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United States of America
POSTAL REGULATORY COMMISSION

Before:

Chairman Blair,
Vice Chairman Tisdale,
Commissioners Acton, Goldway and Hammond

Postal Rate and Fee Changes   Docket No. R2006-1

OPINION
AND
RECOMMENDED DECISION

VOLUME 2

Washington, DC 20268-0001
February 26, 2007

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Jennifer T. Mallon

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Timothy L. Keegan

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Frank R. Heselton
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Nan K. McKenzie
Sheela A. Portonovo
Elizabeth Reed
Brian M. Reimer
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[1] Valpak Dealers' Association, Inc. (VPDA) and Valpak Direct Marketing Systems, Inc. (VDMS) are collectively referred to herein as Valpak.

* Limited Participant

WITNESSES' TESTIMONY

Abdirahman, Abdulkadir M.	Postal Service	USPS-T-22
	Postal Service	USPS-RT-7
Angelides, Peter A., Ph.D.	Association for Postal Commerce and Mailing & Fulfillment Service Association	PostCom-T-4
	Association for Postal Commerce and Mailing & Fulfillment Service Association	PostCom-T-5
Bell, Elizabeth A.	National Association of Presort Mailers	NAPM-RT-1
Bellamy, Cameron	GrayHair Software	GHS-T-1
	GrayHair Software	GHS-ST-1
Bentley, Richard E.	Major Mailers Association, DST Mailing Services, Inc., and Association for Mail Electronic Enhancement	MMA-T-1
Berkeley, Susan W.	Postal Service	USPS-T-34
	Postal Service	USPS-T-39
	Postal Service	USPS-RT-17
Bernstein, Peter	Postal Service	USPS-T-8
Bozzo, A. Thomas	Postal Service	USPS-T-12
	Postal Service	USPS-T-46
	Postal Service	USPS-RT-1
	Postal Service	USPS-RT-5
Bradfield, Lou	American Business Media	ABM-RT-1
Bradley, Michael D.	Postal Service	USPS-T-14
	Postal Service	USPS-T-17
	Postal Service	USPS-RT-4
Buc, Lawrence G.	Direct Marketing Association, Inc.	DMA-T-1
	Direct Marketing Association, Inc.	DMA-RT-1
	Pitney Bowes Inc.	PB-T-2
	Pitney Bowes Inc.	PB-T-3
Callow, James F.	Office of the Consumer Advocate	OCA-T-5
Carlson, Douglas F.	Douglas F. Carlson	DFC-T-1
Cavnar, Nicholas	American Business Media	ABM-T-1
Clifton, James A.	American Bankers Association, and National Association of Presort Mailers	ABA-NAPM-T-1
	Greeting Card Association	GCA-T-1
Cohen, Rita D.	Magazine Publishers of America, Inc., and Alliance of Nonprofit Mailers	MPA/ANM-T-1

Coombs, Joyce K.	Postal Service	USPS-T-44
Crowder, Antoinette	Magazine Publishers of America, Inc., et al.[1]	MPA et al.-RT-1
	Saturation Mailers Coalition, and Advo, Inc.	SMC-RT-1
Cutting, Samuel T.	Postal Service	USPS-T-26
Czigler, Martin	Postal Service	USPS-T-1
Davis, Scott J.	Postal Service	USPS-T-47
Elliott, Stuart W.	Magazine Publishers of America, Inc., et al.[2]	MPA et al.-RT-2
Finley, Chris	Parcel Shippers Association	PSA-T-1
Geddes, R. Richard	United Parcel Service	UPS-T-3
Glick, Sander A.	Magazine Publishers Association, and Alliance of Nonprofit Mailers	MPA/ANM-T-2
	Parcel Shippers Association	PSA-RT-1
	Parcel Shippers Association, Association for Postal Commerce, and Mailing & Fulfillment Service Association	PSA/PostCom-T-1
	Association for Postal Commerce, and Mailing & Fulfillment Service Association	PostCom-T-1
Gorham, David	Major Mailers Association	MMA-RT-2
Gorman, Pete	Saturation Mailers Coalition	SMC-T-1
Haldi, John, Ph.D.	Amazon.com, Inc.	AMZ-T-1
	Valpak[3]	VP-T-2
Harahush, Thomas W.	Postal Service	USPS-T-4
Heath, Max	National Newspaper Association	NNA-T-1
Hintenach, Frederick J., III	Postal Service	USPS-T-43
Horowitz, Aaron	Association for Postal Commerce, et al.[4]	PostCom-T-6
Hunter, Herbert B., III	Postal Service	USPS-T-2
Ingraham, Allan T.	Newspaper Association of America	NAA-T-2
	Newspaper Association of America	NAA-RT-2
Kaneer, Kirk T.	Postal Service	USPS-T-41
Kelejian, Harry	Greeting Card Association	GCA-T-5
Kelley, John P.	Postal Service	USPS-T-15
	Postal Service	USPS-T-30
	Postal Service	USPS-RT-6

[1] Magazine Publishers of America, Inc., Advo, Inc., Alliance of Nonprofit Mailers, American Business Media, Dow Jones & Co., The McGraw-Hill Companies, Inc., Mail Order Association of America, National Newspaper Association, Saturation Mailers Coalition, and Time Warner Inc.

[2] Magazine Publishers of America, Inc., Alliance of Nonprofit Mailers, American Business Media, Dow Jones & Co., The McGraw-Hill Companies, Inc., and National Newspaper Association.

[3] Valpak Direct Marketing Systems, Inc. and Valpak Dealers' Association, Inc. (Valpak).

[4] Association for Postal Commerce, Mailing & Fulfillment Association, and Continuity Shippers Association.

Kent, Christopher D.	American Bankers Association	ABA-RT-1
Kiefer, James M.	Postal Service	USPS-T-36
	Postal Service	USPS-T-37
	Postal Service	USPS-RT-11
Knight, Clifton B., Jr.	Association for Postal Commerce, et al.[5]	PostCom-T-7
Kobe, Kathryn L.	American Postal Workers Union, AFL-CIO	APWU-T-1
Laws, George R.	Postal Service	USPS-RT-16
Liss, Andrea Sue	Greeting Card Association	GCA-T-4
Loetscher, L. Paul	Postal Service	USPS-T-28
	Postal Service	USPS-RT-9
Loutsch, Richard G.	Postal Service	USPS-T-6
Luciani, Ralph L.	United Parcel Service	UPS-T-2
Lyons, W. Ashley	Postal Service	USPS-RT-3
Martin, Claude R., Jr., Ph.D.	Greeting Card Association	GCA-T-2
Mayes, Virginia J.	Postal Service	USPS-T-25
McAlpin, John	Parcel Shippers Association	PSA-T-2
McCormack, Mary P.	Major Mailers Association	MMA-RT-1
McCrery, Marc D.	Postal Service	USPS-T-42
	Postal Service	USPS-RT-14
McGarvy, Joyce	American Business Media	ABM-RT-2
Milanovic, Mico	Postal Service	USPS-T-9
Miller, Michael W.	Postal Service	USPS-T-20
	Postal Service	USPS-T-21
	Postal Service	USPS-RT-8
Mitchell, Robert W.	Time Warner Inc.	TW-T-1
	Time Warner Inc.	TW-T-3
	Valpak	VP-T-1
	Valpak	VP-T-3
	Valpak	VP-RT-1
Mitchum, Drew	Postal Service	USPS-T-40
	Postal Service	USPS-RT-13
Morrissey, Raymond	Greeting Card Association	GCA-T-3
Nash, Joseph E.	Postal Service	USPS-T-16
Neels, Kevin	United Parcel Service	UPS-T-1
Nieto, Norma B.	Postal Service	USPS-T-24

[5] Association for Postal Commerce, Mailing & Fulfillment Service Association, and Direct Marketing Association.

O'Hara, Donald J.	Postal Service	USPS-T-31
Oronzio, Chris R.	Postal Service	USPS-RT-15
Otuteye, Godfred	Association for Postal Commerce, et al.[6]	PostCom-T-8
Paffford, Bradley V.	Postal Service	USPS-T-3
Page, James W.	Postal Service	USPS-T-23
Pajunas, Anthony M.	Postal Service	USPS-T-45
Panzar, John C., Ph.D.	Pitney Bowes Inc.	PB-T-1
Paul, Robert	Growing Family, Inc.	GF-T-1
Pifer, Dion I.	Postal Service	USPS-T-18
Posch, Robert J., Jr.	Association for Postal Commerce, et al.[7]	PostCom-T-3
Prescott, Roger C.	Mail Order Association of America	MOAA-T-1
	Mail Order Association of America	MOAA-RT-1
Pritchard, Janyce	The Flute Network	Flute-T-1
Pursley, Anita	Association for Postal Commerce, and Mailing & Fulfillment Service Association	PostCom-T-2
Resch, Mary Pat	Discover Financial Services LLC, and Morgan Stanley, Inc.	DFS&MSI-T-1
Riddle, Paul	Postal Service	USPS-T-5
Roberts, Mark J.	Office of the Consumer Advocate	OCA-T-1
Robinson, Maura	Postal Service	USPS-RT-10
Scherer, Thomas M.	Postal Service	USPS-T-33
Schroeder, Steven M.	Postal Service	USPS-T-29
Sidak, J. Gregory	Newspaper Association of America	NAA-T-1
	Newspaper Association of America	NAA-RT-1
Siwek, Stephen E.	National Newspaper Association	NNA-T-3
Smith, J. Edward	Office of the Consumer Advocate	OCA-T-2
	Office of the Consumer Advocate	OCA-T-3
Smith, Marc A.	Postal Service	USPS-T-13
Sosniecki, Gary	National Newspaper Association	NNA-T-2
Spatola, Don M.	Postal Service	USPS-T-49
Stevens, Dennis P.	Postal Service	USPS-T-19
Stralberg, Halstein	Time Warner Inc.	TW-T-2
Talmo, Daniel, Ph.D.	Postal Service	USPS-T-27
Tang, Rachel	Postal Service	USPS-T-35

[6] Association for Postal Commerce, Alliance of Independent Store Owners and Professionals, Direct Marketing Association, Mailing & Fulfillment Service Association, and Saturation Mailers Coalition.

[7] *Id.*

Taufique, Altaf H.	Postal Service	USPS-T-32
	Postal Service	USPS-T-48
	Postal Service	USPS-RT-12
	Postal Service	USPS-RT-18
Thompson, Pamela A.	Office of the Consumer Advocate	OCA-T-4
Thress, Thomas E.	Postal Service	USPS-T-7
	Postal Service	USPS-RT-2
Van-Ty-Smith, Eliane	Postal Service	USPS-T-11
Waterbury, Lillian	Postal Service	USPS-T-10
White, Mark Wallace	U.S. News & World Report, L.P.	USNews-T-1
Wilbur, Michael	MBI, Inc.	MBI-T-1
Yeh, Nina	Postal Service	USPS-T-38
Zwieg, Steve	Parcel Shippers Association	PSA-RT-2

REVENUE REQUIREMENT FOR TEST YEAR WITH PROPOSED REVENUE AND COSTS

($000)

	USPS Filing 1/	USPS Revised 2/	PRC 3/
Mail and Special Services Revenue	76,990,772	77,086,808	77,031,918
Appropriations	101,593	101,593	101,593
Investment Income	422,738	437,201	434,831
Total Revenues & Operating Receipts	**77,515,103**	**77,625,602**	**77,568,342**
Postmasters	2,468,028	2,468,028	2,458,662
Supervisors	4,418,969	4,418,969	4,406,184
Clerks & Mailhandlers, CAG A-J	18,492,901	18,492,936	18,636,732
Clerks, CAG K	6,673	6,673	6,733
City Delivery Carriers, In-Office	5,326,944	5,326,944	5,370,274
City Delivery Carriers, Street Time	11,579,707	11,579,707	11,648,158
Vehicle Service Drivers	665,227	665,227	670,560
Rural Carriers	6,445,665	6,445,665	6,491,892
Custodial Maintenance Service	3,509,789	3,509,788	3,515,742
Motor Vehicle Service	1,144,163	1,144,163	1,147,498
Miscellaneous Operating Costs	369,564	369,564	369,402
Transportation	5,427,378	5,426,886	5,422,028
Building Occupancy	1,995,593	1,995,593	1,995,593
Supplies & Services	2,832,701	2,832,702	2,830,238
Research & Development	42,001	42,001	42,001
Administration & Regional Operations	9,146,653	9,146,653	9,050,967
General Management Systems	68,331	68,331	68,318
Depreciation & Servicewide Costs	3,064,789	3,064,789	3,064,949
Final Adjustments	(261,443)	(243,166)	(407,160)
Total Accrued Costs	**76,743,634**	**76,761,453**	**76,788,770**
Contingency	767,436	767,615	767,888
Recovery of Prior Years Losses	4,820	-	9,374
Total Revenue Requirement	**77,515,890**	**77,529,068**	**77,566,032**
Net Surplus (Deficiency)	(787)	96,534	2,310

1/ Revenues: USPS Exh. 6A I
Accrued Costs: USPS Exhibit 10H
Final Adjustments, USPS LR-K-59
2/ Revenues: USPS Exh. 6A as revised by Exh. 6A-1
Accrued Costs: USPS Exh. 6N as revised. Tr.
Final Adjustments: USPS LR-K-59 Revised. Tr. 19/6802-05
3/ Revenues: Appendix G, Schedule 1
Accrued Costs: Appendix F, Schedule 2
Final Adjustments: Appendix F, Schedule 2

DEVELOPMENT OF REVENUE REQUIREMENT AND COST ROLL FORWARD CORRECTIONS

[1] *Introduction:* This appendix explains the various adjustments the Commission makes to the Postal Service's initial test year revenue requirement estimate. The Commission takes account of the following types of changes: (1) Postal Service revisions to revenues, costs, and final adjustments; (2) adjustments to Postal Service compensation and benefits cost factors for known and certain events; (3) other revenue requirement adjustments; and (4) implementation of corrected cost attribution methodologies and revenue requirement computations.

[2] The adjustments for known and certain events are implemented using the Postal Service revised revenue requirement spreadsheets filed as USPS-LR-L-50. The adjusted cost levels, acceptance of the Postal Service proposed treatment of segment 3 window service costs, other Commission attribution changes, and the various corrections to the volume estimates were made using the Commission's cost roll forward model, PRC-LR-2.

A. Revisions to Revenues, Costs, and Final Adjustments

1. Postal Service Revisions

[3] The Postal Service has undertaken several revisions to revenues and the revenue requirement since the initial filing on May 3, 2006. These culminated with several responses to Presiding Officer's Information Request No. 16 in which revised revenues, costs, and final adjustments resulted in the final version of the Postal Service's proposed revenue requirement. The final response was filed on November 21, 2006. These revisions, which the Commission adopts, result in a test year after rates net

revenue surplus of $96 million under Postal Service costing methodology and $215.9 million under PRC costing methodology.

a. Revenues

[4] Witness O'Hara, in his response to Presiding Officer's Information Request No. 16, corrects many of the errors and inconsistencies in the initial estimate of revenues for the test year. Tr. 40/13579-82. These corrections increase revenues by $110.5 million for the test year.

b. Costs

[5] There were several changes to accrued costs relating to corrections in the roll forward process and final adjustments. Tr. 40/13561-71. These corrections increase the revenue requirement by $13.2 million under Postal Service costing methodology. Under PRC costing methodology, the revenue requirement decreases by $4.5 million.

2. Commission Corrections

[6] In addition to the revisions made by the Postal Service, the Commission finds grounds for additional corrections to the revenue requirement.

a. Base Year Periodicals Costs in Cost Segment 6

[7] During the Commission's analysis of base year costs presented by the Postal Service in USPS-LR-L-93, it was noticed that the costs for segment 6, city delivery carrier in-office from the B-workpapers, did not match the amounts shown for Periodicals in the "I" report. When compared with Postal Service's cost worksheets found in USPS-LR-L-4, the amounts for periodicals in the B-workpaper and the "I" report were the same as found in the PRC version of the "B" report. Assuming that this was probably a

transcription error in the production of the PRC version of the "I" report, the Commission corrected the apparent transcription error in the "I" report with the amounts for Periodicals found in the PRC version of the B-workpaper for city delivery carriers. Correcting this error in the base year and rolling it forward to the test year increases attributable costs by $0.2 million.

b. Final Adjustments Corrections

[8] The Commission has corrected the adjustment for the shift of First-Class parcels from single-piece First-Class to presort First-Class. In response to Presiding Officer's Information Request No. 16, witness Smith provides the data on First-Class single-piece permit imprint parcels needed to affect the final cost adjustment. Tr. 40/13590-92. However, he notes that there could be a divergence of volumes reported from the IOCS and the mailing statements, which probably makes the estimated unit costs of parcels moving to presort understated and speculative at best. *Id.* at 13593-95. The Commission uses the total unit costs for First-Class single-piece parcels found in USPS-LR-L-185, as adjusted by the Commission. Additionally, the FY 2007AR parcel volume should only reflect the volume after assumed implementation of the new classification. Accordingly, the Commission adjusts that volume as well. Correcting this final adjustment reduces the test year revenue requirement by $46.6 million.

[9] PSA rebuttal witness Glick notes that the computation of one of the final adjustments for Parcel Post contains more Parcel Select no-fee electronic delivery confirmation pieces than the total volume of Parcel Select. He recommends that an adjustment be calculated by multiplying the total Parcel Select volume by the BY 2005 percentage of Parcel Select pieces that use no-fee electronic delivery confirmation. Tr.33/11269-70. The Commission agrees, and develops the calculations to estimate the volumes of Parcel Select using no-fee electronic delivery confirmation for FY 2006 through the test year after rates. There is no bottom line affect on the revenue requirement; however, it does reduce Parcel Post costs by $6.9 million, increases Priority

Mail costs by $3.3 million, and increases other special services costs by $3.6 million in the test year after rates.

c. Summary

[10] Taking into account all of the revisions provided by the Postal Service and the additional corrections made by the Commission, the revenue requirement for the test year after rates, under PRC costing methodology, is reduced by $52.0 million.

B. Adjustments to Postal Service Compensation and Benefits Cost Factors for Known and Certain Events

[11] The Postal Service's estimates for employee compensation and benefits are influenced by: (1) assumptions regarding the results of labor negotiations or settlements; (2) increases in the consumer price index; (3) management decisions regarding wage changes for nonbargaining employees; and (4) changes in the cost structure of employee benefits.

[12] In the Postal Service's initial filing of May 3 , 2006, the FY 2006 estimates of compensation and benefits for bargaining level employees were determined based on the last year of labor contracts due to expire on November 20, 2006. The estimates for FY 2007 and the test year were assumed to equal the Employment Cost Index less one percent (ECI-1). Subsequent to the initial filing of this docket, two events occurred which affected the original estimates of compensation and benefits. First, the COLA payment for bargaining level employees due in September 2006 was substantially higher than originally estimated by the Service. Tr. 19/6767-68. The Commission calculates the new COLA payment and substitutes it for the original estimate. Second, the Office of Personnel Management announced the average 2007 premium increase for the Federal Health Benefits Program (FEHBP). The average increase of 1.8 percent was substantially lower than the 7.0 percent estimated increase used by the Service. When

asked about the effect of the much lower FEHBP premium increase on Postal Service costs, revenue requirement witness Loutsch noted that the real effect would not be known until after the FEHBP open season, when employees can change plans. However, he noted hat when the new premium rates were applied to the current employee population, the increase was 2.3 percent. *Id.* at 6769-70. Consistent with past practice, the Commission substitutes the 2.3 percent increase in health benefits for the original estimate of 7 percent, but leaves the estimated increase for FY 2008 at the original Postal Service estimate of 7 percent.

[13] PRC-LR-1 contains the workpapers filed by the Service in USPS-LR-L-50 as adjusted for September 2006 COLA and the smaller increase in health benefits premiums for FY 2007.

1. Adjustments Due to CPI-W Actual Results

[14] The Postal Service uses estimates of the Urban Wage Earners and Clerical Workers (CPI-W) index based on the Global Insight, Inc. estimates made in December 2005. The estimates for the January 2006 and the July 2006 CPI-W index were 578.2 and 583.8, respectively. The actual indices for those two months were 577.7 for January 2006 and 593.2 for July 2006. The following table compares the actual CPI-W indices and the COLA payments made, with those estimated by the Postal Service for the period.

Table D-1

	CPI-W		**Cost Per Worker**	
	Actual	**USPS Est.**	**Actual**	**USPS Est.**
January 2006	554.9	577.7	$457.00	$478.00
July 2006	568.8	593.2	812.00	291.00

[15] As the table above indicates, while the estimate for the January 2006 COLA (payable in March 2006) is slightly lower than originally estimated, the estimate for the July 2006 COLA (payable in September 2006) is significantly greater than originally estimated. The effect of adjusting the COLA is to increase cost levels in the test year by $429.3 million. Labor-related accrued costs for Repriced Annual Leave, Premium and Benefit rollup costs, and the Workload Mix Adjustment also increase as a result of this adjustment.

2. Adjustments Due to Actual Health Benefits Increases

[16] The Postal Service has estimated increases for FY 2007 and the test year in the cost of providing health benefits to employees through the FEHBP. These increases are based on a Hay Group analysis and are estimated to be 7 percent for both years. In September 2006, the Office of Personnel Management announced that the average premium increase for the FEHBP would be 1.8 percent for 2007. As noted above, the Postal Service estimated that the increase, when applied to the current mix of employee health plans, would yield a 2.3 percent increase for 2007. Accordingly, the Commission applies this 2.3 percent estimated increase to health benefits costs, in lieu of the original estimate of 7.0 percent. This smaller increase results in a reduction of cost levels of $236.9 million.

[17] Additionally, the 2.3 percent health benefits increase is also applied to the Annuitant Health Benefits model. This has the effect of reducing the costs of Annuitant Health Benefits by $93 million.

3. Other Changes to Compensation and Benefits Cost Levels

[18] There are several other compensation-related costs that are effected by the changes in COLA payments. The costs of premiums to basic pay, such as overtime and

night differential, and the costs of various compensation-related benefits such as Social Security and CSRS/FERS retirement are directly tied to changes in the basic pay of employees. Additionally, the costs of Repriced Annual Leave, Holiday Leave Variance, and the workload mix adjustment are tied directly to changes in compensation. The net effect is to increase costs by $149.7 million.

4. Adjustments to Cost Reductions and Other Programs

[19] The Postal Service has numerous programs and projects designed to produce cost savings in the interim years and the test year. The Postal Service has estimated these cost savings based on estimates of work hour savings by craft from the implementation of the programs priced out at the estimated productive wage rate for the particular craft. The effect of updating the cost level factors for the actual COLA and health benefits will increase the savings estimates associated with these programs by $9.5 million.

[20] Additionally, the cost reductions programs will have certain costs associated with their implementation, and will increase the number of craft work hours. These costs are included in Other Programs. The additional costs of other programs also are estimated with the increased work hours by craft priced out at the estimated productive wage rate for that particular craft. The effect of updating the cost levels for Actual COLAs and health benefits increases these costs by $1.5 million.

5. Summary

[21] The Commission adjustments to compensation and benefits cost estimates through the test year increase the Postal Service's estimated compensation and benefits and other personnel-related test year expenses by approximately $204.0 million.

Table D-2 summarizes the adjustments to compensation and benefits cost level, cost reductions, and service-wide costs effects for FY 2006, FY 2007, and the test year.

C. Other Revenue Requirement Adjustments

[22] The Commission has lowered the estimate of base year registry mail processing costs. This adjustment is based on re-allocating the mail processing costs of registry using the RPW factor to split the Postal Service Penalty Registered mail costs from the commercial registered mail costs. In Docket No. R2005-1, the Commission rejected a Postal Service change in the allocation of these costs. The Commission again rejects this change. *See* section V.F.12. This is applied in the B-workpaper for cost segment 3, PRC LR-4, cs03 PRCfinal.xls, tab PRC 3.0.7 and tab 3.1.1. The results from W/S 3.1.1a are transferred to the PRC version of the premium pay adjustment calculations in USPS-LR-L-100. This adjustment increases the revenue requirement by $19.1 million.

D. Implementation of the Commission's Cost Attribution Methodologies and Revenue Requirement Changes

[23] For the purpose of developing the Commission's test year attributable costs and revenue requirement, changes were made to the Postal Service's roll forward factor files and the base year cost matrix. These changes are listed below:

- Adjustments to FY 2006, FY 2007, and the test year cost level factors, Cost Reductions Programs, Other Programs, and the work year mix adjustment, as discussed above;
- Attribution changes in cost segments 3 and 14, as discussed in the Opinion;
- Adjustments of volumes and revenues for corrections to the volume and revenue estimation models and also for PRC adjustments to rates.

[24] The adjustments made to Postal Service costs are calculated using the PRC version of the revenue requirement workpapers, PRC-LR-1 and the Commission's CRA/Cost roll forward model, PRC-LR-2.

Table D-2
Comparison of Compensation and Benefit Cost Level Effect
Docket No. R2006-1

($ 000)

	FY 2006			FY 2007			Test Year - FY 2008		
	Org. RR Assumptions	After New COLA & New Hlth. Ben.	Difference	Org. RR Assumptions	After New COLA & New Hlth. Ben.	Difference	Org. RR Assumptions	After New COLA & New Hlth. Ben.	Difference
Compensation:									
Pay Increases	629,407	630,432	1,025	967,087	978,717	11,630	828,919	828,507	(412)
COLA	628,743	645,053	16,310	277,417	548,724	271,307	0	0	0
Net Lump Sum	(4,003)	(4,003)	0	(3,993)	(3,992)	1	(3,958)	(3,956)	2
Step Increases	24,082	24,082	0	32,115	32,120	5	61,970	61,938	(32)
Premiums	211,411	214,716	3,305	212,823	267,321	54,498	145,620	145,501	(119)
Adjustment for Mix Change				(131)	(90)	41	44	30	(14)
Total Compensation Change	1,489,640	1,510,280	20,640	1,485,318	1,822,800	337,482	1,032,595	1,032,020	(575)
Benefits:									
Health	311,228	311,228	0	327,973	161,508	(166,465)	350,021	279,068	(70,953)
Uniform Allow .	373	373	0	51	51	0	0	0	0
Roll-Ups	309,469	313,633	4,164	303,787	372,550	68,763	214,268	214,114	(154)
Total Benefits Change	621,070	625,234	4,164	631,811	534,109	(97,702)	564,289	493,182	(71,107)
Other Costs:									
Travel	15,515	15,515	0	14,827	14,823	(4)	7,720	7,716	(4)
Relocation	3,165	3,165	0	101	101	0	703	703	0
Total Other Costs Changes	18,680	18,680	0	14,928	14,924	(4)	8,423	8,419	(4)
Repriced Annual Leave	18,303	25,580	7,277	(24,875)	(32,148)	(7,273)	4,209	4,242	33
Total Personnel Cost Changes	2,147,693	2,179,774	32,081	2,107,182	2,339,685	232,503	1,609,516	1,537,863	(71,653)
Cost Reductions Programs	(1,005,687)	(1,006,140)	(453)	(1,196,499)	(1,202,066)	(5,567)	(1,120,701)	(1,124,139)	(3,438)
Other Programs	74,985	75,038	53	192,314	193,204	890	116,206	116,541	336
Workload Mix Adjustment	104,748	105,030	282	309,978	315,741	5,763	93,631	106,879	13,248
Total PRC Adjustment			31,963			233,589			(61,507)
Total Revenue Requirement Adjustment									204,044

COMPARISON OF COSTS ATTRIBUTED BY COST SEGMENT AND COMPONENT

($ 000's)

	PRC R2006-1 Test Year			USPS R2006-1 Test Year		
	Accrued Cost	Attributable Cost	Percent Attributable	Accrued Cost	Attributable Cost	Percent Attributable
1. Postmasters						
EAS 22 and Below	2,397,817	423,768	17.67	2,406,927	424,556	17.64
EAS 23 and Above	60,845	-	0.00	61,102	-	0.00
Total	2,458,662	423,768	17.24	2,468,028	424,556	17.20
2. Supervisors & Technical Personnel						
Mail Processing	1,001,203	942,114	94.10	1,006,123	841,389	83.63
Window Service	267,379	98,150	36.71	267,793	99,225	37.05
Time and Attendance	73,432	44,565	60.69	73,637	41,994	57.03
Employee & Labor Relations	-	-	0.00	-	-	0.00
City Carriers	1,154,253	584,847	50.67	1,155,719	584,300	50.56
Rural Carriers	116,415	47,572	40.86	116,608	47,522	40.75
Vehicle Service	41,851	25,072	59.91	41,871	25,033	59.79
Higher Level Supervisors	269,373	77,611	28.81	269,824	72,959	27.04
Superv. Qual. Cntrl./Rev. Prot.	50,802	46,987	92.49	50,993	42,867	84.06
Superv. Central Mail Mark-Up	46,400	46,372	99.94	46,916	39,613	84.43
Joint Supv. Clerks & Carriers	619,165	424,682	68.59	620,872	398,173	64.13
Gen.Supv., Mail Process.	-	-	0.00	-	-	0.00
Gen.Supv., Coll.& Del.	-	-	0.00	-	-	0.00
Other Sup., Training	49,258	27,274	55.37	49,405	25,576	51.77
Other	716,653	-	0.00	719,207	-	0.00
Total	4,406,184	2,365,246	53.68	4,418,969	2,218,650	50.21
3. Clerks & Mailhandlers, CAG A-J						
Mail Processing	14,243,015	13,380,667	93.95	14,586,630	12,107,043	83.00
Window Service	2,825,660	1,037,244	36.71	2,724,101	985,231	36.17
Administrative Clerks	1,485,308	968,383	65.20	1,109,123	675,325	60.89
Time & Attendance	72,434	43,959	60.69	62,829	35,830	57.03
Specific Fixed	10,315	10,315	100.00	10,253	-	0.00
Total	18,636,732	15,440,569	82.85	18,492,936	13,803,429	74.64
4. Clerks, CAG K	6,733	3,673	54.55	6,673	3,631	54.41
6. City Carrier In-Office						
Direct Labor	3,890,140	3,339,298	85.84	3,857,993	3,317,946	86.00
Support Overhead	912,866	786,266	86.13	905,404	779,349	86.08
Support Other	567,268	288,410	50.84	563,547	285,890	50.73
Total	5,370,274	4,413,974	82.19	5,326,944	4,383,185	82.28
7. City Carrier Street						
Delivery Activities	8,817,713	3,682,779	41.77	8,763,592	3,650,789	41.66
Delivery Activities Support	1,120,366	484,129	43.21	1,113,405	479,910	43.10
Network Travel	1,484,523	-	0.00	1,478,125	-	0.00
Network Travel Support	225,557	-	0.00	224,585	-	0.00
Total	11,648,158	4,166,908	35.77	11,579,708	4,130,699	35.67
Grand Total City Carriers	17,018,433	8,580,882	50.42	16,906,652	8,513,885	50.36

