If not, why not?

b. Did you test the significance of the coefficients on the quarterly dummy variables before eliminating them from the models you estimated? If so, please provide all results of the tests, the econometric code, and related output log(s). If not, why not?

RESPONSE:

(a) This role of quarterly variation in the data and how it should be utilized is discussed at length in Roberts (2006), Section V.E. While I could not find any operational testimony relevant to this point, I did speculate about the possibility of a changing mix of part-time and full-time workers that might affect the quality of the plant's workforce as one source of quarterly variation in the demand equations. When deciding how to specify the labor demand models, this possibility must be weighed against the certainty that the quarterly variation in mail volume is large and the major source of information available to estimate the output elasticities. This is one of the points I explain in Section V.E.

(b) I did not do this test in preparing OCA-T-1. For the reasons that I explained in Roberts (2006), Section V.E, I felt that it was most appropriate to model the quarterly variation in hours as arising from quarterly variation in mail volume. In Roberts (2006), Table 8, I present estimates from models that use quarterly dummies. In Section V.E, these estimates are discussed and contrasted with the corresponding estimates from models without quarterly dummies in Tables 4 and 5.

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The log file for the regressions in Table 8 is available in the documentation provided for that paper on the OCA web site (file name: finalestq.log). The log file contains the estimates for the quarterly dummy variables and they are almost always statistically significant. Any test that the coefficients on the quarterly dummies were jointly equal to zero would be rejected. However, the magnitudes are so large that it is impossible to believe they are measuring quarterly shifts in the technology, after controlling for output variation. For example, the quarterly dummies in the manual labor demand for letter sorting indicate that, relative to the first quarter, 2nd quarter labor demand is 5.9 percent higher and 4th quarter labor demand is 10.8 percent lower, a 16.7 percent swing in labor demand from the 2nd to 4th quarter. Similar swings in magnitude based on the quarterly dummies are observed for the other major sorting operations. DBCS hours rise 15.0 percent between the 1st and 4th quarter, manual flat sorting hours fall 13.9 percent from the 1st to 4th quarter, while AFSM hours rise 12.0 percent in the 2nd quarter relative to the 3rd and 4th. These are large variations in labor hours that are almost certainly reflecting the quarterly variation in mail volume, not quarterly changes in the technology, such as a changing mix of full and part time workers, after controlling for the volume of mail in the plant. For the reasons I have enumerated, I believe it is appropriate to model the labor demand curves without including quarterly dummies and rather to exploit the quarterly variation in mail volume to estimate the elasticities of labor hours.