Comparison of Costs Attributed by
Cost Segment and Component
($ 000's)

	PRC R2006-1 Test Year			USPS R2006-1 Test Year		
	Accrued Cost	Attributable Cost	Percent Attributable	Accrued Cost	Attributable Cost	Percent Attributable
8. Vehicle Service Drivers	670,560	401,724	59.91	665,227	397,706	59.79
10. Rural Carriers						
Evaluated Routes	5,494,112	2,246,904	40.90	5,451,709	2,224,911	40.81
Other Routes	503,544	197,080	39.14	499,719	195,178	39.06
Equip. Maint. Allow.	494,236	-	0.00	494,236	-	0.00
Total	6,491,892	2,443,984	37.65	6,445,665	2,420,088	37.55
11. Custodial Maint. Service						
Custodial Personnel	1,190,300	725,080	60.92	1,183,684	709,278	59.92
Operating Equipment Maint	1,628,910	1,354,686	83.17	1,631,467	1,143,347	70.08
Bldg. & Plant Maint. Persor	595,909	363,002	60.92	594,015	355,941	59.92
Contract Cleaners	100,623	61,295	60.92	100,623	60,295	59.92
Total	3,515,742	2,504,064	71.22	3,509,789	2,268,861	64.64
12. Motor Vehicle Service						
Personnel	475,730	114,399	24.05	473,229	113,397	23.96
Supplies & Materials	657,467	170,685	25.96	656,665	169,884	25.87
Vehicle Hire	14,301	6,888	48.16	14,270	6,857	48.05
Total	1,147,498	291,971	25.44	1,144,163	290,137	25.36
13. Misc. Operating Costs						
Drive out and Carfare	34,956	4,413	12.62	34,936	4,393	12.57
Tolls & Ferriage	551	-	0.00	551	-	0.00
Other	333,895	-	0.00	334,077	-	0.00
Total	369,402	4,413	1.19	369,564	4,393	1.19
14. Transportation						
Domestic Air	1,439,853	1,439,550	99.98	1,456,743	1,260,702	86.54
Alaskan Air	116,752	8,196	7.02	115,115	8,081	7.02
Highway	3,004,555	2,381,589	79.27	2,995,138	2,372,185	79.20
Railroad	131,001	129,611	98.94	130,219	128,829	98.93
Domestic Water	30,059	26,260	87.36	29,900	26,102	87.30
International Water	699,808	699,812	100.00	699,771	699,775	100.00
Total	5,422,028	4,685,018	86.41	5,426,886	4,495,674	82.84
15. Building Occupancy						
Rents	970,662	970,662	100.00	970,662	970,662	100.00
Fuel & Utilities	649,337	395,549	60.92	649,337	389,091	59.92
Other	375,593	716	0.19	375,593	-	0.00
Total	1,995,593	1,366,927	68.50	1,995,593	1,359,753	68.14

Comparison of Costs Attributed by
Cost Segment and Component
($ 000's)

	PRC R2006-1 Test Year			USPS R2006-1 Test Year		
	Accrued Cost	Attributable Cost	Percent Attributable	Accrued Cost	Attributable Cost	Percent Attributable
16. Supplies & Services						
Custodial & Building	174,601	106,359	60.92	174,601	104,623	59.92
Operating Equip. Maintenar	536,646	345,890	64.45	540,930	285,420	52.76
Stamps & Dispensers	87,478	87,175	99.65	86,623	86,321	99.65
Advertising	127,834	65,377	51.14	127,834	-	0.00
Stmp. Cds. & Emb. Stmp.	8,667	8,667	100.00	8,643	8,643	100.00
Money Orders	5,594	5,594	100.00	5,512	5,512	100.00
Misc. Attrib. PMPC/Intl/DC	86,330	86,330	100.00	86,330	86,330	100.00
Misc. Postal Supp. & Serv.	1,105,837	659,223	59.61	1,105,009	618,021	55.93
Other	697,252	16,136	2.31	697,221	401	0.06
Total	2,830,238	1,380,752	48.79	2,832,701	1,195,270	42.20
18. Administrative & Regional Operations						
Workers Compensation	1,236,630	505,940	40.91	1,236,630	475,123	38.42
Repriced Annual Leave	82,650	48,594	58.79	82,613	45,614	55.21
Holiday Leave	924	543	58.79	924	510	55.21
Retiree Health Benefits	2,026,057	1,191,216	58.79	2,119,140	1,170,052	55.21
Annuitant Life Insurance	15,200	8,937	58.79	15,200	8,392	55.21
USPS Protection Force	78,505	47,822	60.92	78,234	46,879	59.92
Unemployment Compensat	64,373	37,848	58.79	64,373	35,543	55.21
CSRS Reform Escrow	3,588,223	-	0.00	3,588,223	-	0.00
CSRS/FERS Retire. Prin.	32,590	-	0.00	32,590	-	0.00
Money Orders	86	86	100.00	86	86	100.00
Other Personnel	1,638,362	12,510	0.76	1,641,272	-	0.00
Other	287,367	24,296	8.45	287,367	-	0.00
Total	9,050,967	1,877,793	20.75	9,146,653	1,782,199	19.48
20. Depreciation & Other Servicewide Costs						
Vehicle Deprec.	234,300	56,453	24.09	234,300	56,324	24.04
Mail Proc. Equip. Deprec.	1,513,106	819,422	54.15	1,513,106	729,448	48.21
Bldg. & Leasehold Deprec.	774,667	774,667	100.00	774,667	774,667	100.00
Indemnities	127,112	26,076	20.51	126,954	25,919	20.42
Note Interest Expense	84,021	54,987	65.44	84,019	51,984	61.87
Retirement Interest Expens	257,410	-	0.00	257,410	-	0.00
Other Interest	84,961	-	0.00	84,961	-	0.00
Other	(10,628)	-	0.00	(10,628)	-	0.00
Total	3,064,949	1,731,604	56.50	3,064,789	1,638,342	53.46
17. Res., Develop., & Engr.	42,001	-	0.00	42,001	-	0.00
19. Support Services	68,318	145	0.21	68,331	-	0.00
Final Adjustments	(407,160)	(976,711)		(243,166)	(711,781)	
Grand Total All Segments	76,788,770	42,525,822	55.38	76,761,455	40,104,793	52.25

PRC Distribution of Attributable Costs to Classes and Subclasses
Test Year/PRC Recommended Rates
($000)

	Short Run Variable	Product Specific Costs	PESSA Costs	Total Attributable	Final Adjustments	Net Attributable	Contingency @ 1.0 percent	Grand Total Attributable
First-Class Mail:								
Single-Piece Letters	9,902,026	6,191	1,455,286	11,363,503	(166,036)	11,197,467	111,975	11,309,441
Presort Letters	4,743,360	7,003	624,340	5,374,703	144,505	5,519,208	55,192	5,574,400
Total Letters	14,645,386	13,194	2,079,625	16,738,205	(21,531)	16,716,674	167,167	16,883,841
Single-Piece Cards	522,858	359	66,940	590,157	0	590,157	5,902	596,058
Presort Postcards	236,054	443	31,330	267,828	(5,471)	262,356	2,624	264,980
Total Cards	758,911	803	98,270	857,985	(5,471)	852,513	8,525	861,038
Total First-Class	15,404,297	13,997	2,177,896	17,596,190	(27,003)	17,569,187	175,692	17,744,879
Priority Mail	3,078,366	49,793	308,619	3,436,778	(4,988)	3,431,790	34,318	3,466,108
Express Mail	401,347	12,330	48,904	462,582	0	462,582	4,626	467,208
Mailgrams	(0)	-	(0)	(0)	0	(0)	(0)	(0)
Periodicals:								
Within County	72,174	6	8,789	80,968	0	80,968	810	81,778
Outside County	2,055,008	65	309,971	2,365,045	0	2,365,045	23,650	2,388,696
Total Periodicals	2,127,182	72	318,760	2,446,014	0	2,446,014	24,460	2,470,474
Standard Mail:								
Enhanced Carrier Route	2,702,570	4,946	314,053	3,021,569	(180,683)	2,840,886	28,409	2,869,295
Regular Bulk & Nonprofit	8,988,697	9,310	1,332,554	10,330,561	(198,630)	10,131,931	101,319	10,233,250
Total Standard Mail	11,691,267	14,256	1,646,607	13,352,129	(379,312)	12,972,817	129,728	13,102,545
Package Services:								
Parcel Post	1,068,622	74	128,587	1,197,283	68,895	1,266,179	12,662	1,278,840
Bound Printed Matter	569,183	-	85,102	654,285	0	654,285	6,543	660,828
Media and Library	352,751	-	49,654	402,405	0	402,405	4,024	406,429
Total Package Services	1,990,557	74	263,342	2,253,973	68,895	2,322,869	23,229	2,346,097
USPS Penalty Mail	492,980	-	76,570	569,551	(569,551)	0	0	0
Free Mail for the Blind & Hndc	61,269	-	10,763	72,033	0	72,033	720	72,753
TOTAL DOMESTIC MAIL	35,247,267	90,522	4,851,461	40,189,250	(911,958)	39,277,291	392,773	39,670,064
International Mail	1,365,182	32,324	92,704	1,490,210	0	1,490,210	14,902	1,505,112
TOTAL ALL MAIL	36,612,449	122,846	4,944,165	41,679,460	(911,958)	40,767,501	407,675	41,175,177
Special Services:								
Registered Mail	27,056	-	8,678	35,734	0	35,734	357	36,091
Insured Mail	88,548	252	9,423	98,224	(19,105)	79,119	791	79,910
Certified Mail	418,786	33	47,034	465,853	0	465,853	4,659	470,512
Collect-on-Delivery	6,820	-	589	7,410	0	7,410	74	7,484
Money Orders	125,005	3,607	19,337	147,949	0	147,949	1,479	149,428
Stamped Cards	1,662	-	2	1,664	0	1,664	17	1,681
Stamped Envelopes	12,162	-	832	12,994	0	12,994	130	13,124
Special Handling	877	-	153	1,030	0	1,030	10	1,040
Post Office Boxes	52,895	1,103	548,949	602,947	0	602,947	6,029	608,976
Other Special Services	395,291	1,985	51,993	449,269	(45,647)	403,622	4,036	407,658
Total Special Services	1,129,103	6,980	686,991	1,823,073	(64,752)	1,758,321	17,583	1,775,904
Total Attributable	37,741,552	129,825	5,631,156	43,502,533	(976,711)	42,525,823	425,258	42,951,081
Other Costs	39,454,378	(129,825)	(5,631,156)	33,693,397	569,551	34,262,948	342,629	34,605,577
Total Costs	77,195,930			77,195,930	(407,160)	76,788,770	767,888	77,556,658
Prior Years Loss Recovery								9,374
Total Revenue Requirement								77,566,032

PRC Distribution of Attributable Costs to Classes and Subclasses
Test Year/PRC Recommended Rates
($000)

	Post-Masters	Supervisors	Clerks & Mailhandlers CAG A - J	Clerks, CAG K	City Delivery Carriers	Vehicle Service Drivers	Rural Carriers	Custodial Maintenance Service	Motor Vehicle Service	Misc. Operating Costs
First-Class Mail:										
Single-Piece Letters	109,351	690,310	4,850,645	1,361	2,279,509	21,798	299,389	788,579	53,283	1,173
Presort Letters	92,927	309,826	1,811,768	523	1,324,796	26,188	319,835	297,810	34,755	683
Total Letters	202,278	1,000,136	6,662,413	1,884	3,604,305	47,986	619,225	1,086,389	88,038	1,855
Single-Piece Cards	3,643	38,216	232,295	61	168,613	230	21,643	31,800	3,469	87
Presort Post Cards	3,970	16,118	84,973	25	77,715	536	21,107	13,613	1,991	39
Total Cards	7,613	54,334	317,269	86	246,327	765	42,750	45,413	5,460	126
Total First-Class	209,890	1,054,470	6,979,681	1,970	3,850,633	48,751	661,975	1,131,802	93,498	1,982
Priority Mail	27,778	125,573	1,089,954	313	186,509	74,102	47,961	113,915	24,939	81
Express Mail	4,304	24,001	229,371	-	34,926	1,364	10,528	13,251	2,433	15
Mailgrams	-	(0)	(0)	-	-	-	-	(0)	-	-
Periodicals:										
Within County	428	4,788	23,222	-	24,068	2,016	13,024	2,319	1,103	12
Outside County	12,850	147,090	845,488	-	467,396	31,505	148,503	123,810	14,510	267
Total Periodicals	13,278	151,878	868,710	-	491,464	33,521	161,527	126,129	15,613	280
Standard Mail:										
Enhanced Carrier Route	35,275	159,918	573,697	105	1,040,344	46,637	562,983	97,334	38,094	532
Regular Bulk & Nonprofit	95,141	591,356	3,739,142	747	2,415,058	63,064	724,433	627,811	65,755	1,261
Total Standard Mail	130,416	751,273	4,312,839	853	3,455,402	109,702	1,287,416	725,144	103,849	1,793
Package Services:										
Parcel Post	7,498	48,242	366,322	71	92,951	78,122	37,146	51,499	21,369	38
Bound Printed Matter	4,287	32,256	209,640	44	105,630	34,782	31,512	39,535	13,626	43
Media and Library	2,032	16,769	137,929	27	36,144	9,114	11,448	25,011	3,749	15
Total Package Services	13,816	97,267	713,891	142	234,725	122,018	80,106	116,045	38,744	96
USPS Penalty Mail	-	38,882	299,797	-	78,352	3,812	3,160	27,498	1,225	51
Free Mail for the Blind & Hndc	-	3,802	31,311	-	7,009	773	2,901	5,393	330	4
TOTAL DOMESTIC MAIL	399,483	2,247,147	14,525,553	3,278	8,339,020	394,044	2,255,574	2,259,176	280,631	4,302
International Mail	8,771	37,925	356,881	1	36,675	7,680	20,121	40,821	3,333	17
TOTAL ALL MAIL	408,254	2,285,072	14,882,433	3,278	8,375,696	401,724	2,275,695	2,299,997	283,964	4,319
Special Services:										
Registered Mail	253	1,939	17,767	69	2,278	-	1,609	2,708	113	1
Certified Mail	3,872	26,660	134,804	101	120,817	-	110,611	9,514	4,751	56
Insured Mail	653	5,431	38,227	5	9,564	-	14,518	1,964	492	4
Collect-On-Delivery	47	319	1,981	2	974	-	1,595	120	65	0
Money Orders	1,241	11,365	99,407	-	-	-	1,242	4,288	25	-
Stamped Cards	14	0	0	-	-	-	-	1	-	-
Stamped Envelopes	134	486	4,260	-	-	-	-	187	-	-
Special Handling	61	66	692	1	-	-	-	44	-	-
Post Office Boxes	5,183	4,846	40,685	-	-	-	-	165,903	-	-
Other Special Services	4,055	29,062	220,313	217	71,554	-	38,714	19,338	2,563	32
Total Special Services	15,513	80,174	558,137	395	205,186	-	168,289	204,066	8,007	94
Total Attributable	423,768	2,365,246	15,440,570	3,673	8,580,882	401,724	2,443,984	2,504,064	291,971	4,413
Other Costs	2,034,894	2,040,938	3,196,161	3,060	8,437,551	268,836	4,047,908	1,011,678	855,527	364,990
Total Costs	2,458,662	4,406,184	18,636,732	6,733	17,018,433	670,560	6,491,892	3,515,742	1,147,498	369,402
Prior Years Loss Recovery										
Total Revenue Requirement										

PRC Distribution of Attributable Costs to Classes and Subclasses
Test Year/PRC Recommended Rates
($000)

	Trans-portation	Building Occupancy	Supplies & Services	Research & Development	Admin. & Regional Operations	General Management Systems	Depreciation & Service-wide Costs	Total Attributable Costs	Final Adjustments	Contingency	Total PRC Attributable Costs
First-Class Mail:	532,637	324,947	424,816	-	520,998	-	464,708	11,363,503	(166,036)	111,975	11,309,441
Single-Piece Letters	438,321	132,570	137,937	-	244,769	-	201,995	5,374,703	144,505	55,192	5,574,400
Presort Letters	970,957	457,517	562,753	-	765,767	-	666,703	16,738,205	(21,531)	167,167	16,883,841
Total Letters	6,118	14,540	21,709	-	28,524	-	19,209	590,157	-	5,902	596,058
Single-Piece Cards	11,454	6,677	7,003	-	12,833	-	9,774	267,828	(5,471)	2,624	264,980
Presort Postcards	17,572	21,217	28,712	-	41,357	-	28,983	857,985	(5,471)	8,525	861,038
Total Cards	988,529	478,734	591,464	-	807,124	-	695,686	17,596,190	(27,003)	175,692	17,744,879
	1,303,573	81,716	173,499	-	105,287	-	81,576	3,436,778	(4,988)	34,318	3,466,108
Priority Mail	75,209	13,624	25,000	-	18,181	-	10,378	462,582	-	4,626	467,208
Express Mail	-	(0)	(0)	-	(0)	-	(0)	(0)	-	(0)	(0)
Periodicals:	94	2,049	1,829	-	3,976	-	2,039	80,968	-	810	81,778
Within County	240,001	70,741	60,604	-	101,511	-	100,769	2,365,045	-	23,650	2,388,696
Outside County	240,095	72,790	62,433	-	105,486	-	102,808	2,446,014	-	24,460	2,470,474
Standard Mail:	106,171	72,409	71,132	-	143,126	-	73,813	3,021,569	(180,683)	28,409	2,869,295
Enhanced Carrier Route	520,624	293,330	289,472	-	470,415	-	432,951	10,330,561	(198,630)	101,319	10,233,250
Regular Bulk & Nonprofit	626,795	365,739	360,604	-	613,541	-	506,764	13,352,129	(379,312)	129,728	13,102,545
Package Services:	361,181	31,375	22,291	-	39,389	-	39,787	1,197,283	68,895	12,662	1,278,840
Parcel Post	93,602	19,622	14,908	-	26,395	-	28,403	654,285	-	6,543	660,828
Bound Printed Matter	109,141	11,890	8,574	-	13,743	-	16,820	402,405	-	4,024	406,429
Media and Library	563,924	62,888	45,773	-	79,528	-	85,011	2,253,973	68,895	23,229	2,346,097
	32,651	16,413	15,264	-	25,680	-	26,765	569,551	(569,551)	-	-
USPS Penalty Mail	9,536	2,646	1,883	-	2,945	-	3,501	72,033	-	720	72,753
	3,840,312	1,094,550	1,275,921	-	1,757,772	-	1,512,488	40,189,250	(911,958)	392,773	39,670,064
TOTAL DOMESTIC MAIL	844,706	23,610	36,214	-	39,628	145	33,681	1,490,210	-	14,902	1,505,112
International Mail	4,685,018	1,118,160	1,312,134	-	1,797,400	145	1,546,170	41,679,460	(911,958)	407,675	41,175,177
Special Services:											
Registered Mail	-	2,885	953	-	1,582	-	3,577	35,734	-	357	36,091
Certified Mail	-	11,558	10,855	-	23,061	-	9,193	465,853	-	4,659	470,512
Insured Mail	-	2,456	2,508	-	4,000	-	18,402	98,224	(19,105)	791	79,910
Collect-On-Delivery	-	146	138	-	286	-	1,737	7,410	-	74	7,484
Money Orders	-	5,398	10,151	-	10,503	-	4,329	147,949	-	1,479	149,428
Stamped Cards	-	1	1,647	-	1	-	0	1,664	-	17	1,681
Stamped Envelopes	-	235	7,217	-	289	-	187	12,994	-	130	13,124
Special Handling	-	38	32	-	49	-	45	1,030	-	10	1,040
Post Office Boxes	-	212,868	18,232	-	18,828	-	136,402	602,947	-	6,029	608,976
Other Special Services	-	13,182	16,885	-	21,793	-	11,562	449,269	(45,647)	4,036	407,658
Total Special Services	-	248,768	68,618	-	80,393	-	185,435	1,823,073	(64,752)	17,583	1,775,904
Total Attributable	4,685,018	1,366,927	1,380,752	-	1,877,793	145	1,731,604	43,502,533	(976,711)	425,258	42,951,081
Other Costs	737,010	628,666	1,449,486	42,001	7,173,174	68,172	1,333,344	33,693,397	569,551	342,629	34,605,577
Total Costs	5,422,028	1,995,593	2,830,238	42,001	9,050,967	68,318	3,064,949	77,195,930	(407,160)	767,888	77,556,658
Prior Years Loss Recovery											9,374
Total Revenue Requirement											77,566,032

Unit Attributable Cost Comparison
Test Year

	PRC R2005-1 ($)	PRC R2006-1 ($)	Change Over PRC R2005-1 (%)
First-Class			
Single Letter	0.2840	0.3019	6.30%
Presort Letter	0.1030	0.1165	13.19%
Total Letter	0.1882	0.1979	5.19%
Cards	0.1448	0.1501	3.62%
Priority Mail	3.9073	4.1808	7.00%
Express Mail	9.6074	10.9460	13.93%
Periodicals:			
Within County	0.0932	0.1160	24.45%
Outside County	0.2607	0.2969	13.89%
Standard Mail:			
Enhanced Carrier Route	0.0723	0.0891	23.21%
Regular Bulk & Nonprofit	0.1390	0.1348	-3.01%
Total Standard Mail	0.1160	0.1212	4.47%
Package Services:			
Parcel Post	3.1653	3.4096	7.72%
Bound Printed Matter	0.9128	1.0090	10.54%
Media and Library	2.1043	2.4480	16.33%
Free for the Blind	0.6243	0.8313	33.17%
International Mail	1.7817	1.9509	9.50%
Registry	10.5605	10.2832	-2.62%
Certified	1.6616	1.7922	7.86%
Insurance	1.9751	1.9134	-3.13%
COD	4.8509	6.3788	31.50%
Money Orders	0.7473	0.9693	29.72%

Test Year (2008) Volume, Cost, Revenue, and Cost Coverage by Class at Commission Recommended Rates

	Volume (000)	Revenue ($ 000)	Attributable Cost ($ 000)	Contribution to Institutional Cost ($ 000)	Rev./Pc. (Cents)	Cost/Pc. (Cents)	Contribution to Institutional Cost/Pc. (Cents)	Cost Coverage	Change in Rev./Pc.
First-Class Mail									
Letters	85,295,205	35,732,311	16,883,841	18,848,470	41.893	19.795	22.098	211.6%	7.0%
Cards	5,738,035	1,338,036	861,038	476,997	23.319	15.006	8.313	155.4%	6.1%
Priority Mail	829,047	5,192,582	3,466,108	1,726,474	626.331	418.083	208.248	149.8%	13.6%
Express Mail	42,683	796,283	467,208	329,075	1,865.572	1,094.599	770.974	170.4%	12.5%
Periodicals									
Within County	731,966	81,832	81,778	54	11.180	11.172	0.007	100.1%	18.3%
Outside County	8,045,116	2,392,300	2,388,696	3,604	29.736	29.691	0.045	100.2%	11.7%
Standard Mail									
Regular	63,478,847	15,672,195			24.689				9.5%
Nonprofit	12,416,064	1,802,679			14.519				6.7%
Regular and Nonprofit	**75,894,910**	**17,474,874**	**10,233,250**	**7,241,624**	**23.025**	**13.483**	**9.542**	**170.8%**	**9.3%**
Enhanced Carrier Route (ECR)	29,677,241	5,624,459			18.952				6.9%
Nonprofit ECR (NECR)	2,529,325	293,963			11.622				8.8%
ECR and NECR	**32,206,566**	**5,918,422**	**2,869,295**	**3,049,127**	**18.376**	**8.909**	**9.467**	**206.3%**	**6.9%**
Package Services									
Parcel Post	375,070	1,456,748	1,278,840	177,907	388.394	340.960	47.433	113.9%	16.6%
Bound Printed Matter	654,923	788,965	660,828	128,138	120.467	100.902	19.565	119.4%	11.7%
Media Mail	153,674	390,476			254.093				17.9%
Library Rate	12,352	30,829			249.583				17.4%
Media and Library	**166,026**	**421,305**	**406,429**	**14,875**	**253.758**	**244.798**	**8.960**	**103.7%**	**17.8%**
USPS Penalty Mail	646,024								
Free-for-the-Blind Mail	87,514		72,753	(72,753)		83.133			
International Mail 1/	771,496	1,880,630	1,505,112	375,518	243.764	195.090	48.674	124.9%	8.8%
Total All Mail	**211,484,583**	**73,474,287**	**41,175,177**	**32,299,110**	**34.742**	**19.470**	**15.273**	**178.4%**	**7.6%**
Special Services									
Registry	3,510	47,660	36,091	11,568	1,357.927	1,028.324	329.602	132.1%	20.7%
Insurance	41,764	103,509	79,910	23,599	247.842	191.337	56.505	129.5%	-5.6%
Certified	262,526	695,695	470,512	225,183	265.000	179.224	85.776	147.9%	10.4%
COD	1,173	8,258	7,484	774	703.868	637.877	65.991	110.3%	7.9%
Money Orders	154,155	224,143	149,428	74,715	145.401	96.933	48.467	150.0%	8.8%
Stamped Cards	113,618	2,272	1,681	592	2.000	1.479	0.521	135.2%	0.0%
Box/Caller Service	16,343	953,886	608,976	344,909	5,836.794	3,726.305	2,110.489	156.6%	10.1%
Stamped Envelopes	300,000	13,657	13,124	533	4.552	4.375	0.178	104.1%	10.6%
Other Special Services		752,818	408,698	344,119					
Other Income		755,735		755,735					
Total Mail & Services	**211,484,583**	**77,031,918**	**42,951,081**	**34,080,837**	**36.424**	**20.309**	**16.115**	**179.3%**	**7.6%**
Institutional Costs			34,605,577						
Prior Years Loss Recovery			9,374						
Appropriations		101,593							
Investment Income		434,831							
Total Revenues		**77,568,342**							
Total Revenue Requirement			**77,566,032**						
Net Surplus (Loss)		**2,310**							

1/ Not subject to PRC jurisdiction.

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

FIRST-CLASS MAIL		Units (000)	Rate (cents)	Revenues (000)
Letters & Sealed Parcels Subclass				
Regular				
Single-Piece				
Letters, First Oz., except QBRM		33,772,329	41.0	13,846,655
Flats, First Oz.		3,097,650	80.0	2,478,120
Parcels, First Oz.		270,143	113.0	305,262
Additional ounces		11,731,577	17.0	1,994,368
Nonmachinable Letters < 1oz.		113,765	17.0	19,340
Qualified Business Reply Mail		321,668	38.0	122,234
Total Pieces (or Postage Revenue)		37,461,791		18,765,979
Revenue x Adjustment Factor				19,035,616
Single-Piece Fees	Address Correction			14,345
	Business Reply			184,262
	Certificate of Mailing			2,093
	Merchandise Return			117
	Shipper Paid Forwarding			1
	Special Handling			10,362
Total Single-Piece Revenue				19,246,795
Presort				
Letters, First Oz.		1,048,381	37.3	391,046
Flats, First Oz.		106,308	69.9	74,309
Additional ounces		264,118	17.0	44,900
Nonmachinable Letters < 1oz.		14,342	17.0	2,438
Total Pieces (or Postage Revenue)		1,154,688		512,693
Revenue x Adjustment Factor				515,450
Presort Fees	Address Correction			442
	Certificate of Mailing			7
	Merchandise Return			4
	Presort Permit			153
	Shipper Paid Forwarding			0
Total Presort Revenue				516,055
Total Regular Letters		**38,616,479**		**19,762,851**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

FIRST-CLASS MAIL (cont)		Units (000)	Rate (cents)	Revenues (000)
Automation Presort				
Letters				
Mixed AADC, First Oz.		2,816,313	36.0	1,013,873
AADC, First Oz.		2,449,094	34.1	835,141
3-Digit, First Oz.		22,459,952	33.4	7,501,624
5-Digit, First Oz.		17,878,775	31.2	5,578,178
Additional Ounces		1,545,214	12.5	193,152
Total Pieces (or Postage Revenue)		45,604,134		15,121,967
Flats				
Mixed ADC, First Oz.		46,122	68.6	31,640
ADC, First Oz.		110,286	56.7	62,532
3-Digit, First Oz.		284,397	48.4	137,648
5-Digit, First Oz.		361,214	38.3	138,345
Additional Ounces		1,145,173	17.0	194,679
Total Pieces (or Postage Revenue)		802,018		564,844
Business Parcels				
ADC, First Oz.		23,369	89.1	20,822
3-Digit, First Oz.		58,872	83.7	49,276
5-Digit, First Oz.		74,774	70.4	52,641
Nonmachinable Parcels		32,992	5.0	1,650
Additional Ounces		678,698	17.0	115,379
Total Pieces (or Postage Revenue)		157,015		239,767
Automation Letters, Flats and Parcels		46,563,167		15,926,578
Revenue x Adjustment Factor				15,907,072
Automation Fees	Address Correction			17,874
	Certificate of Mailing			263
	Merchandise Return			145
	Presort Permit			6,301
	Shipper Paid Forwarding			1
Total Automation Presort		**46,563,167**		**15,931,657**
NSA Adjustment		115,559		37,803
Total First-Class Letters		**85,295,205**		**35,732,311**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

FIRST-CLASS MAIL (cont)		Units (000)	Rate (cents)	Revenues (000)
Cards Subclass				
Regular				
Single-Piece				
Stamped Cards		113,618	26.0	29,541
Postcards at Card Rate		2,098,906	26.0	545,716
Postcards at Letter Rate		131,463	41.0	53,900
Qualified Business Reply Mail		47,839	23.0	11,003
Total Pieces (or Postage Revenue)		2,391,827		640,159
Revenue x Adjustment Factor				641,216
Single-Piece Fees	Address Correction			916
	Business Reply			11,206
	Certificate of Mailing			134
Total Single-Piece Revenue				653,471
Presort				
Cards		277,854	24.1	66,963
Total Pieces (or Postage Revenue)		277,854		66,963
Revenue x Adjustment Factor				66,893
Presort Fees	Address Correction			106
	Certificate of Mailing			2
	Presort Permit			37
Total Presort Revenue				67,037
Total Regular Cards		**2,669,681**		**720,509**
Automation				
Mixed AADC Cards		321,867	22.0	70,811
AADC Cards		245,144	20.8	50,990
3-Digit Cards		1,302,629	20.4	265,736
5-Digit Cards		1,198,714	19.1	228,954
Total Pieces (or Postage Revenue)		3,068,354		616,491
Revenue x Adjustment Factor				615,929
Automation Fees	Address Correction			1,175
	Certificate of Mailing			17
	Presort Permit			406
Total Automation Cards		**3,068,354**		**617,527**
Total First-Class Cards		**5,738,035**		**1,338,036**
TOTAL FIRST-CLASS MAIL		**91,033,240**		**37,070,347**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Priority Mail

Zone	Pieces		Revenues
Local, 1, 2	225,627,943	$	1,105,375,646
3	82,239,246	$	447,867,324
4	120,800,461	$	697,631,909
5	137,203,699	$	897,067,665
6	80,201,467	$	559,553,397
7	59,788,646	$	446,567,536
8	123,185,850	$	996,219,945
	829,047,312	$	5,150,283,421
Postage Revenue		$	5,150,283,421
times base year revenue adjustments			1.00670
Revenue from rates			**5,184,790,320**
Pickup revenue		$	2,394,489
Revenue from fees			
Address Correction		$	61,946
Business Reply		$	1,066,522
Certificate of Mailing		$	57,340
Merchandise Return		$	129,019
Special Handling		$	379,498
Premium Forwarding		$	3,701,613
Shipper Paid Forwarding		$	959
Total revenue from fees		$	5,396,896
Total Priority Mail Revenue		**$**	**5,192,581,705**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Express Mail

	Pieces		Revenues
Same Day Service	-	$	-
Next Day - Post Office-to-Addressee	42,537,366	$	2,045,183
Next Day - Post Office-to-Post Office	44,105	$	785,676,838
Customer Designed	101,555	$	5,200,159
Total Domestic Service	42,683,026	$	792,922,181
Revenue Adjustment Factor			1.000248939
Postage Revenue		$	793,119,569
Pickup Revenue		$	3,163,201
Total Express Mail Revenue		**$**	**796,282,771**

COMMISSION RECOMMENDED RATES APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Within County

	Rate (cents)	Pieces (000)	Pounds (000)	Revenues (000)
Piece Rate Revenue				
Basic Presort	12.2	17,453		2,129
3-Digit Presort	11	23,918		2,631
5-Digit Presort	9.8	118,578		11,621
Carrier Route Presort	5.6	572,018		32,033
		731,966		
Pound Rate Revenues				
Regular	17.1		132,529	22,662
Delivery Office	13.2		110,109	14,534
Piece Discounts				
High Density	(1.5)	113,095		(1,696)
Saturation	(2.8)	35,569		(996)
Delivery Office Entry	(0.8)	270,049		(2,160)
Automation Discounts				
from Required:				
Pre-barcoded Letters	(6.7)	520		(35)
Pre-barcoded Flats	(1.5)	943		(14)
from 3-Digit:				
Pre-barcoded Letters	(6.4)	4,186		(268)
Pre-barcoded Flats	(1.1)	3,694		(41)
from 5-Digit:				
Pre-barcoded Letters	(5.4)	4,088		(221)
Pre-barcoded Flats	(0.5)	42,968		(215)
Revenue from Rates				79,965
Ride-Along	15.5	625		97
Total Postage Revenue				80,062
Times Correction Factor		1.0004		80,090
Fees				
Address Correction		1,676		
Periodicals Application Fee		66		
Total Fees				1,742
TOTAL PERIODICALS-Within County				**81,832**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Regular Rate

Pound Rate Revenue (Per Pound)	Rate (dollars)	Pieces (000)	Pounds (000)	Revenues (000)	
Advertising	-----------	-----------	-----------	-----------	
Delivery Office	0.160		20,635	3,302	
SCF	0.209		824,503	172,321	
ADC	0.219		156,447	34,262	
Zones 1 & 2	0.239		122,735	29,334	
Zone 3	0.257		59,133	15,197	
Zone 4	0.303		81,160	24,592	
Zone 5	0.372		78,763	29,300	
Zone 6	0.446		33,676	15,020	
Zone 7	0.534		24,503	13,085	
Zone 8	0.610		28,268	17,243	353,655
Editorial (Nonadvertising)					
Delivery Office	0.133		14,461	1,923	
SCF	0.174		934,711	162,640	
ADC	0.182		186,337	33,913	
All Other Editorial (Nonadvertising)	0.199		570,268	113,483	311,960
Science of Agriculture					
Delivery Office	0.120		86	10	
SCF	0.157		1,693	266	
ADC	0.164		363	60	
Zones 1 & 2	0.179		5,368	961	1,296
Piece Rate Revenue (Per Piece)					
Mixed ADC Pieces					
Nonmachinable, Nonbarcoded	0.534	1,604		856	
Machinable, Nonbarcoded	0.431	15,467		6,666	
Barcoded, Nonmachinable	0.504	2,481		1,250	
Barcoded, Machinable	0.404	7,772		3,140	
Automation Letter	0.327	3,998		1,307	
ADC Pieces					
Nonmachinable, Nonbarcoded	0.432	8,844		3,821	
Machinable, Nonbarcoded	0.370	48,543		17,961	
Barcoded, Nonmachinable	0.412	20,278		8,354	
Barcoded, Machinable	0.350	98,672		34,535	
Automation Letter	0.289	25,660		7,416	
DSCF and 3-Digit Pieces					
Nonmachinable, Nonbarcoded	0.373	55,463		20,688	
Machinable, Nonbarcoded	0.348	125,165		43,557	
Barcoded, Nonmachinable	0.362	163,403		59,152	
Barcoded, Machinable	0.331	705,330		233,464	
Automation Letter	0.275	18,409		5,062	
5-Digit Pieces					
Nonmachinable, Nonbarcoded	0.289	70,717		20,437	
Machinable, Nonbarcoded	0.276	127,290		35,132	
Barcoded, Nonmachinable	0.285	334,054		95,205	
Barcoded, Machinable	0.268	1,667,551		446,904	
Automation Letter	0.211	332		70	
Carrier Route Pieces					
Basic	0.169	2,666,868		450,701	
High Density, Carrier Route	0.149	72,528		10,815	
Saturation, Carrier Route	0.131	30,573		4,001	
Firm Bundles					
Nonmachinable, Nonbarcoded	0.169	4,053		685	
Machinable, Nonbarcoded	0.169	12,391		2,094	1,513,275
Per-Piece Editorial Discount	(0.091)	3,661,328		(333,181)	(333,181)

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Regular Rate (continued)

	Rate (dollars)	Bundles (000)	Sacks (000)	Pallets (000)	Revenues (000)	
Bundle Rate Revenue (Per Bundle)						
Mixed ADC Sack						
Mixed ADC Bundle	0.100	2,887			289	
ADC Bundle	0.129	6,867			886	
3-Digit/SCF Bundle	0.134	6,245			837	
5-Digit Bundle	0.161	1,902			306	
Firm Bundle	0.079	5,926			468	
ADC Sack or Pallet						
ADC Bundle	0.038	7,073			269	
3-Digit/SCF Bundle	0.063	25,466			1,604	
5-Digit Bundle	0.095	34,594			3,286	
Carrier Route Bundle	0.104	10,621			1,105	
Firm Bundle	0.048	5,438			261	
3-Digit/SCF Sack or Pallet						
3-Digit/SCF Bundle	0.039	39,497			1,540	
5-Digit Bundle	0.084	115,844			9,731	
Carrier Route Bundle	0.095	193,856			18,416	
Firm Bundle	0.045	4,433			199	
5-Digit Sack or Pallet						
5-Digit Bundle	0.008	5,319			43	
Carrier Route Bundle	0.039	36,892			1,439	
Firm Bundle	0.027	838			23	40,702
Sack Rate Revenue (Per Sack)						
Mixed ADC Sack						
OSCF Entry	0.42		1,594		670	
OADC Entry	0.42		2,073		871	
ADC Sack						
OSCF Entry	1.80		3,332		5,997	
OADC Entry	1.80		2,867		5,161	
OBMC Entry	1.80		687		1,236	
DBMC Entry	1.10		10		12	
DADC Entry	0.60		791		475	
3-Digit/SCF Sack						
OSCF Entry	1.90		6,910		13,128	
OADC Entry	1.90		7,269		13,810	
OBMC Entry	1.90		1,685		3,202	
DBMC Entry	1.20		55		66	
DADC Entry	1.00		1,191		1,191	
DSCF Entry	0.60		3,407		2,044	
5-Digit/Carrier Route Sack						
OSCF Entry	2.24		992		2,222	
OADC Entry	2.24		1,571		3,518	
OBMC Entry	2.24		457		1,024	
DBMC Entry	1.50		23		34	
DADC Entry	1.30		761		989	
DSCF Entry	0.90		2,985		2,686	
DDU Entry	0.70		232		163	58,499

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Regular Rate (continued)

	Rate (dollars)	Bundles (000)	Sacks (000)	Pallets (000)	Revenues (000)	
Pallet Rate Revenue (Per Pallet)	-----------	-----------	-----------	-----------	-----------	
ADC Pallet						
OSCF Entry	18.61			164	3,058	
OADC Entry	18.61			168	3,121	
OBMC Entry	18.61			4	76	
DBMC Entry	13.00			4	58	
DADC Entry	8.90			341	3,036	
3-Digit/SCF Pallet						
OSCF Entry	22.98			186	4,284	
OADC Entry	22.98			200	4,590	
OBMC Entry	22.98			8	174	
DBMC Entry	14.40			11	164	
DADC Entry	12.20			253	3,086	
DSCF Entry	6.70			1,345	9,009	
5-Digit Pallet						
OSCF Entry	26.95			8	220	
OADC Entry	26.95			9	253	
OBMC Entry	26.95			0.1	2	
DBMC Entry	17.50			1	10	
DADC Entry	15.50			37	567	
DSCF Entry	8.00			472	3,776	
DDU Entry	1.20			2	2	35,487
		Pieces (000)				

Ride-Along Revenue	0.155	152,031				23,565
Total Postage Revenue						2,005,257

	Times Correction Factor	0.9983	2,001,766
Fees			
	Address Correction	14,400	
	Periodicals Application Fee	563	
	Total Fees		14,963

TOTAL PERIODICALS-Regular Rate			**2,016,728**
TOTAL PERIODICALS-Outside County			**2,392,300**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Nonprofit Rate

Pound Rate Revenue (Per Pound)	Rate (dollars)	Pieces (000)	Pounds (000)	Revenues (000)	
Advertising	-----------	-----------	-----------	-----------	
Delivery Office	0.160		321	51	
SCF	0.209		71,695	14,984	
ADC	0.219		14,228	3,116	
Zones 1 & 2	0.239		8,688	2,076	
Zone 3	0.257		4,269	1,097	
Zone 4	0.303		6,235	1,889	
Zone 5	0.372		6,198	2,306	
Zone 6	0.446		2,428	1,083	
Zone 7	0.534		1,713	915	
Zone 8	0.610		3,099	1,890	29,408
Editorial (Nonadvertising)					
Delivery Office	0.133		3,099	412	
SCF	0.174		200,326	34,857	
ADC	0.182		39,935	7,268	
All Other Editorial (Nonadvertising)	0.199		122,220	24,322	66,859
Piece Rate Revenue (Per Piece)					
Mixed ADC Pieces					
Nonmachinable, Nonbarcoded	0.534	256		137	
Machinable, Nonbarcoded	0.431	2,461		1,061	
Barcoded, Nonmachinable	0.504	435		219	
Barcoded, Machinable	0.404	1,361		550	
Automation Letter	0.327	1,166		381	
ADC Pieces				0	
Nonmachinable, Nonbarcoded	0.432	1,411		609	
Machinable, Nonbarcoded	0.370	7,752		2,868	
Barcoded, Nonmachinable	0.412	3,552		1,463	
Barcoded, Machinable	0.350	17,282		6,049	
Automation Letter	0.289	7,750		2,240	
DSCF and 3-Digit Pieces				0	
Nonmachinable, Nonbarcoded	0.373	8,384		3,127	
Machinable, Nonbarcoded	0.348	19,035		6,624	
Barcoded, Nonmachinable	0.362	27,170		9,836	
Barcoded, Machinable	0.331	117,281		38,820	
Automation Letter	0.275	9,243		2,542	
5-Digit Pieces				0	
Nonmachinable, Nonbarcoded	0.289	16,670		4,818	
Machinable, Nonbarcoded	0.276	29,727		8,205	
Barcoded, Nonmachinable	0.285	68,075		19,401	
Barcoded, Machinable	0.268	339,820		91,072	
Automation Letter	0.211	1,011		213	
Carrier Route Pieces				0	
Basic	0.169	917,067		154,984	
High Density, Carrier Route	0.149	69,875		10,420	
Saturation, Carrier Route	0.131	28,035		3,668	
Firm bundles (Per Bundle)				0	
Nonmachinable, Nonbarcoded	0.169	646		109	
Machinable, Nonbarcoded	0.169	1,976		334	369,750
Per-Piece Editorial Discount	(0.091)	1,303,323		(118,602)	(118,602)

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Nonprofit Rate (continued)

	Rate (dollars)	Bundles (000)	Sacks (000)	Pallets (000)	Revenues (000)	
Bundle Rate Revenue (Per Bundle)	-----------	-----------	-----------	-----------	-----------	
Mixed ADC Sack						
Mixed ADC Bundle	0.100	328			33	
ADC Bundle	0.129	1,131			146	
3-Digit/SCF Bundle	0.134	957			128	
5-Digit Bundle	0.161	507			82	
Firm Bundle	0.079	945			75	
ADC Sack or Pallet						
ADC Bundle	0.038	779			30	
3-Digit/SCF Bundle	0.063	3,649			230	
5-Digit Bundle	0.095	4,911			467	
Carrier Route Bundle	0.104	2,940			306	
Firm Bundle	0.048	867			42	
3-Digit/SCF Sack or Pallet						
3-Digit/SCF Bundle	0.039	4,666			182	
5-Digit Bundle	0.084	16,245			1,365	
Carrier Route Bundle	0.095	40,738			3,870	
Firm Bundle	0.045	707			32	
5-Digit Sack or Pallet						
5-Digit Bundle	0.008	734			6	
Carrier Route Bundle	0.039	10,157			396	
Firm Bundle	0.027	134			4	7,391
Sack Rate Revenue (Per Sack)						
Mixed ADC Sack						
OSCF Entry	0.42		206		86	
OADC Entry	0.42		268		112	
ADC Sack						
OSCF Entry	1.80		485		874	
OADC Entry	1.80		418		752	
OBMC Entry	1.80		100		180	
DBMC Entry	1.10		2		2	
DADC Entry	0.60		70		42	
3-Digit/SCF Sack						
OSCF Entry	1.90		994		1,889	
OADC Entry	1.90		1,046		1,987	
OBMC Entry	1.90		242		461	
DBMC Entry	1.20		8		9	
DADC Entry	1.00		48		48	
DSCF Entry	0.60		137		82	
5-Digit/Carrier Route Sack						
OSCF Entry	2.24		317		710	
OADC Entry	2.24		482		1,081	
OBMC Entry	2.24		153		342	
DBMC Entry	1.50		7		10	
DADC Entry	1.30		128		167	
DSCF Entry	0.90		533		479	
DDU Entry	0.70		39		27	9,339

COMMISSION RECOMMENDED RATES APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Nonprofit Rate (continued)

	Rate (dollars)	Bundles (000)	Sacks (000)	Pallets (000)	Revenues (000)	
Pallet Rate Revenue (Per Pallet)	-----------	-----------	-----------	-----------	-----------	
ADC Pallet						
OSCF Entry	18.61			20	377	
OADC Entry	18.61			21	385	
OBMC Entry	18.61			1	9	
DBMC Entry	13.00			1	7	
DADC Entry	8.90			27	241	
3-Digit/SCF Pallet						
OSCF Entry	22.98			25	563	
OADC Entry	22.98			26	603	
OBMC Entry	22.98			1	23	
DBMC Entry	14.40			1	22	
DADC Entry	12.20			30	366	
DSCF Entry	6.70			159	1,067	
5-Digit Pallet						
OSCF Entry	26.95			5	141	
OADC Entry	26.95			6	162	
OBMC Entry	26.95			0.1	1	
DBMC Entry	17.50			0.3	6	
DADC Entry	15.50			10	151	
DSCF Entry	8.00			126	1,007	
DDU Entry	1.20			0	1	5,132
Total Revenue						369,277
Postage Not Receiving 5% Discount						29,408
Postage Receiving 5% Discount						339,869
Discount (5%)						(16,993)
		Pieces (000)				

Ride-Along Revenue	0.155	10,667				1,653
Total Postage Revenue						353,937
	Times Correction Factor		1.0001			353,961
Fees						
	Address Correction		3,888			
	Periodicals Application Fee		152			
	Total Fees					4,040

TOTAL PERIODICALS-Nonprofit Rate						**358,001**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Classroom Rate

Pound Rate Revenue (Per Pound)	Rate (dollars)	Pieces (000)	Pounds (000)	Revenues (000)	
Advertising	-----------	-----------	-----------	-----------	
Delivery Office	0.160		5	1	
SCF	0.209		878	184	
ADC	0.219		144	32	
Zones 1 & 2	0.239		135	32	
Zone 3	0.257		351	90	
Zone 4	0.303		739	224	
Zone 5	0.372		609	227	
Zone 6	0.446		122	54	
Zone 7	0.534		121	65	
Zone 8	0.610		259	158	1,066
Editorial (Nonadvertising)					
Delivery Office	0.133		245	33	
SCF	0.174		15,862	2,760	
ADC	0.182		3,162	576	
All Other Editorial (Nonadvertising)	0.199		9,677	1,926	5,294
Piece Rate Revenue (Per Piece)					
Mixed ADC Pieces					
Nonmachinable, Nonbarcoded	0.534	31		17	
Machinable, Nonbarcoded	0.431	307		132	
Barcoded, Nonmachinable	0.504	23		12	
Barcoded, Machinable	0.404	73		29	
Automation Letter	0.327	27		9	
ADC Pieces				0	
Nonmachinable, Nonbarcoded	0.432	171		74	
Machinable, Nonbarcoded	0.370	932		345	
Barcoded, Nonmachinable	0.412	189		78	
Barcoded, Machinable	0.350	922		323	
Automation Letter	0.289	139		40	
DSCF and 3-Digit Pieces				0	
Nonmachinable, Nonbarcoded	0.373	1,751		653	
Machinable, Nonbarcoded	0.348	3,786		1,317	
Barcoded, Nonmachinable	0.362	1,919		695	
Barcoded, Machinable	0.331	8,282		2,741	
Automation Letter	0.275	345		95	
5-Digit Pieces				0	
Nonmachinable, Nonbarcoded	0.289	1,078		311	
Machinable, Nonbarcoded	0.276	1,948		538	
Barcoded, Nonmachinable	0.285	2,782		793	
Barcoded, Machinable	0.268	13,887		3,722	
Automation Letter	0.211	0		0	
Carrier Route Pieces				0	
Basic	0.169	21,026		3,553	
High Density, Carrier Route	0.149	0		0	
Saturation, Carrier Route	0.131	295		39	
Firm Bundles				0	
Nonmachinable, Nonbarcoded	0.169	78		13	
Machinable, Nonbarcoded	0.169	240		41	15,569
Per-Piece Editorial Discount	(0.091)	56,592		(5,150)	(5,150)

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Classroom Rate (continued)

	Rate (dollars)	Bundles (000)	Sacks (000)	Pallets (000)	Revenues (000)	
Bundle Rate Revenue (Per Bundle)	-----------	-----------	-----------	-----------	-----------	
Mixed ADC Sack						
MiXed ADC Bundle	0.100	44			4	
ADC Bundle	0.129	86			11	
3-Digit/SCF Bundle	0.134	89			12	
5-Digit Bundle	0.161	23			4	
Firm Bundle	0.079	115			9	
ADC Sack or Pallet						
ADC Bundle	0.038	81			3	
3-Digit/SCF Bundle	0.063	365			23	
5-Digit Bundle	0.095	282			27	
Carrier Route Bundle	0.104	73			8	
Firm Bundle	0.048	105			5	
3-Digit/SCF Sack or Pallet						
3-Digit/SCF Bundle	0.039	571			22	
5-Digit Bundle	0.084	991			83	
Carrier Route Bundle	0.095	1,282			122	
Firm Bundle	0.045	86			4	
5-Digit Sack or Pallet						
5-Digit Bundle	0.008	50			0	
Carrier Route Bundle	0.039	269			10	
Firm Bundle	0.027	16			0	348
Sack Rate Revenue (Per Sack)						
Mixed ADC Sack						
OSCF Entry	0.42		21		9	
OADC Entry	0.42		28		12	
ADC Sack						
OSCF Entry	1.80		48		86	
OADC Entry	1.80		41		74	
OBMC Entry	1.80		10		18	
DBMC Entry	1.10		0.2		0	
DADC Entry	0.60		1		1	
3-Digit/SCF Sack						
OSCF Entry	1.90		110		209	
OADC Entry	1.90		116		220	
OBMC Entry	1.90		27		51	
DBMC Entry	1.20		1		1	
DADC Entry	1.00		2		2	
DSCF Entry	0.60		6		3	
5-Digit/Carrier Route Sack						
OSCF Entry	2.24		18		40	
OADC Entry	2.24		30		68	
OBMC Entry	2.24		8		17	
DBMC Entry	1.50		0.4		1	
DADC Entry	1.30		1		1	
DSCF Entry	0.90		3		2	
DDU Entry	0.70		0.2		0	814

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

PERIODICALS-Classroom Rate (continued)

	Rate (dollars)	Bundles (000)	Sacks (000)	Pallets (000)	Revenues (000)	
Pallet Rate Revenue (per pallet)						
ADC Pallet						
OSCF Entry	18.61			2	34	
OADC Entry	18.61			2	35	
OBMC Entry	18.61			0.05	1	
DBMC Entry	13.00			0.05	1	
DADC Entry	8.90			2	20	
3-Digit/SCF Pallet						
OSCF Entry	22.98			2	41	
OADC Entry	22.98			2	44	
OBMC Entry	22.98			0.1	2	
DBMC Entry	14.40			0.1	2	
DADC Entry	12.20			2	20	
DSCF Entry	6.70			9	59	
5-Digit Pallet						
OSCF Entry	26.95			1	15	
OADC Entry	26.95			1	17	
OBMC Entry	26.95			0.01	0	
DBMC Entry	17.50			0.04	1	
DADC Entry	15.50			0.2	3	
DSCF Entry	8.00			3	20	
DDU Entry	1.20			0.01	0	312
Total Revenue						18,254
Postage Not Receiving 5% Discount						1,066
Postage Receiving 5% Discount						17,188
Discount (5%)						(859)
		Pieces (000)				
Ride-Along Revenue	0.155	125				19
Total Postage Revenue						17,414
	Times Correction Factor		1.0008			17,428
Fees	Address Correction		138			
	Periodicals Application Fee		5			
	Total Fees					143
TOTAL PERIODICALS-Classroom Rate						**17,571**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail Regular Subclass

	Unit	Rate ($)	TYAR Volume		Revenue	
Nonautomation (Presort) Category						
Letters, Nonmachinable						
MADC	per piece	0.520	29,688,185		$ 15,437,856	
ADC	per piece	0.440	4,862,122		2,139,334	
3-Digit	per piece	0.411	61,251,859		25,174,514	
5-Digit	per piece	0.328	17,191,863		5,638,931	
Subtotal				112,994,028		48,390,635
Letters, Machinable						
MADC	per piece	0.255	645,072,043		164,493,371	
ADC	per piece	0.246	982,612,518		241,722,679	
Subtotal				1,627,684,560		406,216,050
Flats, Piece-Rated						
MADC	per piece	0.515	71,729,651		36,940,770	
ADC	per piece	0.461	49,517,692		22,827,656	
3-Digit	per piece	0.427	126,959,031		54,211,506	
5-Digit	per piece	0.363	121,908,649		44,252,840	
Subtotal				370,115,023		158,232,772
Parcels, Piece-Rated						
MADC	per piece	1.129	1,782,922		2,012,919	
ADC	per piece	0.914	22,101,690		20,200,945	
3-Digit	per piece	0.653	19,966,366		13,038,037	
5-Digit	per piece	0.607	2,218,485		1,346,620	
SubTotal				46,069,463		36,598,521
Not Flat-Machinable, Piece-Rated						
MADC	per piece	1.028	4,472,727		4,597,963	
ADC	per piece	0.767	9,111,394		6,988,439	
3-Digit	per piece	0.506	61,328,539		31,032,241	
5-Digit	per piece	0.460	75,985,418		34,953,292	
Subtotal				150,898,077		77,571,935
Flats, Pound-Rated						
MADC	per piece	0.365	60,124,966		21,945,612	
ADC	per piece	0.311	41,506,538		12,908,533	
3-Digit	per piece	0.277	99,411,293		27,536,928	
5-Digit	per piece	0.213	95,456,749		20,332,288	
Subtotal				296,499,546		82,723,362
Not Flat-Machinable, Pound-Rated						
MADC	per piece	0.878	13,926,107		12,227,122	
ADC	per piece	0.617	28,368,879		17,503,598	
3-Digit	per piece	0.356	190,950,135		67,978,248	
5-Digit	per piece	0.310	236,585,220		73,341,418	
Subtotal				469,830,341		171,050,387
Parcels, Pound-Rated						
Machinable						
Mixed BMC	per piece	0.909	76,878,428		69,882,491	
BMC	per piece	0.716	215,833,500		154,536,786	
5-Digit Machinable	per piece	0.346	73,857,060		25,554,543	
Subtotal				366,568,988		249,973,820
Nonmachinable						
MADC	per piece	0.979	2,280,748		2,232,853	
ADC	per piece	0.764	28,272,912		21,600,505	
3-Digit	per piece	0.503	25,541,363		12,847,306	
5-Digit	per piece	0.457	2,837,929		1,296,934	
Subtotal				58,932,953		37,977,597
CMM Pieces	per piece	0.460	2,634,246		1,211,753	
			pieces >	3,502,227,226		1,269,946,831

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail Regular Subclass

	Unit	Rate ($)	TYAR Volume		Revenue	
Nonautomation (Presort) Category (continued)						
Flats, Pound-Rated						
MADC	per pound	0.739	24,773,937		18,307,939	
ADC	per pound	0.739	16,884,294		12,477,493	
3-Digit	per pound	0.739	38,205,775		28,234,068	
5-Digit	per pound	0.739	36,767,657		27,171,298	
Subtotal				116,631,663		86,190,799
Not Flat-Machinable, Pound-Rated						
MADC	per pound	0.739	5,849,751		4,322,966	
ADC	per pound	0.739	11,965,830		8,842,748	
3-Digit	per pound	0.739	68,354,684		50,514,112	
5-Digit	per pound	0.739	84,690,738		62,586,456	
Subtotal				170,861,003		126,266,282
Parcels, Pound-Rated						
Machinable						
Mixed BMC	per pound	0.739	44,052,655		32,554,912	
BMC	per pound	0.739	138,895,007		102,643,410	
5-Digit Machinable	per pound	0.739	30,512,566		22,548,786	
Subtotal				213,460,227		157,747,108
Nonmachinable						
MADC	per pound	0.739	1,394,844		1,030,790	
ADC	per pound	0.739	15,697,055		11,600,124	
3-Digit	per pound	0.739	14,936,284		11,037,914	
5-Digit	per pound	0.739	1,659,587		1,226,435	
Subtotal				33,687,769		24,895,261
			pounds >	534,640,663		395,099,450
Dropship Discounts:						
Piece-Rated						
BMC	per piece	(0.033)	513,347,408		(16,940,464)	
SCF	per piece	(0.042)	528,029,146		(22,177,224)	
DDU	per piece	(0.051)	235,535		(12,012)	
Subtotal				1,041,612,090		(39,129,701)
Pound-Rated						
BMC	per pound	(0.159)	148,746,305		(23,650,663)	
SCF	per pound	(0.203)	93,222,845		(18,924,238)	
DDU	per pound	(0.248)	12,830,825		(3,182,045)	
Subtotal				254,799,975		(45,756,945)
Rates			pieces >	3,502,227,226		1,580,159,635
Fees						
Address Correction					1,301,161	
Bulk Permit					1,520,482	
Certficate of Mailing					339	
BPRS Permit					150,733	
Standard Mail Forwarding					420,183	
Total Revenue - Presort Category						1,583,552,534

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail Regular Subclass

	Unit	Rate ($)	TYAR Volume		Revenue	
Automation Category						
Letters, Piece-Rated						
MADC	per piece	0.252	2,336,936,902		$ 588,908,099	
ADC	per piece	0.238	2,628,338,118		625,544,472	
3-Digit	per piece	0.233	20,241,531,311		4,716,276,795	
5-Digit	per piece	0.218	23,646,781,113		5,154,998,283	
Subtotal				48,853,587,444		11,085,727,649
Letters, Pound-Rated						
MADC	per piece	0.103	5,065,594		521,756	
ADC	per piece	0.089	9,617,128		855,924	
3-Digit	per piece	0.084	55,519,453		4,663,634	
5-Digit	per piece	0.069	2,836,600		195,725	
Subtotal				73,038,775		6,237,040
Flats, Piece-Rated						
MADC	per piece	0.477	30,743,777		14,664,782	
ADC	per piece	0.424	120,166,140		50,950,444	
3-Digit	per piece	0.392	1,874,462,333		734,789,234	
5-Digit	per piece	0.335	3,562,506,811		1,193,439,782	
Subtotal				5,587,879,061		1,993,844,241
Flats, Pound-Rated						
MADC	per piece	0.328	27,254,890		8,939,604	
ADC	per piece	0.275	106,529,363		29,295,575	
3-Digit	per piece	0.243	1,867,632,451		453,834,685	
5-Digit	per piece	0.186	3,549,526,288		660,211,890	
Subtotal				5,550,942,992		1,152,281,754
			pieces >	60,065,448,272		14,238,090,685
Letters, Pound-Rated						
MADC	per pound	0.739	1,072,174		792,337	
ADC	per pound	0.739	2,034,803		1,503,720	
3-Digit	per pound	0.739	11,747,998		8,681,771	
5-Digit	per pound	0.739	600,626		443,863	
Subtotal				15,455,602		11,421,690
Flats, Pound-Rated						
MADC	per pound	0.739	11,457,379		8,467,003	
ADC	per pound	0.739	44,734,420		33,058,736	
3-Digit	per pound	0.739	678,700,916		501,559,977	
5-Digit	per pound	0.739	1,231,926,185		910,393,451	
Subtotal				1,966,818,900		1,453,479,167
			pounds >	1,982,274,502		1,464,900,857

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail Regular Subclass

	Unit	Rate ($)	TYAR Volume		Revenue	
Automation Category (continued)						
Piece-Rated						
BMC	per piece	(0.033)	19,143,096,158		(631,722,173)	
SCF	per piece	(0.042)	19,054,850,741		(800,303,731)	
DDU	per piece	(0.051)	0		-	
Subtotal				38,197,946,898		(1,432,025,904)
Pound-Rated						
BMC	per pound	(0.159)	599,963,404		(95,394,181)	
SCF	per pound	(0.203)	714,320,947		(145,007,152)	
DDU	per pound	(0.248)	0		-	
Subtotal				1,314,284,351		(240,401,333)
Rates	automation pieces >			60,065,448,272		14,030,564,304
	presort pieces >			3,502,227,226		
	pieces paid @ First-Class and Priority			21,863,649		
	NSA volume adjustment			(110,692,386)		
				63,478,846,761		
Fees						
Address Correction					26,125,201	
Bulk Permit					30,528,803	
Certficate of Mailing					6,812	
BPRS Permit					3,026,478	
Standard Mail Forw arding					8,436,597	
Total Revenue - Automation Category						14,098,688,195

Regular Subclass Total	
Total Postage from Pieces	15,610,723,939
Pieces Paid at First-Class Rates	13,723,602
Pieces Paid at Priority Rates	17,808
Subtotal	15,624,465,349
Times Revenue Adjustment Factor	1.000084546
Adjusted Revenue	15,625,786,337
Plus Fees	71,516,790
NSA Adjustment	(25,108,467)
Total Revenue	15,672,194,661
Revenue Per Piece	0.24654346

COMMISSION RECOMMENDED RATES APPLIED TO TEST YEAR VOLUMES

Standard Mail Nonprofit Regular Subclass

	Unit	Rate ($)	TYAR Volume		Revenue	
Nonautomation (Presort) Category						
Letters - Nonmachinable						
MADC	per piece	0.429	14,635,612		$ 6,278,678	
ADC	per piece	0.349	2,396,918		836,524	
3-Digit	per piece	0.320	18,816,755		6,021,361	
5-Digit	per piece	0.237	5,281,392		1,251,690	
Subtotal				41,130,676		14,388,253
Letters - Machinable						
MADC	per piece	0.164	318,006,111		52,153,002	
ADC	per piece	0.155	330,421,118		51,215,273	
Subtotal				648,427,229		103,368,275
Flats, Piece-Rated						
MADC	per piece	0.389	31,379,795		12,206,740	
ADC	per piece	0.335	21,662,660		7,256,991	
3-Digit	per piece	0.301	59,728,345		17,978,232	
5-Digit	per piece	0.237	57,352,374		13,592,513	
Subtotal				170,123,175		51,034,476
Parcels, Piece-Rated						
MADC	per piece	1.003	51,124		51,277	
ADC	per piece	0.788	633,747		499,392	
3-Digit	per piece	0.527	572,518		301,717	
5-Digit	per piece	0.481	63,613		30,598	
Subtotal				1,321,001		882,984
Not Flat Machinable, Piece-Rated						
MADC	per piece	0.902	1,126,969		1,016,526	
ADC	per piece	0.641	2,295,748		1,471,575	
3-Digit	per piece	0.380	15,452,618		5,871,995	
5-Digit	per piece	0.334	19,145,632		6,394,641	
Subtotal				38,020,966		14,754,736
Flats, Pound-Rated						
MADC	per piece	0.263	8,988,602		2,364,002	
ADC	per piece	0.209	6,205,172		1,296,881	
3-Digit	per piece	0.175	11,263,523		1,971,116	
5-Digit	per piece	0.111	10,815,464		1,200,517	
Subtotal				37,272,761		6,832,516
Not Flat Machinable, Pound-Rated						
MADC	per piece	0.776	1,675,377		1,300,092	
ADC	per piece	0.515	3,412,911		1,757,649	
3-Digit	per piece	0.254	22,972,206		5,834,940	
5-Digit	per piece	0.208	28,462,323		5,920,163	
Subtotal				56,522,817		14,812,845
Parcels, Pound-Rated						
Machinable						
Mixed BMC	per piece	0.807	3,167,683		2,556,320	
BMC	per piece	0.614	8,893,159		5,460,400	
5-Digit machinable	per piece	0.244	3,043,191		742,539	
Subtotal				15,104,033		8,759,258
Nonmachinable						
MADC	per piece	0.877	116,315		102,008	
ADC	per piece	0.662	1,441,878		954,523	
3-Digit	per piece	0.401	1,302,573		522,332	
5-Digit	per piece	0.355	144,730		51,379	
Subtotal				3,005,497		1,630,243
CMM Pieces	per piece	0.334	2,510,976		838,666	

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail Nonprofit Regular Subclass

	Unit	Rate ($)	TYAR Volume		Revenue	
Nonautomation (Presort) Category (continued)						
Flats, Pound-Rated						
MADC	per pound	0.622	3,387,632		2,107,107	
ADC	per pound	0.622	2,292,567		1,425,977	
3-Digit	per pound	0.622	3,950,119		2,456,974	
5-Digit	per pound	0.622	3,755,516		2,335,931	
Subtotal				13,385,835		8,325,989
Not Flat Machinable, Pound-Rated						
MADC	per pound	0.622	630,913		392,428	
ADC	per pound	0.622	1,307,709		813,395	
3-Digit	per pound	0.622	7,246,910		4,507,578	
5-Digit	per pound	0.622	8,978,845		5,584,842	
Subtotal				18,164,377		11,298,242
Parcels, Pound-Rated						
Machinable						
Mixed BMC	per pound	0.622	1,642,361		1,021,549	
BMC	per pound	0.622	5,873,664		3,653,419	
5-Digit Machinable	per pound	0.622	1,297,441		807,008	
Subtotal				8,813,466		5,481,976
Nonmachinable						
MADC	per pound	0.622	70,040		43,565	
ADC	per pound	0.622	792,718		493,071	
3-Digit	per pound	0.622	782,558		486,751	
5-Digit	per pound	0.622	86,951		54,083	
Subtotal				1,732,267		1,077,470
			pounds >	42,095,944		26,183,677
Dropship Discounts:						
Piece-Rated						
BMC	per piece	(0.033)	188,157,925		(6,209,212)	
SCF	per piece	(0.042)	184,349,528		(7,742,680)	
DDU	per piece	(0.051)	6,754		(344)	
Subtotal				372,514,207		(13,952,236)
Pound-Rated						
BMC	per pound	(0.159)	10,976,057		(1,745,193)	
SCF	per pound	(0.203)	8,405,632		(1,706,343)	
DDU	per pound	(0.248)	546,844		(135,617)	
Subtotal				19,928,532		(3,587,154)
Revenue from Rates			pieces >	1,013,439,132		225,946,541
Fees						
Address Correction					404,684	
Bulk Permit					1,591,820	
Certficate of Mailing					106	
BPRS Permit					46,881	
Standard Mail Forwarding					297,861	
Total Revenue - Presort Category						228,287,891

COMMISSION RECOMMENDED RATES APPLIED TO TEST YEAR VOLUMES

Standard Mail Nonprofit Regular Subclass

	Unit	Rate ($)	TYAR Volume		Revenue	
Automation Category						
Letters, Piece-Rated						
MADC	per piece	0.161	897,990,192		$ 144,576,421	
ADC	per piece	0.147	855,332,716		125,733,909	
3-Digit	per piece	0.142	4,530,178,577		643,285,358	
5-Digit	per piece	0.127	3,446,662,686		437,726,161	
Subtotal				9,730,164,171		1,351,321,849
Letters, Pound-Rated						
MADC	per piece	0.035	420,059		14,702	
ADC	per piece	0.021	362,033		7,603	
3-Digit	per piece	0.016	2,607,354		41,718	
5-Digit	per piece	0.001	160,882		161	
Subtotal				3,550,329		64,183
Flats, Piece-Rated						
MADC	per piece	0.354	9,146,821		3,237,975	
ADC	per piece	0.301	35,751,568		10,761,222	
3-Digit	per piece	0.269	388,908,744		104,616,452	
5-Digit	per piece	0.212	739,139,979		156,697,675	
Subtotal				1,172,947,112		275,313,324
Flats, Pound-Rated						
MADC	per piece	0.228	2,096,479		477,997	
ADC	per piece	0.175	8,194,368		1,434,014	
3-Digit	per piece	0.143	167,441,459		23,944,129	
5-Digit	per piece	0.086	318,230,634		27,367,835	
Subtotal				495,962,940		53,223,975
			pieces >	11,402,624,552		1,679,923,332
Letters, Pound-Rated						
MADC	per pound	0.622	89,309		55,550	
ADC	per pound	0.622	76,960		47,869	
3-Digit	per pound	0.622	551,679		343,145	
5-Digit	per pound	0.622	34,035		21,170	
Subtotal				751,983		467,734
Flats, Pound-Rated						
MADC	per pound	0.622	792,054		492,657	
ADC	per pound	0.622	3,089,605		1,921,734	
3-Digit	per pound	0.622	53,423,927		33,229,682	
5-Digit	per pound	0.622	98,095,820		61,015,600	
Subtotal				155,401,405		96,659,674
			pounds >	156,153,389		97,127,408

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail Nonprofit Regular Subclass

	Unit	Rate ($)	TYAR Volume		Revenue	
Automation Category (continued)						
Dropship Discounts:						
Piece-Rated						
BMC	per piece	(0.033)	3,231,276,516		(106,632,125)	
SCF	per piece	(0.042)	2,517,394,779		(105,730,581)	
DDU	per piece	(0.051)	0		-	
Subtotal				5,748,671,295		(212,362,706)
Pound-Rated						
BMC	per pound	(0.159)	46,606,028		(7,410,358)	
SCF	per pound	(0.203)	57,540,679		(11,680,758)	
DDU	per pound	(0.248)	0		-	
Subtotal				104,146,707		(19,091,116)
Revenue from Rates			pieces >	11,402,624,552		1,545,596,917
Fees						
Address Correction					4,959,741	
Bulk Permit					19,509,106	
Certficate of Mailing					1,293	
BPRS Permit					574,562	
Standard Mail Forwarding					3,650,534	
Total Revenue - Automation Category						1,574,292,154

Nonprofit Regular Subclass Total	
Total Postage from Pieces	1,771,543,459
Pieces Paid at First-Classs Rates	
Pieces Paid at Priority Rates	
Subtotal	1,771,543,459
Times Revenue Adjustment Factor	1.000056059
Adjusted Revenue	1,771,642,769
Plus Fees	31,036,587
NSA Adjustment	0
Total Revenue	1,802,679,355
Revenue Per Piece	0.120945809

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail ECR Subclass

	Unit	Rates	Volume		Revenue	
		(1)	(2)		(3)	
Letters						
Letters, Piece-Rated						
Basic	per piece	0.226	1,787,135,617		403,892,649	
High Density	per piece	0.186	547,975,921		101,923,521	
Saturation	per piece	0.177	3,217,068,446		569,421,115	
Subtotal				5,552,179,984		1,075,237,286
Letters, Pound-Rated						
Basic	per piece	0.098	3,955,159		387,606	
High Density	per piece	0.058	12,957,244		751,520	
Saturation	per piece	0.049	108,795,396		5,330,974	
Subtotal				125,707,799		6,470,100
Letters, Pound-Rated						
Basic	per pound	0.621	1,173,207		728,562	
High Density	per pound	0.621	3,331,764		2,069,025	
Saturation	per pound	0.621	25,866,498		16,063,095	
Subtotal				30,371,469		18,860,682
Flats						
Flats, Piece-Rated						
Basic	per piece	0.249	5,683,719,730		1,415,246,213	
High Density	per piece	0.205	856,776,680		175,639,219	
Saturation	per piece	0.187	7,181,961,242		1,343,026,752	
Subtotal				13,722,457,653		2,933,912,185
Flats, Pound-Rated						
Basic	per piece	0.121	5,602,090,986		677,853,009	
High Density	per piece	0.077	999,100,723		76,930,756	
Saturation	per piece	0.059	3,679,961,470		217,117,727	
Subtotal				10,281,153,179		971,901,492
Parcels						
Parcels, Piece-Rated						
Basic	per piece	0.499	207,573		103,579	
High Density	per piece	0.378	7,338		2,774	
Saturation	per piece	0.369	33,757		12,456	
Subtotal				248,668		118,809
Parcels, Pound-Rated						
Basic	per piece	0.371	253,593		94,083	
High Density	per piece	0.250	10,938		2,734	
Saturation	per piece	0.241	95,687		23,061	
Subtotal				360,218		119,878
			pieces >	29,682,107,501		4,987,759,749
			NSA Adjustment	(4,866,935)		
Nonletter Pounds						
Basic	per pound	0.621	1,777,210,500		1,103,647,721	
High Density	per pound	0.621	373,403,588		231,883,628	
Saturation	per pound	0.621	1,149,187,090		713,645,183	
Subtotal				3,299,801,179		2,049,176,532
			pounds >	3,330,172,648		2,068,037,214

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail ECR Subclass (continued)

	Unit	Rates	Volume		Revenue	
Dropship Discounts:		(1)	(2)		(3)	
Piece-Rated						
BMC	per piece	(0.033)	1,678,176,214		(55,379,815)	
SCF	per piece	(0.042)	12,112,642,179		(508,730,972)	
DDU	per piece	(0.051)	4,444,444,649		(226,666,677)	
Subtotal				18,235,263,043		(790,777,464)
Pound-Rated					-	
BMC	per pound	(0.159)	195,018,578		(31,007,954)	
SCF	per pound	(0.203)	1,882,693,740		(382,186,829)	
DDU	per pound	(0.248)	1,183,253,515		(293,446,872)	
Subtotal		-		3,260,965,834		(706,641,655)
DAL Surcharge		0.015	2,180,834,643		32,712,520	
Revenue from Postage						5,558,377,845
Fees						
Address Correction						12,822,205
Bulk Permit						14,983,485
Certficate of Mailing						3,343
BPRS Permit						1,485,390
Standard Mail Forw arding						4,140,668
Total Revenue - ECR Subclass						

ECR Subclass Total	
Net Revenue from Rates	5,558,377,845
Revenue Adjustment Factor	1.0001667
Adjusted Revenue from Rates	5,559,304,180
NSA Adjustment	(998,053)
Fees	33,435,091
Revenue from Surcharges	32,717,971
Total Revenue	5,624,459,189
TYAR Revenue Per Piece	0.189

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail Nonprofit ECR Subclass

	Unit	Rates	Volume		Revenue	
		(1)	(2)		(3)	
Letters						
Letters - Piece Rated						
Basic	per piece	0.157	265,215,375		41,638,814	
High Density	per piece	0.117	57,737,495		6,755,287	
Saturation	per piece	0.108	634,654,437		68,542,679	
SubTotal				957,607,307		116,936,780
Letters - Pound Rated						
Basic	per piece	0.068	420,425		28,589	
High Density	per piece	0.028	60,600		1,697	
Saturation	per piece	0.019	4,913,382		93,354	
SubTotal				5,394,407		123,640
Letters - Pound Rated						
Basic	per pound	0.432	107,612		46,488	
High Density	per pound	0.432	14,491		6,260	
Saturation	per pound	0.432	1,152,734		497,981	
SubTotal				1,274,837		550,730
Flats						
Flats, Piece-Rated						
Basic	per piece	0.180	941,623,274		169,492,189	
High Density	per piece	0.136	65,048,477		8,846,593	
Saturation	per piece	0.118	339,376,598		40,046,439	
SubTotal				1,346,048,349		218,385,221
Flats, Pound-Rated						
Basic	per piece	0.091	152,468,834		13,874,664	
High Density	per piece	0.047	1,297,297		60,973	
Saturation	per piece	0.029	66,417,782		1,926,116	
SubTotal				220,183,912		15,861,752
Parcels						
Parcels, Piece-Rated						
Basic	per piece	0.430	17,916		7,704	
High Density	per piece	0.309	-		-	
Saturation	per piece	0.300	3,975		1,192	
SubTotal				21,891		8,896
Parcels, Pound-Rated						
Basic	per piece	0.341	49,699		16,947	
High Density	per piece	0.220	-		-	
Saturation	per piece	0.211	19,603		4,136	
SubTotal				69,301		21,083
			pieces >	2,529,325,167		351,337,373
Nonletter Pounds						
Basic	per pound	0.432	46,552,707		20,110,769	
High Density	per pound	0.432	461,439		199,342	
Saturation	per pound	0.432	20,339,259		8,786,560	
SubTotal				67,353,404		29,096,671
			pounds >	68,628,241		29,647,400

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Standard Mail Nonprofit ECR Subclass (continued)

	Unit	Rates	Volume		Revenue	
Dropship Discounts:		(1)	(2)		(3)	
Piece-Rated						
BMC	per piece	(0.033)	272,740,868		(9,000,449)	
SCF	per piece	(0.042)	1,606,516,552		(67,473,695)	
DDU	per piece	(0.051)	117,661,155		(6,000,719)	
Subtotal				1,996,918,575		(82,474,863)
Pound-Rated						
BMC	per pound	(0.159)	6,249,923		(993,738)	
SCF	per pound	(0.203)	46,709,058		(9,481,939)	
DDU	per pound	(0.248)	6,709,289		(1,663,904)	
Subtotal		-		59,668,270		(12,139,580)
DAL Surcharge		0.015	81,478,329		1,222,175	
Revenue from Postage						286,370,330
Fees						
Address Correction						1,092,808
Bulk Permit						4,298,553
Certficate of Mailing						285
BPRS Permit						126,596
Standard Mail Forwarding						804,343
Total Revenue - Nonprofit ECR						

Nonprofit ECR Subclass Total

Net Revenue from Rates	286,370,330
Revenue Adjustment Factor	1.0001667
Adjusted Revenue from Rates	286,418,055
Fees	6,322,585
Revenue from Surcharges	1,222,379
Total Revenue	293,963,019
TYAR Revenue Per Piece	0.116

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Package Service - Parcel Post

Inter-BMC		**Pieces**	**Revenues**
Zones	1 & 2	2,690,662	15,921,608
	3	5,398,937	36,569,486
	4	17,715,446	130,743,834
	5	21,002,167	165,647,568
	6	10,669,354	88,687,685
	7	7,866,288	68,773,195
	8	13,062,940	127,584,637
Subtotal		78,405,794	633,928,014
Times Revenue Adjustment			631,017,543

Parcel Select		**Pieces**	**Revenues**
DBMC Zone	1 & 2	43,416,181	149,759,303
	3	10,926,575	53,789,667
	4	2,353,134	13,810,440
	5	-	-
	DSCF	1,725,069	4,474,609
	DDU	191,573,847	314,525,135
Subtotal		249,994,806	536,359,154
Times Revenue Adjustment			543,327,552

Fees		
Address Correction	639,066	
Bulk Permit	28,289	
Certificate of Mailing	24,003	
Special Handling	339,395	
Parcel Air Lift	59,589	
Shipper Paid Forwarding	1,532	
Merchandise Return	64,658	
Total Fees	1,156,532	1,156,532

Adjustments to Revenue		
Dim-Weight Adjustment	10,255,936	
Barcode Discount	(266,162)	
BMC Presort Discount	(389,019)	
OBMC Entry Discount	(17,865,644)	
Nonmachinable Surcharge	66,370,810	
Total Adjustments to Revenue	58,105,921	58,105,921

Intra-BMC		**Pieces**	**Revenues**
Zones	Local	2,316,346	9,559,179
	1 & 2	24,528,117	126,201,061
	3	4,236,658	24,731,158
	4	916,951	5,412,842
	5	66,122	462,145
Subtotal		32,064,194	166,366,384
Times Revenue Adjustment			164,950,345

Other Postage Revenue	
Pickup Fees	527,958
Alaska Bypass	22,006,534
Parcel Enclosures	1,579,613
PRS	34,075,751
Subtotal	58,189,856

Total Postage Revenue **1,397,485,297**

TOTAL PARCEL POST **1,456,747,748**

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Package Service - Bound Printed Matter

Single-Piece Rate
Zoned Rates

Pieces and Pounds Revenue

Zones	Pieces	Revenue
1 & 2	11,120,194	$ 25,733,575
3	3,365,542	8,205,646
4	4,727,844	11,961,172
5	4,840,821	12,939,758
6	2,651,323	7,407,580
7	1,606,897	4,599,239
8	2,966,369	9,188,607
Subtotal	31,278,989	$ 80,035,576

Bulk Rate Nondropshipped Revenue
Piece Rate 1.45

Piece Rate Revenue

Zones	Pieces	Revenue
1 & 2	19,879,947	$ 28,805,383
3	12,407,922	17,978,667
4	19,475,791	28,219,776
5	19,895,821	28,828,385
6	10,858,128	15,733,068
7	7,276,555	10,543,487
8	13,883,066	20,116,102
Subtotal	103,677,231	$ 150,224,869

Pound Rate Revenue

Zones	Pounds	Rate	Revenue
1 & 2	40,806,376	0.12	$ 4,985,145
3	26,218,902	0.15	3,885,672
4	41,095,302	0.20	8,024,476
5	38,565,173	0.25	9,615,781
6	20,726,874	0.31	6,454,820
7	14,129,386	0.36	5,079,344
8	24,545,274	0.48	11,724,010
Subtotal	206,087,288		$ 49,769,248

Bulk Rate Dropshipped Revenue

DBMC	1.13
DSCF	0.75
DDU	0.66

Piece Rate Revenue

Zones	Pieces	Revenue
1 & 2	188,399,910	$ 213,181,271
3	43,786,355	49,545,835
4	9,578,977	10,838,957
5	397,641	449,945
DSCF	205,809,377	153,948,575
DDU	71,994,983	47,797,554
Subtotal	519,967,243	$ 475,762,137

Pound Rate Revenue

Zones	Pounds	Rate	Revenue
1 & 2	546,259,202	0.09	$ 47,042,146
3	115,273,156	0.12	14,313,300
4	24,991,633	0.16	4,104,199
5	691,102	0.22	150,865
DSCF	384,764,372	0.08	31,978,851
DDU	181,818,309	0.04	7,282,618
Subtotal	1,253,797,774		$ 104,871,979

Volume	654,923,463
Revenue from Rates	$ 860,663,809

Revenue from Fees	
Address Correction	$ 1,305,052
Bulk Permit	67,053
Certificate of Mailing	41,912
Special Handling	33,387
Merchandise Return	112,901
Total Revenue from Fees	$ 1,560,304

Adjustments to Revenue	
Flat Differential	$ (47,614,754)
Carrier Route	(18,674,634)
Prebarcoding	(6,969,533)
Total Adjustments	$ (73,258,921)

TOTAL BOUND PRINTED MATTER REVENUE $ 788,965,192

COMMISSION RECOMMENDED RATES
APPLIED TO TEST YEAR VOLUMES

Package Services - Media and Library Rate

Revenue from Rates

	Media Mail	Library Rate	Combined
Single-Piece			
First Pound			
Barcoded	$ 31,229,589	$ 1,997,404	$ 33,226,993
Non-Barcoded	229,748,492	21,680,956	251,429,448
Pounds 2-7	47,441,344	4,127,007	51,568,351
Pounds 8-70	8,030,905	638,145	8,669,051
Total Non-Presorted	$ 316,450,330	$ 28,443,513	$ 344,893,843
Times revenue adjustment	$ 321,682,496	$ 29,436,623	$ 351,119,119
Presorted			
First Pound - Presort Level A (5-Digit)	$ 2,081,601	$ 95,358	$ 2,176,959
First Pound - Presort Level B (BMC)			
Barcoded	42,557,407	10,086	42,567,493
Non-Barcoded	9,530,743	910,494	10,441,237
Pounds 2-7	12,231,244	200,393	12,431,637
Pounds 8-70	675,416	16,349	691,765
Total Presorted	$ 67,076,412	$ 1,232,679	$ 68,309,091
Times revenue adjustment	$ 68,314,340	$ 1,338,308	$ 69,652,648
Total Revenue from Postage	$ 389,996,836	$ 30,774,930	$ 420,771,766
Revenue from Fees			
Address Correction	$ 281,809	$ 51,238	$ 333,047
Bulk Permit	123,358		123,358
Certificate of Mailing	9,834	790	10,625
Special Handling	37,272		37,272
Merchandise Return	26,492	2,129	28,621
Total Revenue from Fees	$ 478,765	$ 54,158	$ 532,923
Total Media and Library Rate Revenue	**$ 390,475,601**	**$ 30,829,088**	**$ 421,304,689**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

SPECIAL SERVICES

A. Address Correction Fees

		Automated 1st 2 notices Transactions (000)	Fee	Automated add. Notices Transactions (000)	Fee	Electronic Transactions (000)	Fee	Manual Transactions (000)	Fee	Revenues (000)
	First-Class									
Regular:	Single-Piece Letters	0	$0.00	0	$0.05	15,305,120	$0.06	21,587,684	$0.50	11,712,149
	Presort Letters	9,237,507	$0.00	2,886,721	$0.05	471,751	$0.06	665,399	$0.50	505,341
	Single-Piece Cards	0	$0.00	0	$0.05	977,188	$0.06	1,378,311	$0.50	747,787
	Presort Cards	2,222,834	$0.00	694,636	$0.05	113,518	$0.06	160,116	$0.50	121,601
Auto:	Automation Letters	373,429,808	$0.00	116,696,815	$0.05	19,070,725	$0.06	26,899,023	$0.50	20,428,596
	Automation Cards	24,546,828	$0.00	7,670,884	$0.05	1,253,584	$0.06	1,768,165	$0.50	1,342,842
	Total First-Class	**409,436,977**	-	**127,949,055**	$0.05	**37,191,886**	$0.06	**52,458,699**	$0.50	**34,858,315**
	Priority					0	$0.25	123,891	$0.50	61,946
	Periodicals									
	In County					5,406,176	$0.25	649,674	$0.50	1,676,381
	Regular Rate					46,437,985	$0.25	5,580,570	$0.50	14,399,781
	Nonprofit					12,536,999	$0.25	1,506,603	$0.50	3,887,551
	Classroom					444,851	$0.25	53,459	$0.50	137,942
	Total Periodicals					**64,826,010**	$0.25	**7,790,306**	$0.50	**20,101,656**
	Standard Mail									
	Presort	13,818,738	0.02	4,935,263	$0.15	2,734,926	$0.25	10,898	$0.50	1,705,845
	Automation	251,813,449	0.02	89,933,375	$0.15	49,837,479	$0.25	198,594	$0.50	31,084,942
	ECR	112,722,980	0.02	40,258,207	$0.15	22,309,488	$0.25	88,900	$0.50	13,915,013
	Total Bulk Std.	**378,355,167**	0.02	**135,126,845**	$0.15	**74,881,893**	$0.25	**298,392**	$0.50	**46,705,799**
	Package Services									
	Parcel Post					2,547,310	$0.25	4,478	$0.50	639,066
	BPM					5,215,027	$0.25	2,590	$0.50	1,305,052
	Media Mail					1,125,119	$0.25	1,059	$0.50	281,809
	Library Rate					202,742	$0.25	1,105	$0.50	51,238
	Total Pkg. Services					**9,090,197**		**9,232**		**2,277,165**
Grand Total Address Correction		**787,792,143**		**263,075,900**		**185,989,987**		**60,680,520**		**$ 104,004,881**
Grand Total Trans. (Auto & Electronic & Manual)						**1,297,538,550**				

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

B. Bulk/Presort Mailing Fees

		Transactions	Fee	Revenues
	First Class			
Regular:	Letter Presort	873	$ 175	$ 152,731
	Post Card Presort	210	175	36,752
Auto:	Auto Letter	36,006	175	6,301,041
	Auto Postcard	2,319	175	405,851
	Total First-Class	**39,408**		**6,896,374**
	Standard			
Regular:	Presort	8,688	175	1,520,482
	Automation	174,450	175	30,528,803
	ECR	85,620	175	14,983,485
	Total Reg. Bulk	268,759		47,032,770
Nonprofit:	NP Presort	9,096	175	1,591,820
	NP Automation	111,481	175	19,509,106
	NP ECR	24,563	175	4,298,553
	Total NP Bulk	145,140		25,399,479
	Total Standard	**413,899**		**72,432,249**
	Package Services			
	Media Mail	705	175	123,358
	Parcel Return Service	2	175	350
	Destination Entry			
	Parcel Select	153	175	26,839
	Bound Printed Matter	383	175	67,053
	Total Destination Entry	537		93,892
	Total Package Services	**1,243**		**217,600**
	Merchandise Return			
	First-Class	457	175	80,054
	Priority	222	175	38,889
	Standard	-	175	-
	Package Services	355	175	62,147
	Total Merchandise Return	**1,035**		**181,090**
	Bulk Parcel Return Service	121	175	21,179
Total Bulk/Presort Mailing Fees		**455,704**		**$ 79,748,143**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

C. Business Reply Mail Fees

	Volume (000)	Fee	Revenues (000)
Advance Deposit			
QBRM with Quarterly Fee	151,803	$ 0.005	$ 759
QBRM without Quarterly Fee	206,021	0.050	$ 10,301
Total QBRM	**357,824**		**$ 11,060**
Non-QBRM Advance Deposit	305,860	0.080	$ 24,469
Nonletter-Size	3,582	0.011	$ 39
Priority	2,869	0.080	$ 230
Subtotal - Per Piece	670,135		$ 35,798
Account Maintenance Fee	65	550	$ 35,802
Nonletter-Size Monthly Fee	0.02	900	$ 234
QBRM Quarterly Fee	1	1,800	$ 7,663
Permit Fee	122	175	$ 21,288
Subtotal - Fees	188		$ 64,987
Advance Total	**670,135**		**$ 100,785**
Nonadvance Deposit			
First-Class	135,590	0.700	$ 94,913
Priority	1,196	0.700	$ 837
Nonadvance Total	**136,785**		**$ 95,750**
Grand Total	**806,920**		**$ 196,535**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

D. Certificate of Mailing Fees

TRANSACTIONS		**Basic**	**Firm Book**	**First 1000**	**Additional 1000**	**Subclass Total**	**Class Total**
First-Class Regular:	Letter	1,879,726	340,196	-	-	2,219,922	
	Letter Presort	-	-	946	2,180	3,126	
	Postcard	120,015	21,721	-	-	141,736	
	Postcard Presort	-	-	228	524	752	
First-Class Auto:	Auto Letter	-	-	38,253	88,109	126,362	
	Auto Postcard	-	-	2,515	5,792	8,306	2,500,204
Priority		50,919	1,861	558	260	53,598	53,598
Standard Regular:	Presort	203	-	23	-	226	
	Automation	3,919	-	437	-	4,356	
	ECR	2,200	-	245	-	2,445	
Standard Nonprofit:	Presort	93	-	10	-	103	
	Automation	731	-	81	-	812	
	ECR	179	-	20	-	199	8,140
Package Services:	Parcels	22,752	323	-	-	23,075	
	BPM	39,728	565	-	-	40,293	
	Media Mail	9,322	133	-	-	9,454	
	Library Rate	749	11	-	-	760	73,583
	Totals	**2,130,536**	**364,809**	**43,315**	**96,864**	**2,635,524**	**2,635,524**

REVENUES		**Basic**	**Firm Book**	**First 1000**	**Additional 1000**	**Subclass Total**	**Class Total**
	Fee >>	$1.05	$0.35	$5.50	$0.60		
First-Class Regular:	Letter	$1,973,713	$119,069	$0	$0	$2,092,781	
	Letter Presort	-	-	5,204	1,308	$6,512	
	Postcard	126,016	7,602	-	-	$133,618	
	Postcard Presort	-	-	1,252	315	$1,567	
First-Class Auto:	Auto Letter	-	-	210,392	52,865	$263,257	
	Auto Postcard	-	-	13,830	3,475	$17,305	$2,515,040
		-	-	-	-		
Priority		53,465	651	3,067	156	$57,340	57,340
		-	-	-	-		
Standard Regular:	Standard Presort	213	-	124	-	$338	
	Automation	4,115	-	2,402	-	$6,516	
	ECR	2,310	-	1,348	-	$3,658	
Standard Nonprofit:	Standard Presort	98	-	57	-	$155	
	Automation	767	-	448	-	$1,215	
	ECR	188	-	109	-	$297	12,179
		-	-	-	-		
Package Services:	Parcel Post	23,890	113	-	-	$24,003	
	BPM	41,714	198	-	-	$41,912	
	Media Mail	9,788	46	-	-	$9,834	
	Library Rate	787	4	-	-	$790	76,540
	Totals	**$2,237,063**	**$127,683**	**$238,234**	**$58,119**	**$2,661,098**	**$2,661,098**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

E. Certified Mail Fees

	Transactions (000)	Fee	Revenues (000)
Basic Fee	262,526	$ 2.65	$ 695,695

F. Collect on Delivery Fees

	Value	Transactions (000)	Fee	Revenues (000)
Fee Charge for Collectable Amount or Insurance Coverage up to	$ 50	321	$ 5.10	$ 1,639
	100	259	6.25	$ 1,619
	200	369	7.40	$ 2,728
	300	137	8.55	$ 1,172
	400	40	9.70	$ 388
	500	18	10.85	$ 197
	600	12	12.00	$ 141
	700	5	13.15	$ 60
	800	5	14.30	$ 70
	900	0	15.45	$ 1
	1,000	5	16.60	$ 80
Total Before Additional Services		**1,171**		**$ 8,096**
Additional Services -- Only Restricted Delivery from Other Subservices				
Registered COD		3	4.55	$ 12
Notice of Non-Delivery		44	3.40	$ 149
Alteration of COD		0	3.40	$ -
Restricted Delivery		0	4.10	$ -
Total Collect on Delivery		**1,173**		**$ 8,258**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

G. Insurance

	Value	Transactions	Fee	Revenues
Domestic Liability up to	$ 50	19,580,597	$ 1.65	$ 32,307,985
	100	11,435,031	2.05	23,441,814
	200	6,251,921	2.45	15,317,207
	300	1,778,424	4.60	8,180,752
	400	803,689	5.50	4,420,287
	500	746,224	6.40	4,775,836
	600	286,296	7.30	2,089,963
	700	189,188	8.20	1,551,338
	800	142,777	9.10	1,299,273
	900	56,847	10.00	568,474
	1,000	182,600	10.90	1,990,336
	1,100	27,812	11.80	328,183
	1,200	34,264	12.70	435,150
	1,300	15,702	13.60	213,549
	1,400	28,892	14.50	418,930
	1,500	58,048	15.40	893,932
	1,600	8,954	16.30	145,948
	1,700	4,277	17.20	73,561
	1,800	6,165	18.10	111,583
	1,900	3,274	19.00	62,203
	2,000	42,064	19.90	837,075
	2,100	1,334	20.80	27,738
	2,200	1,173	21.70	25,451
	2,300	1,007	22.60	22,751
	2,400	3,718	23.50	87,367
	2,500	9,109	24.40	222,254
	2,600	636	25.30	16,091
	2,700	1,536	26.20	40,234
	2,800	2,428	27.10	65,807
	2,900	868	28.00	24,316
	3,000	24,754	28.90	715,399
	3,100	835	29.80	24,875
	3,200	1,171	30.70	35,943
	3,300	0	31.60	-
	3,400	270	32.50	8,783
	3,500	1,818	33.40	60,735
	3,600	3,715	34.30	127,420
	3,700	54	35.20	1,883
	3,800	0	36.10	-
	3,900	569	37.00	21,068
	4,000	3,612	37.90	136,889
	4,100	10,518	38.80	408,091
	4,200	0	39.70	-
	4,300	1,021	40.60	41,446
	4,400	0	41.50	-
	4,500	616	42.40	26,107
	4,600	0	43.30	-
	4,700	31	44.20	1,375
	4,800	0	45.10	-
	4,900	222	46.00	10,234
	5,000	10,153	46.90	476,153
Total		**41,764,212**		**$ 102,091,792**
Express Mail Insurance		433,843		1,417,275
Grand Total		**42,198,055**		**$ 103,509,067**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

H. Merchandise Return	**Transactions**	**Fee**	**Revenues**
Account Maintenance Fee	763	$ 550	$ 419,696
Transactions			
First-Class	10,298,235	-	-
Priority	5,002,742	-	-
Standard	0	-	-
Package Services	7,994,655	-	-
Total Transactions	23,295,632		-
Total Merchandise Return			**$ 419,696**

I. Money Orders

	Transactions (000)	**Fee**	**Revenues (000)**
APO-FPO	304	$ 0.30	$ 91
Domestic (up to $500)	136,376	1.05	$ 143,195
Domestic ($500 to $1000)	17,475	1.50	$ 26,212
Inquiry Fees	551	5.00	$ 2,757
Subtotal	154,155		$ 172,256
Money Order Float Interest			$ 18,514
Outstanding MO Taken into Revenue			$ 33,372
Total Money Orders	**154,155**		**$ 224,143**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

J. Parcel Air Lift

	Transactions (000)	Fee	Revenues (000)
Fees in Addition to Parcel Postage			
Up to 2 pounds	23.2	$ 0.50	$ 11.6
Over 2 up to 3 pounds	15.1	1.00	$ 15.1
Over 3 up to 4 pounds	0.0	1.45	$ -
Over 4 pounds	16.5	2.00	$ 32.9
Total Parcel Air Lift	**54.7**		**$ 59.6**

K. Permit Imprint

Transactions	Fee	Revenue
37,301	$ 175	$ 6,527,758

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

L. Post Office Boxes and Caller Service

		Volume	Annual Fee	Revenues
Group 1				
Box Size:	1	380,719	$ 84	$ 31,611,997
	2	178,991	128	22,565,582
	3	42,191	236	9,844,493
	4	5,758	484	2,756,559
	5	968	780	747,814
		608,627		**67,526,446**
Group 2				
Box Size:	1	553,314	70	38,289,679
	2	165,420	108	17,642,343
	3	58,471	188	10,886,711
	4	9,236	368	3,377,130
	5	1,446	652	938,669
		787,887		**71,134,532**
Group 3				
Box Size:	1	1,500,909	56	83,257,907
	2	579,090	92	52,685,974
	3	197,569	168	32,792,309
	4	37,997	300	11,245,396
	5	7,315	500	3,620,682
		2,322,881		**183,602,268**
Group 4				
Box Size:	1	2,642,461	40	105,229,157
	2	1,104,217	68	74,936,782
	3	358,605	104	37,794,618
	4	65,878	204	13,543,136
	5	13,538	392	5,276,534
		4,184,699		**236,780,226**
Group 5				
Box Size:	1	3,127,675	36	110,671,014
	2	1,251,785	52	64,347,534
	3	353,367	96	33,579,652
	4	44,582	176	7,823,624
	5	7,617	296	2,254,807
		4,785,026		**218,676,631**
Group 6				
Box Size:	1	1,103,999	26	28,536,571
	2	469,387	40	18,614,271
	3	123,656	70	8,598,850
	4	14,222	124	1,758,204
	5	1,829	220	401,242
	-	1,713,093		**57,909,138**
Group 7				
Box Size:	1	326,642	20	6,648,211
	2	151,768	32	4,904,556
	3	38,963	56	2,209,968
	4	4,143	96	404,349
	5	450	172	78,109
		521,967		**14,245,193**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

L. Post Office Boxes and Caller Service (continued)

	Volume	Annual Fee		Revenues
Group E				
Box Size: 1-5	1,251,023	-		-
Unadjusted Revenue	**16,175,203**			**849,874,435**
Revenue Adjustment Factor				1.0000
Box Revenue	**16,175,203**		**$**	**849,874,435**
Caller Service				
(Except Group E)				
Fee Group: 1	7,310	1,260		8,973,187
2	10,181	1,100		11,003,823
3	25,413	970		24,436,038
4	35,987	950		33,943,421
5	16,223	930		15,004,303
6	7,027	830		5,854,596
7	421	740		316,220
	102,563			99,531,590
Reserved Number	64,865	38		2,443,355
Lock Replacement	66,776	14		$934,860
Key Duplication	183,583	6		$1,101,500
Grand Total	**16,342,631**		**$**	**953,885,739**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

M. Registered Mail

Domestic Value up to	--- Covered by USPS Insurance --- Fees	Transactions (000)	Revenues (000)	- Not Covered by USPS Insurance -- Fees	Transactions (000)	Revenues (000)
$0	N/A	-	$ -	$ 9.50	1,279	$ 12,147
100	$ 10.15	234	2,372	N/A		
500	11.25	380	4,275	N/A		
1,000	12.35	295	3,643	N/A		
2,000	13.45	320	4,303	N/A		
3,000	14.55	171	2,491	N/A		
4,000	15.65	94	1,470	N/A		
5,000	16.75	110	1,847	N/A		
6,000	17.85	83	1,490	N/A		
7,000	18.95	46	866	N/A		
8,000	20.05	60	1,201	N/A		
9,000	21.15	44	931	N/A		
10,000	22.25	56	1,253	N/A		
11,000	23.35	46	1,084	N/A		
12,000	24.45	17	421	N/A		
13,000	25.55	13	335	N/A		
14,000	26.65	12	326	N/A		
15,000	27.75	22	611	N/A		
16,000	28.85	34	983	N/A		
17,000	29.95	8	242	N/A		
18,000	31.05	17	515	N/A		
19,000	32.15	6	193	N/A		
20,000	33.25	21	692	N/A		
21,000	34.35	13	459	N/A		
22,000	35.45	7	262	N/A		
23,000	36.55	4	159	N/A		
24,000	37.65	7	276	N/A		
25,000	38.75	72	2,772	N/A		
		--------	-----------		---------	-----------
Subtotals		2,194	35,471		1,279	12,147
Combined Total Before Handling Charges					3,473	47,619
Handling Charges	$1.10	37	$41			
Combined Total for Registered Mail					**3,510**	**$47,660**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

N. Restricted Delivery Fees

	Transactions	Fee	Revenues
Basic Fee	1,891,099	$ 4.10	$ 7,753,506

O. Return Receipt Fees

	Transactions (000)	Fee	Revenues (000)
Requested at Time of Mailing			
Electronic	232	$ 0.85	$ 197
Registry	1,317	2.15	2,831
Certified Mail	202,938	2.15	436,317
Insured Mail	836	2.15	1,797
COD	1	2.15	2
Merchandise	667	3.50	2,333
Requested after Mailing			
Registry	606	3.80	2,303
Certified Mail	29,944	3.80	113,786
Insured Mail	207	3.80	786
Total Return Receipts	**236,747**		**$ 560,353**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

P. Periodicals Application Fees

	Transactions	Fee	Revenues
Within County			
Original Entry	55	$ 500	$ 27,604
Reentry	423	55	23,278
Additional Entry	181	75	13,600
News Agents	23	45	1,055
Total Within County	683		$ 65,536
Regular Rate Publications			
Original Entry	474	500	237,111
Reentry	3,635	55	199,951
Additional Entry	1,558	75	116,818
News Agents	201	45	9,058
Total Regular Rate	5,869		$ 562,938
Nonprofit Publications			
Original Entry	128	500	64,014
Reentry	981	55	53,981
Additional Entry	421	75	31,538
News Agents	54	45	2,445
Total Nonprofit	1,584		$ 151,978
Classroom			
Original Entry	5	500	2,271
Reentry	35	55	1,915
Additional Entry	15	75	1,119
News Agents	2	45	87
Total Classroom	56		$ 5,393
Summary			
Original Entry	662	500	331,000
Reentry	5,075	55	279,125
Additional Entry	2,174	75	163,075
News Agents	281	45	12,645
Total Periodicals Application Fees	**8,192**		**$ 785,845**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

Q. Special Handling Fees

		Transactions	Fee	Revenues
First-Class		1,501,696	$ 6.90	10,361,702
Priority				
	up to 10 lbs	53,671	6.90	370,332
	> 10 lbs	955	9.60	9,165
Total Priority		**54,626**		**379,498**
Package Services				
Parcel Post	up to 10 lbs	42,221	6.90	291,328
	> 10 lbs	5,007	9.60	48,067
Total Parcel Post		**47,228**		**339,395**
Media Mail	up to 10 lbs	5,402	6.90	37,272
	> 10 lbs	-	9.60	-
Total Special Rate		**5,402**		**37,272**
Bound Printed Matter	up to 10 lbs	4839	6.90	33,387
	> 10 lbs	-	9.60	-
Total BPM		**4,839**		**33,387**
Total Special Handling Fees		**1,613,791**		**$ 11,151,253**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

R. Stamped Envelopes

	Size 6-3/4		Size 10		
	Transactions	Fee	Transactions	Fee	Revenues
Plain Envelopes					
Single	4,676,969	$ 0.09	36,592,274	$ 0.09	$ 3,714,232
Note: Below are boxes of 500, except household					
Regular, Window , Precanceled Regular, Precanceled Window	33,648	14.50	267,439	16.50	4,900,633
Total Plain Envelope Transactions (in 500's)			383,625		
Total Plain Envelope Revenues					8,614,865
Printed Envelopes					
Regular, Window , Precanceled Regular, Precanceled Window	89	20.00	212,927	23.00	4,899,098
Household Regular Household Window (Box of 50)	-	4.25	33,591	4.25	142,760
Total Printed Envelope Transactions (in 500's)			216,375		
Total Printed Envelope Revenues					5,041,858
Total Stamped Envelope Transactions (in 500's)			600,000		
Total Stamped Envelope Sales			**300,000,000**		
Total Envelope Revenues					**$ 13,656,723**

	Transactions (000)	Fee ($)	Revenues (000)
S. Zip Coding of Mail Lists (per 1000 addresses)	0.047	$ 110	$ 5.156
T. Correction of Mailing Lists (per change of address)	211	0.33	70
U. Address Changes for Election Boards, etc. (per change of address)	82	0.32	26
V. Carrier Sequencing of Address Cards	N/A	0.33	N/A

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

W. Delivery Confirmation

	Volume (000)	Fee	Revenues (000)
First-Class Manual	17,245	$ 0.75	$ 12,934
First-Class Electronic	37,091	0.18	$ 6,676
Total First-Class	**54,336**		**$ 19,610**
Priority Manual	85,229	0.65	$ 55,399
Priority Electronic	172,583	-	$ -
Total Priority	**257,812**		**$ 55,399**
Standard Electronic	**59,754**	0.18	**$ 10,756**
Parcel Select Electronic	267,830	-	$ -
Other Package Services Manual	17,820	0.75	$ 13,365
Other Package Services Electronic	153,767	0.18	$ 27,678
Total Package Services	**439,417**		**$ 41,043**
Total Delivery Confirmation	**811,319**		**$ 126,808**

X. Stamped Cards

Transactions	Fee	Revenues
113,618,223	$ 0.02	$ 2,272,364

Y. Bulk Parcel Return Service

	Transactions	Fee	Revenues
Per Piece	2,554,564	$ 2.10	$ 5,364,584
Account Maintenance Fee	45	550	24,877
Total Bulk Parcel Return Service			**$ 5,389,461**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

Z. Signature Confirmation

	Volume TYAR (000)	Fee	Revenues (000)
First-Class Manual	840	$ 2.10	$ 1,764
First-Class Electronic	1,229	1.75	2,152
Total First-Class	2,069		3,915
Priority Manual	4,473	2.10	9,393
Priority Electronic	2,878	1.75	5,036
Total Priority	7,351		14,429
Package Services Manual	560	2.10	1,175
Package Services Electronic	559	1.75	978
Total Package Services	1,119		2,153
Total Signature Confirmation	**10,538**		**$ 20,498**

AA. Premium Forwarding Service

	Volume TYAR	Fee	Revenue
Packages	961,458	$2.85	$2,740,155
Application Fee	96,146	$10.00	$961,458

AB. Shipper Paid Forwarding

	TYAR Volume	Fee	TYAR Revenue
First-Class	4	$ 550	$ 1,974
Priority	2	550	959
Package Services	3	550	1,532
Total Accounting	**8**		**$ 4,465**

COMMISSION RECOMMENDED FEES
APPLIED TO TEST YEAR TRANSACTIONS

AC. Standard Mail Weighted Fee

	TYAR Volume	Fee	TYAR Revenue
Regular	8,062,794	$1.34	$10,796,657
Nonprofit	3,949,119	$1.11	$4,399,656
Total	**12,011,912**		**$15,196,313**

AD: Standard Mail Forwarding

	TYAR Volume	Fee	TYAR Revenue
Letters	2,873,438	$0.35	$1,005,703
Flats	1,474,447	$1.05	$1,548,170
Total	**4,347,886**		**$2,553,873**

AE: Confirm

	TYAR Volume	Fees	TYAR Revenue
VALUE:			
Silver	16	$2,000.00	$32,000
Additional Scans	0	$500.00	$0
Gold	119	$6,000.00	$714,000
Additional Scans	1	$750.00	$750
Platinum	45	$19,500.00	$877,500
Additional IDs			
Quarter	0	$750	$0
Annual	0	$2,000	$0
Total	**0**		**$0**
Total	**181**		**$1,624,250**

Comparison of Markups

	R2006-1 PRC Recommended Rates	R2005-1	R2001-1	R2000-1 Modified	R2000-1	R97-1	R94-1	R90-1	R87-1	R84-1	R80-1	R77-1	R76-1	R74-1	R71-1
All Mail & Special Services	79.3	77.0	64.8	58.5	58.7	55.3	56.8	50.0	48.0	52.0	27.0	24.0	52.0	69.0	85.0
First-Class Mail															
Letters	111.6	111.3	92.0	78.1	78.8	72.4	74.5	61.7	58.0	59.0	25.0	24.0	63.0	87.0	96.0
Cards	55.4	53.0	42.6	36.8	33.0	50.5	36.7	45.9	64.0	93.0	33.0	49.0	104.0	129.0	173.0
Priority Mail	49.8	40.1	59.5	61.4	61.9	66.1	97.2	85.4	76.0	104.0	58.0	66.0	121.0	132.0	213.0
Express Mail	70.4	71.8	84.0	51.3	51.3	13.6	18.9	28.6	69.0	139.0	123.0	422.0	--	--	--
Mailgrams	--	148.8	42.4	29.4	33.3	725.5	1.6	2.8	11.0	81.0	193.0	137.0	--	--	--
Periodicals															
Within County	0.1	1.4	0.2	0.4	0.3	0.5	2.7	1.5	5.0	1.0	--	--	--	1.0	--
Regular Rate	--	--	--	1.0	0.9	1.0	16.3	23.2	25.0	24.0	21.0	0.0	19.0	17.0	29.0
Nonprofit 1/	--	--	--	(3.5)	(3.9)	0.7	4.1	1.1	5.0	3.0	--	--	--	--	--
Classroom	--	--	--	2.5	1.7	(16.3)	6.8	--	5.0	--	--	--	--	--	--
Outside County	0.2	2.9	1.3	0.3	0.1	0.8	13.8	--	--	--	--	--	--	--	--
Controlled Circulation	--	--	--	--		--	--	--	--	--	--	33.0	49.0	82.0	162.0
Standard Mail															
Single Piece	--	--	--	--		--	4.5	20.1	26.0	15.0	--	4.0	4.0	4.0	75.0
Regular	--	--	--	37.0	37.4	34.6	23.4	47.0	41.0	46.0	34.0	20.0	55.0	82.0	104.0
Nonprofit	--	--	--	8.2	7.4	13.7	1.7	0.9	8.0	(1.0)	--	--	--	--	--
Regular and Nonprofit	70.8	51.5	35.1	31.9	32.1	31.2	19.0	--	--	--	--	--	--	--	--
Enhanced Carrier Route (ECR)	--	--	--	99.0	99.4	103.0	109.4	--	--	--	--	--	--	--	--
Nonprofit ECR	--	--	--	36.6	36.1	43.0	53.8	--	--	--	--	--	--	--	--
ECR and NECR	106.3	137.8	101.0	94.6	94.9	99.4	105.2	--	--	--	--	--	--	--	--
Package Services															
Parcel Post	13.9	15.8	14.1	15.5	14.9	8.0	7.4	11.5	12.0	16.0	6.0	3.0	21.0	41.0	56.0
Bound Printed Matter	19.4	21.8	24.1	13.1	13.9	35.6	36.6	44.5	49.0	74.0	39.0	25.0	63.0	90.0	169.0
Media Mail	--	--	--	2.4	1.9	5.6	4.6	4.8	6.0	12.0	6.0	2.0	35.0	38.0	54.0
Library Rate	--	--	--	(4.1)	(4.5)	(17.9)	0.8	0.0	1.0	2.0	--	--	--	1.0	--
Media and Library	3.7	0.2	9.6	1.5	1.0	1.8	4.1	--	--	--	--	--	--	--	--
Government Mail 2/	--	--	--	--		--	--	--	120.0	136.0	132.0	116.0	206.0	229.0	212.0
Free-for-the-Blind Mail	--	--	--	--		--	--	--	--	--	--	--	--	--	--
International Mail	24.9	21.9	12.2	4.9	6.3	25.3	21.8	48.1	23.0	48.0	16.0	29.0	57.0	62.0	103.0
Special Services	57.8	63.3	66.0	68.5	63.1	43.5	34.7	28.2	9.0	30.0	21.0	18.0	2.0	8.0	75.0

1/ Nonprofit and Classroom were combined in R90-1.
2/ Since R90-1, Government Mail has been distributed to all classes.

Comparison of Markup Indices

	R2006-1 PRC Recommended Rates	R2005-1	R2001-1	R2000-1 Modified	R2000-1	R97-1	R94-1	R90-1	R87-1	R84-1	R80-1	R77-1	R76-1	R74-1	R71-1
All Mail & Special Services	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
First-Class Mail															
Letters	1.407	1.446	1.420	1.334	1.342	1.308	1.311	1.235	1.200	1.135	0.926	1.000	1.210	1.260	1.130
Cards	0.698	0.688	0.658	0.629	0.561	0.913	0.645	0.919	1.330	1.788	1.222	2.040	2.000	1.870	2.040
Priority Mail	0.628	0.521	0.919	1.050	1.053	1.195	1.710	1.708	1.580	2.000	2.148	2.750	2.330	1.910	2.510
Express Mail	0.888	0.933	1.296	0.878	0.873	0.245	0.332	0.572	1.420	2.673	4.556	17.580	--	--	--
Mailgrams	--	1.934	0.654	0.502	0.568	13.114	0.028	0.056	0.230	1.558	10.852	5.710	--	--	--
Periodicals															
Within County	0.001	0.018	0.004	0.006	0.005	0.010	0.048	0.031	0.110	0.019	--	--	--	0.010	--
Regular Rate	--	--	--	0.017	0.015	0.017	0.286	0.465	0.510	0.462	0.778	0.000	0.370	0.250	0.340
Nonprofit 1/	--	--	--	(0.060)	(0.066)	0.012	0.071	0.022	0.100	0.058	--	--	--	--	--
Classroom	--	--	--	0.042	0.029	(0.294)	0.119	--	0.100	--	--	--	--	--	--
Outside County	0.002	0.037	0.021	0.005	0.002	0.015	0.242	--	--	--	--	--	--	--	--
Controlled Circulation	--	--	--	--		--	--	--	--	--	--	1.380	0.940	1.190	1.480
Standard Mail															
Single Piece	--	--	--	--		--	0.079	0.402	0.540	0.288	--	0.170	0.080	0.060	0.880
Regular	--	--	--	0.633	0.637	0.626	0.412	0.941	0.840	0.885	1.259	0.830	1.060	1.190	1.220
Nonprofit	--	--	--	0.140	0.126	0.248	0.030	0.018	0.170	(0.019)	--	--	--	--	--
Regular and Nonprofit	0.892	0.670	0.542	0.546	0.547	0.563	0.335	--	--	--	--	--	--	--	--
Enhanced Carrier Route (ECR)	--	--	--	1.693	1.692	1.862	1.926	--	--	--	--	--	--	--	--
Nonprofit ECR	--	--	--	0.626	0.615	0.778	0.948	--	--	--	--	--	--	--	--
ECR and NECR	1.339	1.790	1.560	1.617	1.616	1.797	1.851	--	--	--	--	--	--	--	--
Package Services															
Parcel Post	0.175	0.206	0.218	0.264	0.253	0.144	0.131	0.230	0.240	0.308	0.222	0.130	0.400	0.590	0.660
Bound Printed Matter	0.244	0.283	0.373	0.224	0.237	0.643	0.644	0.890	1.020	1.423	1.444	1.040	1.210	1.300	1.990
Media Mail	--	--	--	0.040	0.032	0.101	0.080	0.097	0.110	0.231	0.222	0.080	0.670	0.550	0.640
Library Rate	--	--	--	(0.070)	(0.076)	(0.324)	0.013	0.001	0.030	0.038	--	--	--	0.010	--
Media and Library	0.046	0.002	0.148	0.025	0.017	0.033	0.073	--	--	--	--	--	--	--	--
Government Mail 2/	--	--	--	--		--	--	--	2.480	2.615	4.889	4.830	3.960	3.320	2.490
Free-for-the-Blind Mail	--	--	--	--		--	--	--	--	--	--	--	--	--	--
International Mail	0.314	0.285	0.188	0.084	0.106	0.457	0.383	0.962	0.480	0.923	0.593	1.210	1.100	0.900	1.210
Special Services	0.728	0.823	1.019	1.171	1.074	0.787	0.611	0.564	0.200	0.577	0.778	0.750	0.040	0.120	0.880

1/ Nonprofit and Classroom were combined in R90-1.
2/ Since R90-1, Government Mail has been distributed to all classes.

COMPARISON OF ESTIMATED TEST YEAR VOLUMES[1]

(Pieces in Thousands)

	USPS Est. TYAR Volume	PRC Est. TYAR Volume
First-Class Mail		
Single-Piece Letters	37,206,438	37,613,747
Presort Letters	929,256	1,159,748
Automation Letters	47,497,945	46,406,152
Workshared Letters	48,427,200	47,565,900
Total Letters	**85,633,639**	**85,179,646**
Single-Piece Cards	2,358,960	2,391,827
Presort Cards	300,783	277,854
Automation Cards	2,997,708	3,068,354
Workshared Cards	3,298,491	3,346,208
Total Cards	**5,657,451**	**5,738,035**
Total First-Class	**91,291,090**	**90,917,681**
Priority Mail	829,079	829,856
Express Mail	42,683	42,683
Periodicals		
Within County	700,140	705,280
Regular Rate	6,290,945	6,287,446
Nonprofit	1,698,941	1,697,440
Classroom	60,068	60,230
Total Periodicals	**8,750,094**	**8,750,396**
Standard Mail		
Regular Presort	2,859,038	3,011,563
Regular Automation	60,067,212	60,577,976
Total Regular	**62,926,250**	**63,589,539**
Nonprofit Presort	1,129,174	936,648
Nonprofit Automation	11,243,381	11,479,416
Total Nonprofit	12,372,554	12,416,064
Total Regular and Nonprofit	**75,298,805**	**76,005,603**
ECR	29,346,811	29,682,108
Nonprofit ECR	2,522,847	2,529,325
Total ECR and NECR	31,869,658	32,211,433
Total Standard Mail	**107,168,463**	**108,217,035**

Comparison of Estimated
Test Year Volumes[1]
(Pieces in Thousands)

	USPS Est. TYAR Volume	PRC Est. TYAR Volume
Parcel Post	362,597	367,858
Bound Printed Matter	654,853	654,923
Media Mail	153,731	153,674
Library Rate	12,253	12,352
Total Media and Library	**165,984**	**166,026**
Total Package Services	**1,183,434**	**1,188,808**
USPS Penalty Mail	646,024	646,024
Free-for-the-Blind Mail	87,514	87,514
TOTAL DOMESTIC MAIL	**209,998,381**	**210,679,997**
International Mail	771,496	771,496
TOTAL ALL MAIL	**210,769,877**	**211,451,493**
Special Services		
Registered Mail	3,396	3,510
Insured Mail	41,636	41,764
Certified Mail	263,719	262,526
Collect on Delivery	1,135	1,173
Money Orders	151,879	154,155
Stamped Cards	111,951	113,618
Return Receipts	237,633	236,747
Delivery Confirmation	811,319	811,319
Signature Confirmation	10,538	10,538
Total Special Services	**1,633,206**	**1,635,351**

1/ The volumes on this appendix have not been adjusted for the effect of negotiated service agreements or for any classification changes.

ECONOMIC DEMAND MODELS AND FORECAST METHODOLOGY

[1] For this proceeding, and for all general rate proceedings since Docket No. R80-1, the Commission has adopted the econometric demand models and forecasting methods developed by Postal Service witnesses. In the present case, these models and methods are described in detail for all categories of domestic mail and special services in the testimony of witness Thress. The models are similar in design to those provided by witness Thress, and used by the Commission, in Docket Nos. R97-1, R2000-1, R2001-1 and R2005-1. They are somewhat similar to earlier models supplied by Postal Service witnesses Tolley and Musgrave. Witness Thress' demand models and forecasts are described extensively in his direct testimony (USPS-T-7). The data, econometrics and forecasting process are found in four supporting library references: USPS-LR-L-63, USPS-LR-L-64, USPS-LR-L-65, and USPS-LR-L-66. Additional original econometric evidence is also contained in witness Thress' rebuttal testimony (USPS-RT-2).

[2] Postal Service witness Bernstein discusses aspects of the demand models relating to the effects of electronic diversion via the Internet. *See* USPS-T-8. Forecasts of volumes and revenues for International mail and services are found in the Postal Service response to Presiding Officer's Information Request No. 1, Question 11 and in the supporting library reference USPS-LR-L-121.

[3] The Postal Service models were criticized in the testimony of witnesses Clifton and Kelejian, sponsored by the Greeting Card Association (GCA). Witness Clifton asserts that the equation used by witness Thress to model the demand for First-Class single-piece mail fails to correctly represent the impact of electronic diversion on the price elasticity of this large and disparate subclass. He argues that the price elasticity estimated by witness Thress has too small a magnitude and offers substitute equations for First-Class single-piece and Standard Regular mail.

[4] Witness Kelejian raises several problematic technical aspects of witness Thress' econometric practice. His comments and criticisms apply to many of the equations fit by witness Thress and suggest general questions regarding the statistical

qualities of the Postal Service demand model and, in particular, the estimates of price elasticities. Witness Kelejian's critique of the Postal Service models and econometrics was submitted, at first, as an attachment to the Clifton testimony and later as direct testimony in GCA-T-5.

[5] Witnesses Thress, Clifton and Kelejian have also responded extensively to written interrogatories, and, orally, in hearings.

[6] In response to this testimony, the Commission has conducted a review of the Postal Service econometric demand models and forecast methodology. The purpose of this review is two-fold. First, it was necessary for the Commission to evaluate issues raised by GCA witnesses to determine if the Postal Service econometric models are seriously flawed. This evaluation led to an investigation focused more widely on the reliability of the forecasts and elasticity estimates used by the Commission, on the econometric practice of witness Thress, on his demand equations and on potential opportunities to replace or improve them for future proceedings. Commission findings, in summary, are as follows:

- Volume forecasts made with the Postal Service models appear to be unbiased and highly accurate in the aggregate. The accuracy is also excellent for the larger subclasses. However, the reliability of these forecasts declines precipitously for smaller subclasses and when the mailstream is divided into worksharing categories.
- The conventional statistical properties of witness Thress' long-run own-price elasticity estimates are fair-to-good, but the estimates are not often robust.
- The lag structures for price effects found in witness Thress' equations are mostly assumed or the forced result of his estimation method.
- Witness Thress' reported own-price elasticities do not conform to the conventional economic definition of price elasticity when discounts are included among the explanatory variables of his equations. On those occasions, the conventional definition implies that the price elasticities have higher absolute values.
- Witness Thress' econometric practice is mostly conventional. The technical issues raised by witness Kelejian would not have much effect on the volume forecasts and are likely to have only a minor impact on the estimates of price elasticities.
- It is impossible to tell from the available evidence whether witness Thress has underestimated the price elasticity for First-Class single-piece mail.

- Witness Clifton's equations for First-Class single-piece and Standard Regular mail are not preferable to those of witness Thress.
- The demand equations specified by witness Thress are complex, frequently non-linear and commonly include explanatory variables that exhibit a high degree of co-linearity. There appear to be many ways that the Postal Service models could be simplified and improved.
- The Postal Service forecasting methodology is well-suited to the Commission's needs and to the Postal Service models. However, there are several ways that the Commission could potentially improve the forecasts for a rate proceeding by updating the information from which they are derived.

1. How reliable are the forecasts of volumes produced by the Postal Service forecasting models?

[7] The Commission's recommended rates are designed to meet a revenue target that allows Postal Service to cover the total cost of providing mail and related services plus other permitted expenses during the test year. If determining these rates is to be more than an academic exercise, then the volume forecasts used by the Commission must be forecasts of the actual volumes of mail and special services that are expected to arise in response to the recommended rates during the test year. The more accurate the volume forecasts, the more accurate will be the corresponding forecast of postal revenue.

[8] An inaccurate forecast will affect the Commission's projection of net revenue during the test year because the recommended rates exceed marginal costs for virtually every category of domestic mail and service. If demand is underestimated, this creates an unintended net surplus in the test year. Conversely, an overestimate creates a net deficit. Therefore, the quality of the volume forecasts largely determines the confidence the Commission can place in its judgment that the recommended rates will meet the prescribed revenue target.

[9] The volume forecasts may be inaccurate for many reasons, some of which have little to do with the quality of the Postal Service demand models or witness Thress'

econometrics. Any listing of factors affecting the accuracy of the forecasts ought to include the following:

- Sampling error: volume statistics periodically reported by the Postal Service in the Revenue, Pieces, and Weights (RPW) reports are derived from samples of only a very small portion of the mailstream. The sampling errors left in the volume statistics are inherently random and can not be reduced by perfecting the demand models or the econometrics.
- Sample size: the samples that are available for fitting the Postal Service models are fairly short quarterly time series, typically of about 80 observations. This limits the complexity of the models primarily because the number of estimated parameters must be small relative to the size of the sample.
- Autoregressive disturbances: the errors from equations fit to a time series often exhibit nonrandom patterns over time. This characteristic tends to reduce the useful information contained in a sample.
- Colinearity: many variables that describe economic activity, and especially postal rates, are highly correlated over time making it difficult to statistically distinguish between their effects within a small sample.
- Structural change: variations in postal volumes are partly caused by structural changes in postal markets occurring within the time period spanned by the samples. This often means that the explanatory variables describing the changes have incomplete records.
- Forecasts off a base year: the Postal Service methodology is to forecast off a recent base year. This embeds the average of the forecast errors in the base year within the test year forecasts.
- Forecasts of economic activity and non-postal prices: the Postal Service demand models make volumes a function of an array of variables representing economic activity and non-postal price levels. The accuracy of the volume forecasts depends in turn on the accuracy of projections into the future of these explanatory variables.
- Installation of the tariff: the Postal Service does not always enact a new tariff exactly as recommended by the Commission. Often, different parts of a recommended tariff are installed on dates that differ from the date of installation assumed for the volume forecasts.

[10] Sample size, autoregressive disturbances, colinearity, and structural change all place practical limits on the complexity of the equations that can be successfully fit to the available data. Therefore, of necessity, any econometric model will be an approximation. Sampling error, forecasting off a base year and the use of imperfect forecasts of economic activity and non-postal prices would cause errors in the forecasts

of volumes even in the unlikely event that the econometrics had yielded precise estimates of the "true" demand equations.

[11] The Commission's assessments of the reliability of the volume forecasts are based on evidence from several sources. First, coefficients of variation (CVs) for the GFY 2004 and GFY 2005 RPW reports can be found attached to the testimony of Postal Service witness Pafford in Docket No. R2005-1 (USPS-T-4) and Docket No. R2006-1 (USPS-T-3). The CV of a statistic is the ratio of the statistic's standard deviation to its mean value and is usually expressed as a percentage. The CVs for the RPW statistics are measurements of the magnitudes of the sampling errors in the annual RPW summary reports.

[12] A second important source of evidence is the goodness-of-fit statistics for the fitted equations of the Postal Service models. These statistics are found, for the current proceeding, throughout the direct testimony of witness Thress. For each of the subclass demand equations, witness Thress reports the mean square error (MSE) and the adjusted R-Squared. He also fits share equations to predict the division of several worksharing categories into automated and non-automated shares. For the share equations he reports the mean absolute percentage error (MAPE).

[13] Third, witness Thress has provided econometric models and forecasts for the most recent past four general rate proceedings as well as the present one. The models used in these past cases are sufficiently similar in design and estimation to the current edition that the performance of the forecasts versus the actual volumes should provide a "track record" to reveal the reliability of the forecasts made for this proceeding. And, fourth, the Commission's rules require the Postal Service to provide before-rates forecasts of volumes for the quarters that intervene between the base year (GFY 2005) and the test year (GFY 2008). [Rules of Practice and Procedure 3001.54(j)] Most of these forecasts can be found attached to witness Thress direct testimony *See* USPS-T-7, Attachment A. Forecasts for International Mail are contained in the response to Presiding Officer's Information Request No. 1, Question 11. USPS-LR-L-121. The before-rates quarterly forecasts for GFY 2006 can now be directly compared to the

quarterly GFY 2006 volumes which were provided by the Postal Service in the end-of-year GFY 2006 RPW report received by the Commission in December 2006.

[14] Some of this evidence is displayed in the RPW format in Tables 1 and 2. The RPW CVs are those for GFY 2005. The subclass CVs are derived from witness Thress' MSEs using the formula: $CV = \frac{\exp\{\sqrt{MSE}\} - \exp\{-\sqrt{MSE}\}}{2}$. The share CVs are the MAPEs for the share equations. The CVs for classes and other combinations of categories were computed by assuming that the component errors are uncorrelated. All of the CVs are expressed as percentages. Table 1 displays the percentage errors in the forecasts for the past four rate proceedings. These percentage errors are derived as percentages of the forecasts: (Actual test year volume - Forecast test year volume) / (Forecast test year volume). *See* Docket No. R97-1, R2000-1, R201-1, and R2005-1 Opinion and Recommended Decision. The actual volumes are those from the RPW for the test year. Table 2 displays the percentage errors of the before-rates forecasts made by witness Thress for the four quarters of GFY 2006. The formula for these percentage errors is: (Actual quarterly volume – Forecast quarterly volume) / (Forecast quarterly volume). Both tables show the percentage errors in witness Thress' before-rates forecasts for all of GFY 2006.

[15] The Commission believes that the testimony and statistics referenced above support the Commission's reliance on aggregate forecasts of test year volumes and revenues made with the Postal Service models and forecasting methodology. The very low RPW and subclass CVs for total domestic mail and for the four major mail classes show that the quality of the RPW data is high at this level and that the models should produce forecasts with low percentage errors. This predicted reliability is borne out in the actual performance of the forecasts in prior rate proceedings and during GFY 2006. The forecast errors are no more than a few percentage points in all years and quarters except GFY 2003, the test year for the forecasts from Docket No. R2001-1. Postal volumes were still depressed in GFY 2003 due to the 9/11 and Anthrax attacks.

Table I-1

Camparisons of Percentage Errors - Postal Rate Proceedings
Forecast versus RPW Numbers of Pieces

RPW Volumes	RPW CV	Subclass CV	Share CV	Percentage Difference Actual vs Forecast R97-1	R2000-1	R2001-1	R2005-1	GFY 2006
First Class Mail								
Single-Piece Letters	0.28%	1.57%		0.11%	-1.24%	-0.60%	-0.92%	1.59%
Nonautomation Presort Letters	1.96%	1.09%	5.08%	-8.44%	77.24%	-17.14%	54.97%	15.33%
Automation Presort Letters	0.17%	1.09%	0.35%	-2.14%	-8.82%	-7.23%	2.90%	1.87%
Total Letters	0.14%	0.94%		-1.21%	-2.69%	-4.43%	1.75%	1.96%
Single-Piece Cards	1.14%	3.86%		-5.46%	-4.10%	-2.82%	-7.30%	-7.75%
Nonautom. Presort Cards	10.48%	3.21%	8.92%	-16.08%	68.95%	78.02%	25.18%	10.95%
Automation Presort Cards	2.54%	3.21%	1.76%	3.94%	-13.18%	-6.12%	12.32%	6.65%
Total Cards	1.47%	2.47%		-3.56%	-2.64%	-1.02%	4.10%	0.55%
Total First-Class	0.13%	0.89%		-1.34%	-2.69%	-4.26%	1.89%	1.88%
Priority Mail	0.72%	2.25%		5.18%	-2.23%	-27.03%	15.63%	2.55%
Express Mail		1.67%		10.37%	-3.35%	-20.14%	11.04%	2.82%
Mailgrams		22.57%		-10.10%	2.78%	2.42%		
Periodicals								
Within County	2.29%	6.25%		1.63%	2.51%	-7.03%	1.37%	0.48%
Regular Rate	0.07%	2.17%		0.11%	-3.04%	-8.34%	-0.45%	-1.28%
Nonprofit	0.31%	5.87%		-0.36%	2.99%	0.38%	0.26%	2.15%
Classroom	0.30%	5.87%		33.81%	14.29%	4.04%	-11.00%	-8.15%
Total Periodicals	0.20%	2.02%		0.30%	-1.28%	-6.46%	-0.24%	-0.51%
Standard Mail								
Single-Piece				-8.35%				
Regular - Non-automation Presort	1.03%	1.58%	2.69%	-29.34%	19.34%	-10.10%	1.24%	-4.34%
Regular - Automation Presort	0.13%	1.58%	0.17%	-0.71%	1.39%	-0.55%	-3.13%	-2.62%
Enhanced Carrier Route	0.37%	2.07%		17.70%	-1.11%	-11.46%	2.51%	1.21%
Total Standard Regular	0.05%	1.26%		3.01%	1.50%	-5.53%	-0.94%	-1.27%
Nonprofit - Non-automation Presort	1.02%	1.69%	2.00%	3.51%	-11.68%	1.47%	-1.06%	1.98%
Nonprofit - Automation Presort	0.34%	1.69%	0.43%	-1.79%	2.59%	-3.79%	-3.14%	-0.01%
Nonprofit Enhanced Carrier Route	2.09%	7.13%		2.24%	1.52%	-7.98%	-15.24%	-4.93%
Total Standard Nonprofit	0.21%	1.97%		0.45%	-0.93%	-3.91%	-5.35%	-0.72%
Total Standard Mail	0.06%	1.11%		2.57%	1.10%	-5.28%	-1.59%	-1.19%
Package Services								
Parcel Post	0.26%	3.75%		49.21%	-12.11%	4.26%	7.81%	-8.26%
Bound Printed Matter	0.08%	7.26%		-12.34%	2.70%	-7.43%	-1.31%	1.59%
Media Mail	0.58%	6.85%		-7.81%	6.51%	12.95%	-3.32%	2.17%
Library Rate	1.72%	6.85%		-7.48%	-1.31%	-34.99%	-3.68%	12.64%
Total Package Services	0.16%	4.01%		1.76%	-1.54%	-1.47%	0.98%	-1.47%
USPS Penalty Mail	2.03%	11.76%		26.61%	2.73%	10.72%	52.42%	62.64%
Free-for-the-Blind	3.44%	27.19%		-6.40%	-17.81%	50.20%	-1.03%	-6.60%
Total Domestic Mail		0.68%		0.46%	-0.99%	-4.90%	0.29%	0.43%
International Mail				-6.39%	3.84%	-33.21%	-6.31%	-3.64%
Total All Mail				0.42%	-0.97%	-5.06%	0.27%	0.41%
Special Services								
Registry - Fees Affixed	1.88%	7.44%		0.69%	39.09%	-0.21%	136.11%	100.76%
Insurance	4.31%	7.37%		34.42%	26.22%	-6.84%	44.59%	3.59%
Collect On Delivery	1.60%	9.82%		0.82%	13.37%	-40.10%	-9.32%	6.76%
Certified	1.31%	7.65%		-7.52%	-3.87%	-10.40%	-4.69%	0.97%
Return Receipts & Confirmations	0.34%	8.50%			56.85%	41.13%	8.09%	1.40%
Money Orders		2.00%		-13.97%	-3.62%	-13.15%	-2.07%	0.31%
Total Domestic Services		5.76%		-7.77%	14.45%	12.75%	5.23%	1.24%

Table I-2

Camparisons of Percentage Errors - Before Rates Forecasts
Forecast versus RPW Numbers of Pieces

RPW Volumes	RPW CV	Subclass CV	Share CV	2006 Q1	2006 Q2	2006 Q3	2006 Q4	GFY 2006
				Percentage Difference Actual vs Forecast				
First Class Mail								
Single-Piece Letters	0.28%	1.57%		-2.05%	5.97%	2.45%	0.56%	1.59%
Nonautomation Presort Letters	1.96%	1.09%	5.08%	6.40%	10.23%	22.59%	25.69%	15.33%
Automation Presort Letters	0.17%	1.09%	0.35%	0.35%	2.95%	2.57%	1.59%	1.87%
Total Letters	0.14%	0.94%		-0.72%	4.43%	2.83%	1.50%	1.96%
Single-Piece Cards	1.14%	3.86%		-8.90%	-5.82%	-6.26%	-9.99%	-7.75%
Nonautom. Presort Cards	10.48%	3.21%	8.92%	-16.12%	18.10%	-1.15%	47.65%	10.95%
Automation Presort Cards	2.54%	3.21%	1.76%	-1.73%	8.14%	10.06%	10.95%	6.65%
Total Cards	1.47%	2.47%		-5.68%	2.57%	2.20%	3.57%	0.55%
Total First-Class	0.13%	0.89%		-1.00%	4.32%	2.79%	1.62%	1.88%
Priority Mail	0.72%	2.25%		-2.93%	9.20%	1.23%	3.65%	2.55%
Express Mail		1.67%		1.88%	3.35%	3.73%	2.29%	2.82%
Mailgrams		22.57%						
Periodicals								
Within County	2.29%	6.25%		-0.83%	-2.95%	2.53%	3.18%	0.48%
Regular Rate	0.07%	2.17%		-2.33%	-0.36%	-1.02%	-1.44%	-1.28%
Nonprofit	0.31%	5.87%		5.82%	1.14%	-1.62%	3.31%	2.15%
Classroom	0.30%	5.87%		-21.38%	8.37%	-18.92%	-0.35%	-8.15%
Total Periodicals	0.20%	2.02%		-0.72%	-0.20%	-0.97%	-0.13%	-0.51%
Standard Mail								
Single-Piece								
Regular - Non-automation Presort	1.03%	1.58%	2.69%	-2.47%	-3.05%	-4.66%	-7.35%	-4.34%
Regular - Automation Presort	0.13%	1.58%	0.17%	-2.00%	-2.24%	-4.25%	-1.98%	-2.62%
Enhanced Carrier Route	0.37%	2.07%		-1.21%	1.45%	4.99%	0.11%	1.21%
Total Standard Regular	0.05%	1.26%		-1.71%	-0.96%	-0.99%	-1.39%	-1.27%
Nonprofit - Non-automation Presort	1.02%	1.69%	2.00%	0.57%	2.27%	3.77%	1.63%	1.98%
Nonprofit - Automation Presort	0.34%	1.69%	0.43%	1.99%	1.06%	-2.75%	-0.74%	-0.01%
Nonprofit Enhanced Carrier Route	2.09%	7.13%		1.16%	-4.39%	-8.14%	-8.72%	-4.93%
Total Standard Nonprofit	0.21%	1.97%		1.68%	0.20%	-3.04%	-2.10%	-0.72%
Total Standard Mail	0.06%	1.11%		-1.21%	-0.79%	-1.27%	-1.49%	-1.19%
Package Services								
Parcel Post	0.26%	3.75%		-11.19%	-1.87%	-10.49%	-8.27%	-8.26%
Bound Printed Matter	0.08%	7.26%		1.32%	6.53%	2.32%	-2.90%	1.59%
Media Mail	0.58%	6.85%		-0.24%	6.09%	-5.67%	9.23%	2.17%
Library Rate	1.72%	6.85%		-8.20%	38.10%	11.96%	11.32%	12.64%
Total Package Services	0.16%	4.01%		-3.95%	4.16%	-3.05%	-2.63%	-1.47%
USPS Penalty Mail	2.03%	11.76%		31.02%	54.80%	131.16%	28.53%	61.64%
Free-for-the-Blind	3.44%	27.19%		6.06%	-1.56%	-14.53%	-15.86%	-6.60%
Total Domestic Mail		0.68%		-1.02%	1.82%	1.00%	0.04%	0.43%
International Mail				1.30%	-6.52%	-4.11%	-6.15%	-3.64%
Total All Mail				-1.01%	1.79%	0.98%	0.02%	0.41%
Special Services								
Registry - Fees Affixed	1.88%	7.44%		97.98%	109.14%	97.25%	98.61%	100.76%
Insurance	4.31%	7.37%		4.24%	2.91%	-1.90%	9.54%	3.59%
Collect On Delivery	1.60%	9.82%		-12.57%	11.04%	-0.28%	29.12%	6.76%
Certified	1.31%	7.65%		-4.83%	8.25%	-3.57%	4.09%	0.97%
Return Receipts & Confirmations	0.34%	8.50%		1.83%	3.21%	-5.58%	6.51%	1.40%
Money Orders		2.00%		-0.24%	1.59%	-0.43%	0.27%	0.31%
Total Domestic Services		5.76%		0.54%	3.91%	-4.49%	5.39%	1.24%

[16] The Postal Service model also seems likely to produce reliable test year forecasts for all of the larger subclasses of mail, *e.g.*, First-Class single-piece letters, First-Class presort letters, Regular rate Periodicals, Standard Regular presort, Standard ECR, and Standard Nonprofit presort. Again, the low CVs show, first, that the RPW data are fairly accurate and, second, that the Postal Service models are close fits. This pattern is mostly, but not always, confirmed by the patterns of percentage forecast errors from past rate proceedings and during GFY 2006.

[17] The forecasting reliability of the Postal Service models and methodology deteriorates rapidly as the subclasses become smaller in volume as measured by the number of pieces. The CVs in Tables 1 and 2 suggest that this decline can not be entirely attributed to the rise in sampling error. There are a number of mid-sized subclasses, such as Bound Printed Matter, with small RPW CVs, but large subclass CVs. This indicates that the Postal Service model, and not the sampling error in the RPW data, is responsible for the increasing unreliability of the forecasts.

[18] The forecasts that depend upon witness Thress' share models are the least reliable of the volume forecasts. The fairly high CVs for the share models show that they are major contributors to inaccuracies in the volume forecasts wherever they are applied to divide a subclass of mail into automated and non-automated components. Many of the share models consist of simply extrapolating base year worksharing percentages.

[19] Forecasts for domestic special services are less reliable, even in the aggregate, than the volume forecasts for the major mail classes. This should not be surprising in view of the high subclass CV (5.76 percent) that emerges from witness Thress' equation fits for domestic services. In past proceedings, witness Thress' econometric models for domestic special services were also somewhat less successful than his mail equations. For this reason, the forecast errors for all domestic services have occasionally exceeded 10 percent.

[20] There are no apparent biases in the forecasts except for those made in Docket No. R2001-1 for GFY 2003 which were too high in the aggregate and for most kinds of mail. Otherwise, positive and negative percentage differences between actual

and predicted volumes are about equally frequent in Tables 1 and 2. In Docket No. R2001-1 the model and forecasts did not reflect the impact of the 9/11 and Anthrax attacks on postal volumes. Postal volumes took time to recover from the effects of these attacks and remained somewhat depressed in GFY 2003.

2. How accurate and robust are witness Thress' estimates of price elasticities?

[21] Estimates of postal rate elasticities are necessary to correctly predict the revenue impact of changes in postal rates. If the own-price elasticity of a postal service is underestimated (absolutely), then revenues from the service will be overestimated after a rate increase. The rate elasticities are also useful for making comparisons of the value-of-use of postal services to customers. The standard economic measure of value-of-use is consumers' surplus. Calculations of consumers' surplus for a proposed set of postal rates depend almost entirely on the estimates of postal price elasticities found in the demand models.

[22] The statistical accuracy of the estimates of the parameters of an econometric model is commonly assessed under the assumption that the fitted equation structurally matches the "true" equation that generated the observations in the sample. The usual statistics for evaluating the statistical significance of coefficients and performing more sophisticated tests presume that the equation is correct in form and that the disturbances have certain assumed random properties. On the other hand, robustness describes the stability of the parameter estimates when the retained assumptions are relaxed in ways that do not conflict with the underlying economic theory. Estimates are robust if they are little changed by alterations in the explanatory variables not dictated by the relevant economic theory, by the mathematical form of the fitted equation, by arbitrary divisions of the sample, and so on. The advantage to having robust estimates is largely practical. If the estimates are robust, it is not necessary to

assume that the fitted equation is the only correct model. Little will change if the fitted equation is only an approximation.

[23] Demand models yielding accurate and robust estimates of postal price elasticities are harder to fit econometrically than models that are designed only to make reliable forecasts. This occurs for a number of somewhat technical reasons.

- Postal rates are not the principal determinants of postal volumes. Rate effects are mostly secondary to the effects of population growth, seasonal change, economic activity, competitive conditions and structural changes in postal markets.
- All postal rates are highly correlated over time with each other. This makes it particularly difficult to fit demand equations with cross-price elasticities.
- All postal rates are highly correlated over time with their own lagged values in a quarterly time series. This makes it particularly difficult to fit demand models in which rate changes have delayed effects.
- If a demand model is mis-specified, the resulting estimates of price elasticities are likely to be biased, but the mis-specification will often have little effect on the reliability of forecasts made with the model.
- Estimates of price elasticities that are robust with respect to minor changes in the model or sample are likely to be less affected by mis-specifications of the demand model. However, there is no assurance that estimates from an approximately-correct postal demand model will be robust.

[24] In every general rate proceeding the Commission makes an effort to assess the accuracy and robustness of the estimates of price elasticities that are an integral part of Postal Service models. If the estimates are accurate and demonstrably robust, the Commission may safely rely on them for most purposes even if the econometric models are possibly defective in other respects. If the elasticity estimates are not robust, then the Commission may still have to rely on them, but does so as little as necessary. For example, in previous proceedings, the Commission has discounted testimony based on Ramsey pricing and calculations of consumers' surplus because, among other reasons, the testimony depended on price elasticity estimates of doubtful accuracy and robustness.

[25] The evidence of accuracy and robustness of the elasticity estimates for the Postal Service demand models found in testimony for this proceeding consists primarily of the following:

- The signs and magnitudes of the estimates themselves. The long-run own-price elasticities must be negative in sign. These elasticities should have smaller absolute values for postal services with no close substitutes. Cross-price elasticities should be mostly positive since many postal services are substitutes for each other. Price elasticities that violate the requirements of basic economic theory are evidence that the fitted equation has been mis-specified in some essential way.
- The t-values of the coefficient estimates. An estimated coefficient with a t-value whose absolute value is greater than 2.0 is the econometrician's rule-of-thumb for identifying an estimate that is different from zero at a level of significance that exceeds 95 percent.
- Comparisons of the estimates of price elasticities taken from comparable Postal Service demand models in four past rate proceedings and the current proceeding. Stable estimates constitute evidence that the elasticities are robust with respect to the changes in models and samples among the cases.
- Comparisons of the estimates of price elasticities taken from witness Thress "choice trail" describing the evolution of the demand models for several subclasses from the forms used in Docket No. R2005-1 to the forms found in Docket No. R2006-1. All of these estimates are fits to the same samples so stable estimates constitute evidence that the elasticities are robust with respect to changes in just the models.

[26] This evidence is summarized in Tables 3 and 4. The estimates for the Postal Service model for Docket No. R2006-1 are from witness Thress' direct testimony. The estimates for earlier cases are taken from witness Thress' direct testimony in those cases. The estimates for witness Thress' choice trail are found in library reference USPS-LR-L-65I.

[27] The Commission's findings are:

- All of the estimated elasticities for witness Thress' recommended models conform in sign and magnitude to conventional economic theory. The own-price elasticities reported in Table 3 are all negative. Most have absolute values that are less than one indicating that the demand for postal services is generally inelastic. The exceptions — Standard ECR, Express Mail and Media Mail — are subclasses for which one might reasonably expect postal customers to be extraordinarily sensitive to rates. Cross-price elasticities and discount elasticities have signs that are appropriate for goods that are fairly close substitutes. These elasticities are typically smaller in magnitude than the own-price elasticities.
- Most of the coefficients labeled "long-run own-price" elasticities from the Docket No. R2006-1 models are significantly different from zero at levels of significance that exceed 95 percent. However, few of these elasticities have been estimated with sufficient accuracy to distinguish between the own-price

elasticities of different subclasses. For example, the difference between the estimated own-price elasticities for First-Class single piece (-0.184) and First-Class workshared (-0.130) mail is not statistically significant.

- Witness Thress' price elasticities are most often derived as sums of current and lagged coefficients for rates lagged up to four quarters. The estimates are forced to lie along a polynomial curve using the Shiller lag method. In a few cases, the lag structure has just been assumed. A majority of the individual coefficients have statistically insignificant t-values when a lag structure is included in the demand equation. Consequently, the lagged responses of volumes to rates found in most of the Postal Service models are poorly supported by the data.

- Witness Thress' price elasticities are mostly not robust with respect to the changes that he has made to his sample and models from one rate proceeding to another since Docket No. R97-1. Many of the changes in the models shown in Table 3 involve different choices of variables and forms to represent the effects of electronic diversion via the Internet. GCA witness Clifton notes the instability of witness Thress' own-price elasticity estimates with respect to First-Class single-piece letters. GCA-T-1 at 5-11, 30-31, Appendix at 8.

- Witness Thress' price elasticities are mostly not robust with respect to the changes he makes along the "choice trail" connecting his Docket No. R2005-1 models and their Docket No. R2006-1 counterparts. The long-run own-price elasticity for Standard Nonprofit rate mail is the only elasticity that remains stable in Table 4.

3. Alternative Definitions of Price Elasticity

[28] Virtually all of the standard microeconomic theory applied in a rate proceeding presumes that price elasticities are defined in a conventional way. When the Postal Service demand equations include worksharing discounts, as they do for several large subclasses of First-Class and Standard Mail, the "long-run own-price" elasticities reported by witness Thress and referred to by witnesses throughout the current proceeding do not conform to the conventional definition. The conventionally-defined price elasticities are generally higher absolutely than witness Thress' corresponding "long-run own-price" elasticities. Witness Clifton cites witness Thress' long-run own-price elasticities in his testimony arguing that the price elasticity estimate for First-Class single-piece mail is too low. Witness Thress' testimony contains an explicit

Table I-3

USPS Model Price Elasticity Coefficients
Selected Equations from Dockets Since 1997

		Docket No. R97-1		Docket No. R2000-1		Docket No. R2001-1		Docket No. R2005-1		Docket No. R2006-1	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
First-Class Single-Piece Letters											
Own-Price	Sum	-0.189	-1.684	-0.262	-2.998	-0.311	-4.619	-0.175	-2.176	-0.184	-2.354
Worksharing First-Class Letters Discount	Sum	-0.164	N/A	-0.139	-3.869	-0.027	-2.351	-0.102	-5.562	-0.096	-9.634
Price Elasticity @2005 Rates		-1.122		-1.052		-0.465		-0.755		-0.730	
Combined Price/Discount Elasticity		-0.353		-0.401		-0.338		-0.277		-0.280	
Workshared First-Class Letters											
Own-Price	Sum	-0.289	-1.683	-0.251	-1.614	-0.071	-0.149	-0.329	-2.179	-0.130	-2.201
Worksharing First-Class Letters Discount	Sum	0.222	2.704	0.216	3.619	0.027	2.271	0.108	5.554	0.098	9.867
Average Standard Regular Letters Discount	Sum							-0.097	-2.856	-0.111	-3.359
Price Elasticity @2005 Rates		-1.098		-1.039		-0.169		-0.989		-0.792	
Combined Price/Discount Elasticity		-0.511		-0.467		-0.098		-0.437		-0.228	
Standard Regular Mail											
Own-Price	Sum	-0.382	-3.633	-0.570	-10.200	-0.388	-9.418	-0.267	-3.521	-0.296	-4.092
Average Standard Regular Letters Discount	Sum							0.075	0.942	0.100	1.224
Price Elasticity @2005 Rates		-0.382		-0.570		-0.388		-0.420		-0.500	
Combined Price/Discount Elasticity		-0.382		-0.570		-0.388		-0.192		-0.196	
Standard Enhanced Carrier Route Mail											
Own-Price	Sum	-0.598	-3.616	-0.808	-7.172	-0.770	-6.628	-1.093	-4.973	-1.079	-6.159
Aggregate Direct Mail Advertising Price	Sum	-2.794	-3.060			-1.612	-4.831	-0.483	-1.437	-0.530	-1.974
Periodical Regular Rate											
Own-Price	Sum	-0.143	-2.730	-0.148	-2.837	-0.166	-3.133	-0.193	-10.330	-0.294	-4.199
Bound Printed Matter											
Own-Price	Sum	-0.355	-3.024	-0.392	-2.584	-0.231	-1.931	-0.604	-2.165	-0.491	-1.972
Media Mail Price	Sum							0.510	2.707	0.334	N/A
Aggregate Direct Mail Advertising Price								-0.716	-1.400		
Combined Price/Media Mail Elasticity		-0.335		-0.392		-0.231		-0.094		-0.157	
Media and Library Rate Mail											
Own-Price	Sum					-0.144	-0.889	-0.796	-2.135	-1.196	-2.866
Bound Printed Matter Price	Sum							0.509	1.090	1.005	2.007
Combined Price/BPM Elasticity						-0.144		-0.287		-0.191	

Source: Docket No. R2006-1, USPS-T-7 *passim*; Docket No. R2005-1, USPS-T-7 *passim*; Docket No. R2001-1, USPS-T-8 *passim*; Docket No. R2000-1, USPS-T-7 *passim;* Docket No. R97-1, USPS-T-*7 passim*

Table I-4

Thress Choice Trail Price Elasticity Coefficients
Long-Run Elasticities for Selected Subclasses

First-Class Single-Piece Letters

Model	Own-Price	t-value
R2005-1	-0.175	-2.176
LR65-198	-0.123	-1.499
LR65-202	-0.196	-2.569
LR65-206	-0.224	-2.794
LR65-210	-0.292	-2.274
LR65-215	-0.319	-2.247
LR65-220	-0.287	-3.194
LR65-224	-0.182	-2.338
LR65-228	-0.130	-1.674
LR65-232	-0.154	-2.014
LR65-236	-0.178	-3.083
LR65-241	-0.183	-3.128
LR65-246	-0.177	-2.127
LR65-250	-0.177	-2.331
LR65-254	-0.143	-1.789
LR65-258	-0.209	-2.334
LR65-262	-0.095	-1.149
LR65-266	-0.100	-1.176
LR65-270	-0.124	-1.405
LR65-274	0.019	0.163
LR65-279	-0.129	-1.694
LR65-283	-0.101	-1.142
R2006-1	-0.184	-2.354

First-Class Workshared Letters

Model	Own-Price	t-value
R2005-1	-0.329	-2.179
LR65-292	-0.105	-1.834
LR65-297	-0.091	-1.442
LR65-302	-0.082	-1.324
LR65-307	-0.181	-3.020
LR65-312	-0.186	-3.092
R2006-1	-0.130	-2.201

Media and Library Rates

Model	Own-Price	t-value
R2005-1	-0.796	-2.135
LR65-611	-0.736	-1.768
LR65-615	-0.651	-1.616
LR65-619	-0.746	-1.745
LR65-623	-0.972	-2.308
LR65-627	-1.082	-2.620
LR65-635	-1.241	-2.734
R2006-1	-1.196	-2.866

Periodicals Regular Rate

Model	Own-Price	t-value
R2005-1	-0.193	-10.330
LR65-640	-0.284	-3.696
LR65-645	-0.404	-6.366
LR65-650	-0.404	-7.800
LR65-655	-0.397	-6.101
LR65-660	-0.388	-5.193
LR65-665	-0.364	-3.228
LR65-670	-0.402	-4.190
LR65-675	-0.533	-2.093
LR65-680	-0.254	-3.748
LR65-685	-0.298	-4.314
LR65-690	-0.295	-4.381
LR65-700	-0.321	-4.774
LR65-705	-0.360	-6.464
LR65-710	-0.491	-8.084
LR65-715	-0.697	-3.635
R2006-1	-0.294	-4.199

Bound Printed Matter

Model	Own-Price	t-value
R2005-1	-0.604	-2.165
LR65-528	-0.923	-3.133
LR65-532	-0.947	-3.405
LR65-536	-0.540	-1.377
LR65-541	-0.495	-1.287
LR65-546	-0.399	-1.563
LR65-550	-0.197	-0.884
LR65-555	-0.302	-1.188
LR65-560	-0.415	-1.606
LR65-565	-0.529	-1.196
LR65-570	-0.627	-1.137
LR65-575	-0.287	-0.782
LR65-580	-0.487	-1.366
LR65-585	-0.515	-2.151
LR65-589	-0.379	-1.590
LR65-593	-0.530	-2.238
LR65-601	-0.488	-1.929
LR65-605	-0.397	-1.744
R2006-1	-0.491	-1.972

Standard Nonprofit Mail

Model	Own-Price	t-value
R2005-1	N/A	N/A
LR65-381	-0.351	-8.188
LR65-389	-0.342	-5.003
LR65-398	-0.356	-5.536
LR65-407	-0.342	-4.512
LR65-412	-0.343	-6.703
LR65-420	-0.378	-8.884
LR65-425	-0.359	-5.226
LR65-430	-0.303	-6.365
LR65-434	-0.331	-4.131
LR65-439	-0.350	-6.883
LR65-443	-0.310	-6.201
LR65-447	-0.378	-8.757
LR65-452	-0.325	-4.247
LR65-457	-0.305	-6.239
R2006-1	-0.306	-6.279

Standard Nonprofit ECR Mail

Model	Own-Price	t-value
R2005-1	N/A	N/A
LR65-385	-0.531	-2.213
LR65-394	-0.440	-2.067
LR65-403	-0.114	-0.793
LR65-461	-0.173	-1.185
LR65-465	-0.199	-1.590
LR65-469	-0.238	-1.620
LR65-473	-0.227	-1.383
LR65-477	-0.230	-1.270
LR65-481	-0.204	-1.398
LR65-485	-0.439	-3.224
LR65-493	-0.451	-3.243
LR65-497	-0.448	-2.815
LR65-501	-0.443	-2.353
LR65-505	-0.341	-2.565
R2006-1	-0.284	-2.106

warning that should have alerted readers to the difference in definitions. *See* USPS-T-7 at 38.

[29] Calculations of price elasticities for three alternative definitions are shown in Table 3. The alternative definitions are:

- Thress' "Long-Run Own-Price" Elasticity ("Own-Price" in Table I-3) – The ratio of the percentage change in volume to the percentage change in price with all other rates and discounts in the demand equation held fixed. This definition implicitly assumes that the two rates that are used to calculate a worksharing discount always change by the same amount leaving the discount unchanged. Thress' own-price elasticities are best-suited for judging the impact of rate changes under the efficient component pricing (ECP) rule. Under this rule, the discount is set equal to the per-piece cost saving of worksharing to the Postal Service.

- Combined Price Elasticity ("Combined Price/Discount Elasticity" in Table I-3) – The ratio of the percentage change in volume to an equal percentage change in all of the postal rates and discounts in the demand equation. This elasticity can be calculated by simply summing the coefficient estimates for all of the postal rates and discounts appearing in Thress' log-log demand equations. The definition implicitly assumes that the two rates that are used to calculate a worksharing discount always change by the same percentage amount. Therefore, the discount will also change by the same percentage. The combined price elasticity is best-suited for estimating the impact of inflation while nominal postal rates remain fixed. Then, all real postal rates and discounts change inversely in proportion to the general level of prices. The combined price elasticity is also useful for judging the effects of across-the-board changes in rates, *e.g.*, a proportionate change in all First-Class rates.

- Standard Economic Definition of Elasticity ("Price Elasticity @2005 Rates" in Table I-3) – The ratio of the percentage change in volume to the percentage change in price with all other rates (but not discounts) in the demand equation held fixed. This definition implicitly assumes that a worksharing discount will increase or decrease by an amount equal to the change in price. The formula for a discount, D, used by witness Thress is the arithmetic difference between the rates for the discounted, P_1, and undiscounted, P_2, categories of service, $D = P_2 - P_1$. If the demand equation is for the discounted category then the discount decreases as the rate increases. If the demand equation is for the undiscounted category then the discount and the rate increase together. The standard economic elasticity is a function of the ratio of the price to the discount and can be calculated for an assumed price P and discount D using the formula: $E = E_0 + E_D(P/D)$.

E_0 and E_D are the own-price and discount elasticities from Thress' fitted equations.

[30] Table 3 shows that there can be a considerable difference in the price elasticities depending upon how they are defined. For example, for Docket No. R2006-1, the various price elasticities for First-Class single-piece letters are -0.184 (Thress' Long-Run Own-Price), -0.280 (Combined) and -0.730 (Standard Economic Definition). Elasticities calculated using the standard economic definition in Table 3 use the before-rates postal rates and discounts in the formula $E = E_0 + E_D(P/D)$.

4. Did witness Thress commit any fatal technical mistakes?

[31] The application of appropriate econometric methods to fit equations that correctly represents the demand behavior of postal customers ensures that the fitted models will have properties that are known and desirable. For the estimates of the price elasticities, the most important of these properties are that the estimates are consistent (unbiased in the limit) and that the estimates have sampling distributions that are known at least approximately. Standard econometric methods are also usually efficient in their use of data whereas improvised methods often waste information leaving estimates that are statistically less accurate. The Commission depends upon these properties to evaluate the reliability of the forecasts and the accuracy of the price elasticities it uses. Incorrect models and methods make it difficult for the Commission to employ any of the standard statistics that should describe a fitted model's reliability and accuracy such as witness Thress' MSEs and t-values.

[32] The use of novel and/or improvised estimation methods are discouraged by the Commission's rules of practice and procedure. Under these rules, such methods must be accompanied by "a description and analysis of the technique that is sufficient for a technical evaluation." Standard methods need only be accompanied by "a reference to a detailed description in a text, manual, or technical journal" and a justification for using the technique. *See* 39 § 3001.31.k(2)(iv)(e)

[33] The testimony of GCA witness Kelejian identifies several aspects of witness Thress' econometric practice that may constitute technical errors. Witness Kelejian's comments and criticisms apply to the methods used by witness Thress to fit many of the demand equations of the Postal Service models.

- Witness Thress applies a Box-Cox transform to several variables used in the models to capture the effects of electronic diversion of mail via the Internet. The Internet variables used by witness Thress all have recorded values beginning after the start of his time series samples. The Box-Cox transform is a frequently-used method for avoiding a singularity when using such variables in a log-log equation. Unfortunately, witness Thress has oversimplified the transform in several of the demand equations. This causes an omission of explanatory terms from the fitted equation. GCA-T-5 at 3-7.
- Witness Thress uses an improvised preliminary statistical procedure to find a value for a nonlinear parameter required for each of his Box-Cox transforms. The effect of this preliminary procedure on the properties of his final estimates is unknown.
- Witness Thress imposes two kinds of symmetry conditions on his parameter estimates. First, he assumes that volume flows in response to discount changes between worksharing and non-worksharing subclasses are symmetric. And, second, he imposes the Slutsky-Schultz symmetry condition on the cross-elasticities of postal services that are regarded as close substitutes. Witness Kelejian points out that Thress' method for imposing these symmetry conditions creates explanatory variables in his equations that are observed with an error. This will result in inconsistent estimates of the equation's coefficients. *Id.* at 6-12.
- Witness Thress' method for imposing symmetry conditions has the effect of adding stochastic restrictions to his samples. However, the stochastic restrictions do not have autocorrelated errors as do the equations. This creates a conflict between his method for imposing the symmetry conditions and his method for treating autocorrelated disturbances. *Id.* at 12-14.
- Witness Thress' treatment of autocorrelated equation errors always omits the 3-quarter lagged error and frequently omits one or more of the other lagged errors for an autoregressive process over four quarters (AR-4). *Id.*
- Witness Thress selects his preferred models from among the set of candidate models on the basis of the MSE of the fits. The preferred model is the one with the minimum MSE. Witness Kelejian points out that model selection on the basis of the minimum MSE can lead to the selection of an incorrect model even if the correct model is among those in the set of candidates. *Id.* at 14-15.

[34] In addition, GCA asserts on Brief that the use of MSE as the criterion for model selection violates the Commission's rules of practice and procedure because it is

neither referenced nor described in reviewable detail by witness Thress. GCA Brief at 43-47.

[35] In his defense, witness Thress performed a limited number of additional equation fits and conducted various statistical tests reported in his rebuttal testimony. USPS-RT-2 at 50-60. The intent of this additional work was to demonstrate that the impact on the coefficient estimates of the technical issues raised by witness Kelegian is small. Minor mistakes in the specification of an equation or the application of econometric methods can be expected to have a correspondingly minor impact on estimates. The impact will also tend to be small if the estimates are robust. Witness Thress is able to show, with respect to First-Class single-piece letters, that correcting most of the practices criticized by witness Kelejian would have very little impact on the estimates of own-price and discount elasticities.

[36] His models are the only comprehensive set available for the Commission's use in this proceeding. Witness Clifton has fit equations that might be used to replace the models for First-Class single-piece letters and Standard Regular mail. Otherwise, the Commission has no alternative except to use one or another of the models fit by witness Thress. No party has offered testimony that any of the other models fit by witness Thress and catalogued in library reference USPS-LR-L-65 are superior to those he has selected to make the volume forecasts.

[37] The Commission's findings with respect to witness Thress' econometric practice are:

- Witness Thress' econometric practice is conventional except with regard to several devices that have been adopted to deal with the special problems he confronts: 1) finding suitable variables to describe the role of the Internet in the electronic diversion of mail; 2) imposing symmetry conditions on his estimates of discount elasticities and cross-price elasticities; and 3) using the Shiller lag method to fit lag structures for the price elasticities. Without these complications his estimates would be the result of conventional applications of the method of generalized least squares.
- Witness Kelejian has correctly pointed out several ways that witness Thress' econometric practice is problematic. However, it has not been demonstrated that the mistakes will have more than a very minor impact on the volume forecasts made with the models. It appears likely to the Commission that the

principal effect of most of the mistakes will be to cause inconsistencies in the estimates of the less stable price elasticities. Most of the technical mistakes noted by witness Kelejian are minor and should have correspondingly minor consequences.

- The dangers of using MSE as a model selection criterion are well-known from the literature on stepwise regression where minimizing MSE along the steps is the most commonly used rule for selecting variables to enter or leave the regression. Choosing a model with the lowest MSE from among a set of non-nested models, as witness Thress has done, is defensible as a means of selecting a model that will make forecasts with a small error variance. However, the chosen model is likely to be somewhat mis-specified. For example, variables with t-value that are less than 1.0 in absolute value are usually omitted from the equation.

5. Does the Postal Service model underestimate the price sensitivity of First-Class single-piece letters?

[38] GCA witness Clifton asserts that the own-price elasticity of First-Class single-piece letters has been underestimated while that of Standard Regular mail has been overestimated. GCA-T-1 at 2-3. In an efficient rate design, subclasses with lower (absolutely) price elasticities would tend to be assigned higher markups over marginal costs than those subclasses with higher price elasticities. For example, in the simplest application of Ramsey pricing the markups are inversely proportional to the own-price elasticities. Therefore, witness Clifton's claim supports GCA's recommendation that the Commission raise the First-Class single-piece letter rate by one cent less than the Postal Service has proposed and make up the lost revenue by further raising the rates for commercial bulk mailers.

[39] The GCA argues that First Class single-piece mail is declining due to electronic diversion, and that mail volumes lost to diversion will not subsequently return to the system. GCA Brief at 5. As a result, GCA argues that demand for single-piece First-Class Mail is much more price sensitive than reflected in the own-price elasticity estimated by witness Thress. USPS Brief at 37-38; *see also, generally,* USPS-T-7. asserts that high institutional cost burdens on First-Class should be moderated in an

environment where the preponderance of mail is shifting to Standard Mail GCA. Brief at 2, 4.

[40] The arguments that apply to GCA's claim are found in the testimony of GCA witnesses Clifton (GCA-T-1) and Martin (GCA-T-2). The testimony of Postal Service witnesses Thress (USPS-T-7 and USPS-RT-2) and Bernstein (USPS-T-6) and GCA witness Kelejian (GCA-T-5) are also relevant. The following points summarize the argument and evidence.

- The price elasticity of demand for a single producer's product is generally higher (absolutely) if the producer has competitors offering products that are close substitutes than if he does not. The Postal Service now has a newly emerged competitor in what witness Clifton describes as the "payments" market. Clifton's Federal Reserve data, Bernstein's diary studies and Martin's surveys all show that bill payments are increasingly being made electronically, often over the Internet, while bill payments by check remitted in First-Class single-piece letters are declining.
- Witness Clifton makes non-econometric estimates of price elasticities for bill payments that are higher than the own-price elasticity estimate from the Postal Service model for First-Class single-piece letters. GCA-T-1 at 20.
- Witness Martin's surveys suggest a weak connection between the use of the mail for bill payments and postal rates. His hypothesis is that rate increases act as a trigger encouraging consumers to reconsider their customary use of the mail to pay bills.
- Witness Clifton notes that witness Thress' estimates of own-price elasticities for First-Class single-piece letters have changed considerably from case to case since Docket No. R97-1 as shown in Table I-3. GCA-T-1 at 4-11. This instability in the price coefficients is attributed to changes witness Thress has made in the demand equation to represent electronic diversion and the increasing impact of the Internet on volumes.
- Witness Clifton claims that witness Thress' incorrect application of the Box-Cox transform to the Internet variable in his equation for First-Class single-piece letters causes a downward bias in the own-price elasticity. GCA-T-1 at 33. In fact, all of the mistakes cited by witness Kelejian are likely to produce more-or-less biased estimates of the coefficients in the Postal Service models. However, it is not usually possible to determine the direction of these biases. Witness Thress' technical problems are not serious if the biases they leave can be expected to be small.
- Volume forecasts made for First-Class single-piece letters using the Postal Service models for recent rate proceedings have all proven too high. The percentage errors for Docket Nos. R2000-1, R2001-1 and R2005-1 are all negative. Witness Clifton demonstrates that the discrepancy can be

corrected for the Docket No. R2000-1 forecasts by assuming a higher (absolutely) own-price elasticity for First-Class single-piece letters. *Id.* at 41-43.

- Witness Thress' demand equations are log-log equations with constant own-price elasticities. Witness Clifton points out that if the equations are actually linear the own-price elasticity will increase as volume decreases. First-Class single-piece letters per person have been declining since 1996 and are forecast to continue declining. With a linear demand equation this would raise the own-price elasticity of First-Class single-piece letters. *Id.* at 45-49.

- Witness Clifton fits linear analogues of witness Thress' demand equations for First-Class single-piece letters from Docket Nos. R2005-1 and R2006-1 and finds that the estimated own-price elasticities increase substantially. A similar experiment with Standard Regular mail results in a decrease in the estimated own-price elasticities. *Id.* at 49-56.

[41] In his defense of the price elasticity estimates, witness Thress points out that there are no certain grounds in economic theory for presuming *a priori* that the opportunity for electronic diversion afforded by the Internet will increase the own-price elasticity of First-Class single-piece letters. Market bifurcation can produce the opposite result. USPS-RT-2 at 12-15. If the postal customers who are diverted have high price elasticities while the ones that continue to use the mail have low elasticities, then the aggregate own-price elasticity will decrease rather than increase. Therefore, it is impossible to determine on purely conceptual grounds if the own-price elasticity of First-Class single-piece letters has increased.

[42] The question is an empirical issue that can only be resolved by gathering the quantitative evidence, doing the required econometrics and employing the appropriate statistical tests. The testimony proffered by GCA witnesses Clifton and Martin simply does not do this job. Witness Clifton's statistics drawn from Federal Reserve data and other sources is suggestive, but is hardly conclusive with respect to the own-price elasticities. Price elasticities can not be derived non-econometrically, as he has attempted, from this data. Nor can a change in own-price elasticities be inferred from witness Martin's survey responses, even if we are willing to accept completely his trigger theory and other explanations for the responses.

[43] The questionnaire, data capture and sample designs for the consumer and small business surveys referenced by witness Martin precluded an objective examination of “emerging competitive substitutes to first class letter mail.” GCA-T2-1. The qualifications associated with the results of these studies should be noted carefully. While the data presented by witness Martin confirmed increased acceptance of technological advances accessible to the general consumer and a gradual shift toward more use of electronic alternatives to First-Class Mail, his efforts to provide data supportive of the hypothesis that knowledge of regularly scheduled increases in postage rates would “trigger” a switch or serious consideration of a switch to electronic methods of submitting billing statements and rendering payment were substantially deficient. His major conclusions were subjective and lacked statistical defensibility.

[44] There is little disagreement between Postal Service and GCA witnesses regarding the negative impact of electronic diversion on First-Class single-piece volumes and the facilitating role of the Internet. All of the available information tells roughly the same story. Since the Internet became widely accessible in the mid-1990s, it has been used to conduct an increasing volume of transactions that were formerly conducted by mail. The replacement of check-in-the-mail bill payments by electronic bill payments over the Internet receives the most attention in testimony. However, it is not possible to tell if the well-documented loss of volume to the Internet is evidence that the own-price elasticity of First-Class single-piece letters has increased with the advent of the Internet.

6. Testimony of Witnesses Clifton and Kelejian

[45] Witness Kelejian’s identification of errors in the econometrics and witness Clifton’s observation that witness Thress’ estimates are unstable fall short of proving that the own-price elasticity of First-Class single-piece mail has increased. Most of the mistakes identified by witness Kelejian are likely to cause biases in the estimates of the own-price elasticities as well as the other coefficients of witness Thress’ First-Class single-piece equation. However, there is no reason to believe that the biases will

necessarily result in an underestimate. The same can be said regarding the instability of the estimates with respect to witness Thress' various experiments defining an Internet variable. Witness Thress' elasticity estimates for First-Class single-piece letters are not robust. Altering the Internet variable in the equation can produce a considerable change in the estimated own-price elasticity. However, we simply cannot tell if the right definition will leave a higher or lower estimate of the own-price elasticity for First-Class single-piece letters.

[46] Nor can the Commission determine from the evidence if there has been an increase in the own-price elasticity over the time period spanned by witness Thress' sample (1983 Quarter 1-2005 Quarter 4). None of the econometric research presented in testimony proceeds towards a formal statistical test of this hypothesis. Witness Thress' log-log equations do not include any mechanism that would permit the own-price elasticities to change over the time span of his samples. If the First-Class single-piece letters own-price elasticity has risen recently, witness Thress' estimates will average them with the lower elasticities of earlier years. Witness Clifton's linear equations do the same with the slope coefficients for rates. Both Thress' and Clifton's models could be modified in several ways and refit to test the hypothesis that the own-price elasticity of First-Class single-piece letters has increased as the Internet has diverted larger volumes of mail. But neither witness has done this work.

[47] Witness Clifton's linear equations for First-Class single-piece letters and Standard Regular mail are simpler and somewhat easier to fit than witness Thress' log-log (Constant Elasticity of Substitution (CES)) equations because there is no need to perform a Box-Cox transformation on the Internet variables. Since witness Thress' own-price estimates are not robust for either of his equations, it is not surprising that the change in the equation form produces very different own-price elasticities. Again, this is not proof that the own-price elasticity of First-Class single-piece letters is higher (absolutely) than witness Thress' estimate or that the own-price elasticity of Standard Regular mail is lower. It is just further evidence of instability.

[48] Witness Clifton's estimates are also somewhat suspect on technical grounds. He has chosen a very defective method for dealing with autocorrelated errors and his estimate of the coefficient for the worksharing discount from his equation for First-Class single-piece letters has a sign that can not be correct. (USPS-RT-2 at 37-45) The latter flaw indicates that the equation is mis-specified.

7. Testimony of Witness Martin

[49] GCA witness Martin's market research study attempts to show that electronic substitution for delivery of material ordinarily carried as First-Class Mail has made mail more price-sensitive. USPS Brief at 38.

[50] Witness Martin said "postal rates seem to be a future trigger for diverting from mailed bill payments." GCA-T-2 at 23. Martin implies that more widespread broadband access provides an increasing number of bill-payers an option to switch irreversibly to electronic bill payment/presentment, and that the existence of this switchover phenomenon exacerbates the effective elasticity of First-Class Mail. Martin also implies that it is the disruptive effect of a price change itself irrespective of the amount that can "trigger" single-piece mailers to adopt electronic alternatives. He suggests that both price itself as well as the "trigger" event of price changes can speed the transition to electronic bill payment. GCA argues that "the frequency and magnitude of [First-Class letter mail] rate increases are likely to be important behavioral triggers as regards consumer decisions to shift First-Class letter mail volumes to electronic substitutes" and that "price matters." GCA Brief at 5. Martin also says "[t]hat data suggest that once motivated to switch from the mailed payments by the price (or changes in the price) of postage, major mailers then use other competitive attributes for the switching or diversion decision." GCA-T-2 at 27.

[51] GCA acknowledges the "general consensus that the First-Class [mail] volumes that have left the Postal System due to electronic diversion will not return." GCA Brief at 63. GCA also asserts that its proposal is likely to stem further migration by

mailers who still use single piece First-Class mail. GCA Brief at 34-37. GCA uses Martin's testimony to highlight the significance of price in the decision to switch. However, the Postal Service points out that Martin's survey results show that for every category of respondents, postal rate changes were rated the least important factor (of ten factors) in selecting payment method.

[52] In opposition, the Postal Service argues that Martin failed to consider the extent and magnitude of electronic diversion without any postal rate increases. The Service also says Martin acknowledged that previous researchers have not addressed postal rates as a factor in assessing transition to electronic alternatives to mail. GCA-T-2 at 1, cited in USPS Brief at 38-40. The Service says that Martin omits any study of the case in which postage rates remain the same. The Postal Service points to witness Bernstein, who said that he believes factors other than postal rates are dominant in terms of explaining the growth in electronic alternatives, because he has seen numerous studies on the subject that do not mention postal rates. USPS Brief at 40, citing Tr. 6/1443-44.

[53] The Postal Service says that witness Spulber in Docket No. R94-1 and witness Sidak in Docket No. R2006-1 both testified that electronic alternatives are encouraged by the increasing benefits and declining cost of electronic transmission, rather than rising postal rates. USPS Brief at 40-41, citing AMMA, et al.-RT-2 at 12, Docket No. R94-1, Tr. 19/9195 and Docket No. R2006-1, Tr. 32/10873-77 passim. Witness Sidak says that the increasing benefits and declining costs of electronic transmission which are responsible for its rapid expansion are "pretty uncontroversial" (Tr. 32/10876) and that he has no basis to disagree with Spulber's contention that these developments are independent of postal rates. *Id.* While Martin's failure to explain the omission in other studies of postal rates as a significant factor in diversion to electronic alternatives is not by itself fatal to his argument, it certainly suggests a substantial gap in his analysis and research that would require a higher standard of evidentiary support.

[54] Witness Martin utilized certain survey questions to assess the importance of postal rates in diversion to electronic alternatives to mail. GCA-T-2 *passim*. The Postal

Service argues that the questions are impossibly flawed and inartfully drafted so as to preclude any meaningful interpretation of the results. USPS Brief at 50. One of the survey questions does not specify the magnitude of postal increases upon which the respondent is assessing the likelihood of switching. Another survey question specifies a series of potential postal increases, but does not specify the time frame involved. *Id.* at 50-51.

[55] The Service also expresses concern about the order in which the survey questions were posed. It says that the trigger questions were asked after, not before, the competitive factors questions, preventing the proper analysis of possible connections between the decision to switch and postal rates. The Service argues that Martin's decision to limit his inquiry to changes in postal rates and avoid other potential switching factors destroyed his ability to draw meaningful conclusions from his survey. *Id.* at 47-49. The questions also sought from the respondents whether they would "seriously consider switching" to some form of electronic payment instead of the mail. The Postal Service questions whether "seriously consider switching" can be equated with "will switch," and concludes that it can not. *Id.* at 53.

[56] The questionnaires for the consumer and small business surveys, on which Martin placed considerable emphasis, were clearly biased toward responses suggesting that an increase in the postage rate for First-Class Mail would engender a change in the mode of billing for businesses and bill payment for consumers. This was the result of emphasizing perceived knowledge of future postal rate increases, as a potential significant factor affecting the diversion of bill payment and billing from mail, in the phrasing of selected questions. The questionnaire designs employed by witness Martin did not permit the collection of data that would examine the tendency toward greater use of electronic options as a preference to mail in the absence of increases in postal rates.

[57] The Service questions Martin's selection of defined price points. *Id.* at 54. Martin's selection of defined price points used for the survey made the study vulnerable to central tendency bias, in which respondents are reluctant to choose the extreme values offered in such a survey and tend to select more moderate values.

[58] Apart from being suggestive, the questions that Martin posed to derived data on the threshold postal rate increase that would lead to serious consideration of a diversion from the use of mail were ambiguous and possibly misleading. *See, e.g.,* GCA-T-2 at 25. There was no time frame associated with the increases and there is no definitive method of identifying the likelihood that giving serious consideration would actually result in switching to an alternative to First-Class Mail.

[59] The Commission believes that the questions regarding “seriously consider switching” are biased since they allude to whether the respondent expresses an actual intent to switch, or instead simply acknowledges a measure of willingness to consider a new idea.

[60] Martin suggests that the mere occurrence of a change in the First-Class postage rate, independent of its magnitude, acts as an incentive to switching to electronic bill payment. There is no basis for discounting entirely the possibility that Martin’s hypothesis has some intrinsic merit. Nevertheless, his research approach appears sufficiently flawed and his stated conclusions are unsupported by his factual data.

[61] Martin characterized his telephone survey of consumers as a national random sample of 1,000 household bill payers. *Id.* at 15. To the extent that the targeted household did not have telephone numbers in the sampling frame for the survey, there is selection bias associated with the subsequent estimates. In addition, a table entry indicating that only 6.4 percent of the bill payers in the survey were college graduates , suggests a large sampling error, serious frame bias and/or non-response bias, or both. *See* GCA-T-2 at 18, Table 2. Moreover, while the sample size for the survey is given as 1,000, the actual response rates were not provided for most of the tables and questions presented in the testimony. The Commission finds that the sample design was insufficiently rigorous for the conclusions drawn.

[62] In market research and the general conduct of a survey, probability sampling and probability sampling designs can be used to make valid inferences about a population. Most of the primary conclusions drawn by witness Martin are based on the

results of Likert[2] scale ratings for selected questions. Interpreting Likert scale ratings without sufficient care can introduce sources of error. One source of interpretive error is arbitrarily assigning a specific Likert response to a particular conclusion. Martin arbitrarily assumed that a rating in a specific range should be interpreted as the certainty of the occurrence of a given event. For example, for the question relating to the likelihood of switching to electronic bill payments in light of pending regularly scheduled postal rate increases, a rating of 5 or more was treated as a definite decision to switch for estimation purposes. Consequently, Martin concludes that 25 percent of "the critical market segment" of major mailers would probably switch to electronic payment. The Commission has no objective and valid method of assigning the probability or likelihood of a switch given a specific Likert rating, nor can we objectively assess the reliability of the "principal estimates" provided by Martin.

[63] Martin contends that for the three mailing segments he characterized as "major," "minor," and "hardcore" mailers, the perception of planned regular increases in the First-Class postage rate for bill paying would trigger a switch to electronic payments and billing. He makes this contention despite the fact that each of these groups considered future postal rate increases to be the least important among factors that could potentially affect their decision regarding the method of bill payment. Moreover, historical data suggest the absence of significant correlation between the decline of traditional mail payment and the rate of increase in First-Class postage.

8. Can the Postal Service demand models be improved?

[64] Fitting an aggregate demand function to a time series sample for a single supplier and a single product with predetermined prices is one of the most common

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[2] A Likert Scale is a type of psychometric response scale often used in questionnaires, and is the most widely used scale used in survey research. Martin reports using a 7 point Likert scale to measure switching receptivity in order to assess the vulnerability of types of First-Class Mail to electronic diversion. GCA-T-2 at 49.

applications in econometrics. The most useful equation forms, variable definitions, and estimation methods are the grist for every standard textbook and econometrics manual. The markets for postal services have generally enjoyed a stable existence for many years and fairly accurate statistics for U.S. postal volumes and prices have been collected on a quarterly basis since 1972. Fitting postal demand models should be straightforward. Yet almost all of the equations of the Postal Service demand models have unusual structural features that require highly specialized methods. These structural features are:

- Lagged price coefficients requiring the Schiller lag estimator;
- Box-Cox transforms of Internet variables requiring a nonlinear estimator;
- Symmetry conditions requiring estimation with stochastic restrictions; and
- Autocorrelated disturbances requiring the Cochrane-Orcutt procedure.

[65] There are many studies of the demand for postal services. Hausman (1987), Taylor (1989), and Pearsall (1997, 2002 and 2005) have all fit demand models using U.S. Postal Service quarterly time series data. Wolak (1997 and 1998) has fit models to cross-sections drawn from the U.S. Census. Robinson (2006) cites 20 European demand studies that have appeared in open literature. Many of these studies are reported in chapters of Crew and Kleindorfer's annual Postal and Delivery Economics Conference volumes. A list of relevant references is provided at the conclusion of this Appendix.

[66] No references or apparent uses of any postal demand research other than the models fit by himself and his colleagues for previous rate proceedings or the competing models of witness Clifton are made by witness Thress in his testimony. Other researchers have successfully modeled the demand behavior of postal customers with far simpler models than those fit by witness Thress. Other researchers also tend to fit models that are less specialized with respect to different classes and categories of mail. The structural features that complicate the estimation of witness Thress' equations, with the exception of autocorrolated disturbances, are absent from the models fit by other

researchers. And, other researchers have identified significant causes of variation in postal volumes that have been entirely overlooked by witness Thress. For example, the Postal Service models all incorporate fixed seasonals, but Pearsall (2005) found that the seasonals for most subclasses are changing over time. Some of the findings of other researchers ought to be useful in simplifying and improving the models fit for rate proceedings by Postal Service econometricians.

[67] In general, witness Thress attempts to fit large models with his samples. Often this leaves few degrees of freedom for the estimate of the MSE. For example, his model for Periodicals Outside County rates has 23 parameters and is fit to a sample of 52 quarterly observations leaving only 29 degrees of freedom. Fitting large models to small samples is also difficult because of the likelihood that the explanatory variables will be correlated in the sample. Near multi-colinearity will often cause the coefficient estimates of the correlated variables to be inaccurate and non-robust.

[68] The majority of the parameters found in the Postal Service models are fixed seasonals. Up to 22 variables are included in the demand equations to model seasonal effects down to the level of the five days before Christmas. For example, 12 of the parameters in the model for Periodicals Outside County rate are seasonal coefficients. The volume forecasts for a rate proceeding are made by government quarters and make no use of this detail in the estimation of seasonal variations in volume. A set of three dummy variables are all that are needed to represent fixed seasonal effects for a model that is used to make quarterly forecasts. Little precision is likely to be gained for the forecasts by adding dummy variables to more finely divide the year.

[69] Own-prices appear in the Postal Service models lagged up to four quarters. The explanation that has been provided for this mechanism is that postal customers require time, up to five quarters, to respond to changes in postal prices. The assumption that underlies this explanation is that postal customers are surprised by rate changes. However, when rate changes are fully expected, postal customers should respond without appreciable delay. Most changes in relative postal rates are widely reported and easily anticipated. They are the result of generalized price inflation and changes to

nominal rates made after more than 12 months of public consideration by the Postal Service and the Commission. Business mailers are aware of future rate changes and even retail postal customers are provided some advance notice.

[70] The lag structure assumed for most postal price effects is rarely justified by the fits of the Postal Service models. Most often the lag structure is the result of using the Shiller lag method to force the coefficients to lie along a polynomial and to all have non-positive values. Frequently, the lag structure is simply imposed by assumption. Getting the lag structure right (if there are lagged responses to rate changes) is important for forecasting volumes accurately in the test year because the time span between the date the rates are assumed to take effect and the beginning of the test year is less than five quarters. For this case, the rates are expected to take effect on May 6, 2007, and the test year begins on October 1, 2007. Under the lag structure estimated by witness Thress, postal customers will not fully respond to the Commission's recommended rates until the test year is almost over.

[71] Witness Thress' symmetry assumptions not only cause estimation issues, they may be incorrect on economic grounds as well. Witness Kelejian notes that the assumed symmetry of the volume effects of worksharing discounts between worksharing and non-worksharing categories is not necessarily correct. The same can be said of the Slutsky-Schultz symmetry condition. This condition arises from the mathematics of utility-maximizing behavior by individual consumers. However, it is far from clear that the same symmetry applies to the aggregate behavior of all consumers of postal services.

[72] There are no economic causes identified for some of the dummy variables and trends that witness Thress inserts in several of the subclass demand equations. Several examples of this practice are: (1) a dummy variable equal to one beginning in 2001 Q3 inserted in the equations for Standard ECR mail and Express Mail; (2) a linear trend beginning in 2001 Q3 inserted in the equations for Express Mail and Priority Mail; (3) a linear trend for the period 1990 Q1 through 2001 Q2 in the Priority Mail equation; (4) a dummy variable equal to one beginning in 2004 Q1 in the Destination Entry Parcel

Post equation; and (5) a dummy variable equal to one beginning in 1998 Q1 in the equation for Bound Printed Matter.

[73] Witness Kelejian has noticed that the autoregressive processes that witness Thress assumes for many of the equation disturbances always omit the third quarter lag and sometimes omit other lags as well. GCA-T-5 at 12-14. These are odd processes to find in an economic model. Autoregressive error processes are often present in models fit to time series data because the causes of disturbances can persist over time or recur periodically. The autoregressive process that this suggests for postal demand equations is a process with all four lags included.

[74] Although they are mathematically elegant, the Postal Service worksharing share models are not a statistical success. Econometrically fit share models are currently used only to divide the volumes of worksharing categories into their automated and non-automated components. Other divisions of worksharing categories are made simply by assuming that the shares observed in the base year will remain fixed. It may be possible to fit share equations based on logit or probit models that will do better than this.

9. Can the forecasts be improved?

[75] The Postal Service forecasting method is described in detail by witness Thress in his direct testimony. USPS-T-7 at 331-65. In brief, the method proceeds through the following steps:

(1) Average quarterly volumes by subclass are determined for a base year. Average quarterly values of the explanatory variables in the model are also computed for the base year.

(2) Forecasts are made or obtained for each explanatory variable of the demand model for each quarter out to one year past the end of the test year.

(3) Multipliers are constructed for each related set of variables using the estimated coefficients and the quarter/average base year ratios of the values of the variables.

(4) The multipliers are applied to the average base year volumes to forecast the volumes for every quarter out to one year past the end of the test year.

(5) Subclass volumes are further split into worksharing rate categories using shares projected with the equations of the shares models.

[76] The forecasting process is called “forecasting off a base year” and is one of several methods that are commonly used in conjunction with an econometric model consisting of log-log (CES) equations. The process is an appropriate choice if the errors in the base year are expected to persist or recur in future quarters because the average error in the base year is included in the forecasts.

[77] Given the estimated equations of the Postal Service model, the opportunities available to the Commission to improve the reliability of the test year forecasts are limited to updating the information used to make them. The Commission might have updated the information used to make the forecasts in any of the following ways:

- Advance the base year using the additional 3-4 quarters of volumes that are reported in RPWs while a rate proceeding is in progress. The averages for the explanatory variables would also have to be advanced. The base year used by the Postal Service in the current proceeding is GFY 2005. The RPW report for GFY 2006 was released by the Postal Service in December 2006.
- Use more current forecasts of population, economic activity and non-postal prices. The forecasts of these variables used by the Postal Service for this case were made by Global Insight in December 2005. Global Insight updates

these forecasts on a monthly basis and makes major revisions in December of each year.

- Update the projections of explanatory variables, such as the number of broadband subscribers, made by witness Thress. This would have to be done by advancing the forecasts generated by the various models witness Thress uses to make the projections.

[78] In this, as in past proceedings, with the notable exception of Docket No. R90-1, the Commission has avoided updating the information used to make the volume forecasts on the grounds that the updating would have little effect. Any improvement in the accuracy of the volume forecasts would have been outweighed by the inconvenience to the Postal Service, the parties and the Commission of changing the basis for the forecasts in mid-proceeding. Updates to projections of economic activity were made in Docket No. R90-1 to handle the onset of a major recession shortly before the proceedings ended. The DRI forecasts of economic activity used by the Postal Service and the Commission at that time showed the recession persisting into the test year. It was clear that rates based upon the pre-recession DRI forecasts would leave a shortfall in net revenue during the test year.

[79] We note that the information used by the Postal Service forecast method was already many months old at the time that the Postal Service submitted its request in May of 2006. The Postal Service could improve the reliability of the volume forecasts simply by using the most current available information at the time of filing. It would also be useful for the Postal Service to revise its forecasts towards the end of a proceeding as was done in Docket No. R2001-1, or, as an alternative, to make a systematic presentation all of the information needed to update the forecasts. This would allow the Commission to more easily determine if an update is necessary.

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MAIL PROCESSING VARIABILITY

1. Summary

[1] For more than two decades, the Postal Service adhered to the view that mail processing labor costs rise essentially in proportion to the volume of mail that is processed. This implies that the volume variability of those costs is approximately 100 percent. This view is grounded on the observation by postal experts of the organization of mailflows and flexibility with which managers typically match labor to those flows. It is also grounded on the observation that most forms of processing capacity (worker, mail container, and sorting machine) scale up or down essentially in modular fashion over a rate cycle. The Commission continues to accept this engineering/operational view of labor cost variability as realistic and valid.

[2] In Docket No. R97-1, the Postal Service proposed a statistical model for estimating the variability of mail processing labor costs. The Commission rejected the proposal. It concluded that the quality of the underlying data were too poor to support a valid statistical model, that it did not reflect an articulated economic theory, and that the resulting variabilities (76 percent) were so low as to be implausible. PRC Op. R97-1 at 79-96.

[3] In Docket No. R2000-1, the Postal Service proposed a revised model. While it reflected a more identifiable economic theory, the theory required a number of restrictive assumptions that the Commission found to be unrealistic. Prominent among them was the assumption that each operation within a processing plant functioned as a stand-alone operation, unaffected by the volume of mail or productivity of any other operation. Another overly restrictive assumption, in the Commission's view, was that piece handlings affect work hours in exactly the same way that volume does. Perhaps more important, the quality of the underlying data was no better than that upon which the initial model was based. The resulting variability estimates were even lower (less than 73

percent), and as counterintuitive as the initial model results. For these reasons, the Commission rejected those estimates.

[4] In Docket No. 2005-1, the Postal Service acknowledged for the first time the possibility that poor data quality was biasing the results of some of its models. In 2002, Roberts, working on behalf of the OCA, published a paper recommending the use of an Instrumental Variables estimator to reduce the risk of downward bias that errors in the measurement of output impart to the class of models that the Postal Service employs. In that docket, the Postal Service applied the Instrumental Variables technique recommended by Roberts to its non-automated cost pools. The variabilities estimated for its manual sorting operations rose dramatically (each by roughly 20 percentage points). This increased the Postal Service's estimate of overall mail processing variability to 83 percent. By agreement of the participants to Docket No. R2005-1, the Commission did not rule on the merits of the cost attribution proposals presented there. Consequently, the Commission evaluates these revisions to the Postal Service's proposed models for the first time in this docket.

[5] Also in this docket, for the first time, the Commission evaluates the approach to modeling mail processing labor costs recommended by Roberts. He develops a different theory of production that defines output as the volume of mail processed in the plant. He believes that approach is needed in order to estimate economically meaningful marginal costs. He recommends this general approach to the Commission, and illustrates it with specific variability models for letter sorting and for flat sorting.[3] He concludes that his approach models the variability of letters reasonably well, but not that of flats. His estimated variabilities for letter sorting operations are well above 100 percent. Also for illustrative purposes, UPS witness Neels presents comprehensive

[3] Dr. Roberts' recommendations are developed in a series of three papers. The first was published in May of 2002 and the second in March of 2006. These papers were made available on the OCA's portion of the Commission's website and discussed in public seminars following their publication. Roberts presented testimony in this docket in September 2006 which referenced his findings in the earlier papers and included additional research. These papers have been treated by Roberts and the participants in this docket as an integrated whole in discovery, oral cross-examination, and briefs. The Commission affords them similar treatment in evaluating the evidence in this docket.

models of mail processing that yield variability estimates above 100 percent. A group of Periodicals mailers "augments" the engineering/operational analysis employed by the Commission to reflect new data collected by the Postal Service's In-Office Cost System (IOCS). The augmented Commission method, the group argues, implies that mail processing variability ranges from 92 to 94 percent.

[6] As in Docket No. R2000-1, the competing mail processing variability models in this docket bracket the estimate of approximately 100 percent that the Commission has traditionally applied to mail processing labor costs. One hundred percent remains the center of gravity of the array of statistical and the operational estimates of mail processing variability that have been presented on this and prior records. For this reason, the Commission adheres to its determination that mail processing labor costs are almost 100 percent volume variable.

[7] For more than a decade, the Commission has expressed concern that the quality of the Management Operating Data System (MODS) data upon which mail processing variability models depend is too poor to support valid statistical models. Over that time, the quality of that data has not improved in any discernible respect. This record has clarified the theoretical requirements of valid mail processing models. At the same time, it illustrates that resourceful data manipulation is not sufficient to overcome the obstacle to successful modeling that the error-ridden MODS data presents. The Postal Service should understand that if the quality of the MODS data does not improve, or alternative data developed, models that rely on such data have little prospect of being accepted by the Commission.

2. Positions of the Participants

a. The Postal Service's Revised Mail Processing Model

[8] Since its mail processing labor cost variability model was last litigated in Docket No. R2000-1, the Postal Service has modified its model in a number of ways.

The most significant modification is its use of an Instrumental Variables technique to estimate the coefficients in these models, following the suggestion contained in the OCA-sponsored research of Roberts published in May of 2002.[4] The Postal Service now applies this estimating technique to the manual sorting operations, the cancellation operation, and the Priority Mail operation. To make models of these operations amenable to the use of the Instrumental Variables, log-linear models have been substituted for the earlier translog models. The Postal Service continues to use translog models for the remaining operations.

[9] Witness Bozzo applied the Instrumental Variables approach suggested by Roberts as a solution to the "potential" inconsistency of variability estimates obtained from least squares regression techniques "due to measurement error and simultaneity in MODS output measures." Docket No. R2005-1, USPS-T-12 at 6. This technique dramatically altered the variabilities of the manual sorting operations to which they were applied, as the table below shows.[5]

[10] Witness Bozzo does not apply the instrumental variables technique to automated cost pools, asserting that although piece handling data for automated operations "isn't perfect," they are likely to be more accurate since it is compiled from machine counts, and does not require the use of a weight conversion factor. [cite R2005-1] He tested the impact that instrumental variables techniques would have had on his variability estimates, and concludes that they yield estimated variabilities for individual operations that are, in many instances, unreasonably high or unreasonably low, and therefore are unsuitable for ratesetting. *See* Docket No. R2005-1 USPS-T-12 at 57-58.

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[4] *See* Roberts, March (2002) *An Empirical Model of Labor Demand for Mail Sorting Operations*, by Dr. Mark Roberts, published May 31, 2002. The paper and audio seminar are available at *http:www.prc.gov/OCA/OCApapers.htm.*

[5] By not applying the Instrumental Variables technique to automated operations, witness Bozzo apparently did not consider automated operations to suffer from simultaneity bias either.

Table J-1
Postal Service Base Year 2004 Recommended Variabilities Versus Base Year 2000 Variabilities

Cost Pool	R2005 USPS-T-12	R2001 USPS-T-14
BCS/	0.90	0.94
BCS/DBCS	0.85	0.87
OCR	0.78	0.77
FSM	1.01	0.74
FSM/1000	0.73	0.74
AFSM100	1.03	n/a
SPBS	0.77	0.66
Manual Flats	0.90	0.71
Manual Letters	0.87	0.58
Manual Parcels	0.78	0.44
Manual Priority	0.76	0.55
Cancellation	0.46	N/A
LSM	N/A	0.90
Composite	0.83	0.71

For Docket No. R2001-1 factors, *See* Docket No. R2001-1 USPS-T-14, Table 6.
Docket No. R2005-1, USPS-T-12 at 54.

[11] Witness Bozzo regards his model as a short-run model of mail processing labor demand derived from a cost minimizing production function. Labor demand is assumed to be caused by the level of output, the prices of the variable inputs (wages), the quantities of "quasi-fixed" inputs (an index of plant-level capital) and the other factors that explain labor demand (i.e., number of delivery points served by the plant, dummy variables designed to remove the effects of technical change, and seasonal volume fluctuations). To reflect unmodeled determinants of labor hours that are specific to individual plants, and that persist over the period covered by the panel data, witness Bozzo estimates a "fixed effect" shift variable designed to remove those effects.

[12] A key feature of the Bozzo model is its definition of "output". The theoretically ideal measure of output for the mail processing system is pieces finalized and ready to be transferred to the delivery unit.[6] Because he lacks data that measures

finalized pieces exiting the plant, witness Bozzo uses Total Piece Handlings (TPH) in specific sorting operations (usually defined by the machine used). He justifies using this definition of output on the ground that it captures the effect that different levels of work effort expended in an operation have on work hours spent in that operation. USPS-T-12 at 12-16. This definition of output reflects witness Bozzo's explicit theory of production.

[13] His theory of production is that output and work hours in any specific processing operation are independent of output in any other operation in the plant because there is an operating plan in place throughout the rate cycle that prescribes where in the plant each piece will be processed given the physical characteristics of the piece (its shape, whether it is machinable, and whether it is pre-barcoded). To support this theory, witness Bozzo's testimony in this docket presents a set of diagrams depicting the organization of the various shape-based mailstreams. He asserts that pieces of mail with the same characteristics always follow a processing path through the plant that is prescribed by the current operating plan.

[14] Bozzo's mail processing variability models cover 11 direct sorting operations, which account for roughly one-third of the costs of the mail processing network. The other two-thirds are incurred in "allied" (support) operations in the processing plants, and in the operations of the bulk mail centers. Witness Bozzo recommends that the Commission use the weighted average variability estimated by his models (85 percent) as a proxy for the volume variability of the unmodeled two-thirds of mail processing network costs.

[15] In the event that the Commission does not adopt witness Bozzo's proposed models, he urges the Commission to adopt his "updated" version of the models developed by Roberts in his March 2006 paper, which yield similar variability estimates.

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[6] This would be the theoretical ideal if the boundary between the mail processing system and the delivery system were well defined and stable. As discussed later, it is not which presents a substantial obstacle to successful modeling of mail processing.

b. The Research Sponsored by the OCA

[16] Mark Roberts is a professor of economics at Pennsylvania State University and a Research Associate in the Productivity Program at the National Bureau of Economic Research. His mail processing labor cost variability research is sponsored by the Office of the Consumer Advocate (OCA). His testimony in the docket draws from two previous studies conducted on behalf of the OCA. In May of 2002, he completed a paper titled *An Empirical Model of Labor Demand in Mail Sorting Operations* (Roberts 2002). In March of 2006, he completed a second paper titled *An Economic Framework for Modeling Mail Processing Costs* (Roberts March 2006). Public seminars on both papers were conducted at the Commission contemporaneously with their publication on the Commission's website at *http//:www.prc.gov/OCA/OCApapers.htm.* He extended and revised his research in his testimony in this docket, OCA-T-1. His papers are intended to be an integrated set of research, and this proceeding has treated them as such. The objective of his research is less to provide a definitive set of labor demand variability estimates than to establish a valid theoretical framework for conducting the research, and stimulate a dialogue on the key issues in modeling variable mail processing labor costs. Seminar by Professor Mark Roberts on His Economic Framework for Modeling Mail Processing Costs, Afternoon Session, Transcript at 52-53.

(1) Roberts' 2002 Paper

[17] In his May 2002 paper, Roberts developed a theoretical foundation for his model of mail processing labor demand. He identifies a transformation function, and from that derives his mail processing labor cost minimization functions. From those cost functions, he derives his mail processing labor demand models.

[18] *Theoretical model*. Professor Roberts' 2002 paper develops a theoretical model of mail processing. At its most basic level, it is a transformation function in which unsorted pieces of mail enter the system and are transformed to pieces finalized to the last sort needed before being turned over to the delivery network. Professor Roberts

assumes that there are three separate processes for the three basic shapes of mail — letters, flats, or parcels. A unique sorting path and equipment stock is used for each shape. The labor input varies, depending on whether the labor is used in manual or automated sorting operations. The plant manager's task is to allocate resources among each shape-based process and between manual and automated technologies within each process in a way that minimizes its total expenditure on labor, given a fixed capital stock available in each process. 2002 Paper at 5-7.

[19] This results in a labor cost function in which labor cost is calculated separately for the letter sorting, flat sorting, and parcel sorting process. The cost function for each shape of mail depends on the amount and kind of equipment available, the relative price of manual and automation labor, and the amount of sorted output. Output is viewed as the number of unique pieces sorted and dispatched from the plant, which is the same as the number of pieces of a given shape that enter the plant, rather than the number of times a piece is handled in an operation.

[20] From these cost functions, Professor Roberts derives labor demand functions. Demand for man hours in these functions depends on the relative wage in automated and manual functions, the stock of available equipment, and the quantity of sorted pieces.

[21] *Definition of "output."* The definition of output plays a crucial role in Roberts' labor demand functions. Output is defined as the number of unique pieces that are finalized to the last sort before being sent to the delivery units. This number could be calculated either at the exit point of the plant, or the entry point to the plant. This definition ensures that each piece of mail that enters the plant is counted only once. These are measured as the number of first handled pieces (FHP) in the plant. These pieces are counted only at the point where they receive their initial sort in the plant. A piece of mail finalized at the plant is viewed as what the plant "produces"[7]. The kind and amount of resources spent in producing a finalized piece are treated as inputs. Roberts uses panel data that allows observations of hours to be matched with plant-level output by shape, both across plants and over time. Variation of hours with output in both

dimensions is used to estimate the marginal effect of output on hours (labor costs). Because the definition of output is the number of unique pieces of each shape in the plant, the definition of output that is used to measure the variability of hours in each operation is consistent. That allows the variability estimate for each operation to be aggregated to a shape-wide variability. Shape-wide variabilities can be aggregated to plant-wide variabilities.[8] *Id.* at 13-15.

[22] *Simultaneity and endogeneity*. Roberts' model measures the response of hours spent in a specific sorting operation to a change in the amount of mail of a given shape that the entire plant has to process because it reflects his understanding of what the plant manager can and cannot control. In his understanding, the plant manager is not able to control the amount of mail of a given shape that arrives at the plant for processing. Because it is determined outside the production process that is being modeled, it is "exogenous" to the model. In his understanding, the plant manager can control the kind of inputs he will use to process the shape volume that he receives. He believes that the plant manager has discretion to send mail of a given shape to a manual or an automated operation, or some mixture of each, and discretion to send mail to different kinds of automated equipment (high tech or low tech), depending on the level of arriving volume, and other factors, such as the condition in which it arrives (single-piece, bulk, presorted, or barcoded), level of service the mail is entitled to, and the timing of its arrival.

[23] Roberts' model reflects his assumption that the number of piece handlings in any specific operation depends on the amount of mail that the manager chooses to send

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[7] This contrasts with the definition of output used in the labor demand functions developed by witness Bozzo for the Postal Service. He views output as the number of handlings that are performed (in an individual sorting operation), rather than the number of pieces of mail that have been converted to the form required by the network. Roberts views the number of handlings as a measure of intermediate labor inputs (and an indirect measure of the capital input) used to produce the final product of the plant.

[8] Roberts argues that the operation-specific variabilities estimated by witness Bozzo's model cannot be aggregated to construct an overall variability at the shape or plant level because piece handlings is not a stable measure of output. He points out that the number of piece handlings needed to accomplish the improvement in the sort status of a piece changes according to the capability of the machine used. *Id.* at 13-14

to it and other candidate operations. He believes that the decision to allocate mail to a given operation depends on how much of the plant workload has been allocated to related operations. In other words, he views the level of piece handlings in all related operations as jointly or "simultaneously" determined. If an individual sorting operation were being modeled, that operation's output would, in part, reflect the discretionary decision of the plant manager. It would therefore be considered an "endogenous" variable in a correctly structured model — a variable that allows factors other than "output" (*e.g.*, managerial judgment) to affect hours.

[24] Endogenous explanatory variables create special challenges for estimation because they are correlated with the error term in the regression. Applying Ordinary Least Squares estimation techniques to models with endogenous explanatory variables will bias the resulting estimates unless appropriate control variables are included.

[25] *Fixed effects*. The need to avoid endogeneity motivates Roberts to adopt a "fixed effect" control variable similar to that used by witness Bozzo. Both recognize that the productivity of mail processing operations vary widely across plants in the network in response to unidentified factors that neither can explicitly model. The fixed effect approach transforms the FHP observations for a given plant by taking as their values only the distance of each one from the system mean value. This shifts the intercept for the labor demand curve up or down as necessary to eliminate the influence that persistent differences in productivity levels among plants would have on hours. The rationale is that the "plant effect" on hours is likely to be highly correlated with plant size (and therefore with volume). Roberts believes that if left in, these myriad productivity-related effects would be mixed with the effect of volume on hours, which is the effect that Roberts and Bozzo are trying to measure. *Id*. at 48. According to Roberts, not estimating and removing the "fixed" unknown plant effects would lead to omitted variables bias. Omitted variables bias is another source of correlation between regression and error term that would allow changes in hours to reflect non-volume factors.

[26] *Measurement error.* Endogeneity can also be caused by errors in the measurement of the volume variable used in the labor demand model. If the proxy for volume employed by the model is measured with error, the error will be correlated with that measure of volume, making the measure of volume endogenous. *Id.* at 49. This will produce a downward bias in the variability of labor hours estimated with that variable, even in regressions with multiple explanatory variables. *Id*. Any downward bias from measurement error will be magnified where, as with the models of Drs. Bozzo and Roberts, the "fixed" plant effects that are removed are large. This is true, Dr. Roberts explains, because removing the "fixed" plant effects reduces the systematic variation in the volume variable that remains available to be modeled relative to the error that arises from inaccurately measuring the volume variable. Id. at 50. Dr. Roberts also notes that Dr. Bozzo's models are replete with other dummy variables that remove systematic variation in the volume variable, including lagged volume variables, year variables, and quarterly variables. So little volume variation remains available to model that it risks falling below the noise level of measurement error in the volume variable. Id. at 54.

[27] Roberts concludes that measurement error in the FHP variable is potentially large. He focuses his analysis on the measurement error in MODS FHP data that arises from the need to weigh mail and use national conversion factors to estimate the number of pieces (FHP) that a given weight implies. He estimates that the use of obsolete conversion factors prior to 1999 had led the FHP count of letters to be overestimated by 18 percent, and of flats to be overestimated by 11 percent, demonstrating that conversion factors are a potential source of very large measurement error. *See 2006 Paper at 49*.

[28] *Instrumental Variables*. Roberts' efforts to reduce endogeneity caused by errors in the measurement of FHP caused him to estimate his models differently from those of witness Bozzo who, up to that point, had not acknowledged that measurement error presented a significant risk of endogeneity in any of his modeled operations. In addition to his theoretical reasons for suspecting that FHP operation variables were not exogenous, Dr. Roberts used a Hausman test to test the hypothesis that these output

variables were exogenous. The hypothesis was rejected for seven of the ten operations, including the majority of the automated operations. See Roberts 2002 at 62 and Table 5. To reduce the risk of bias from endogeneity in the ouput variables, Dr. Roberts resorted to the technique of using "instrumental variables" to estimate the response of work hours to volume.

[29] As implemented by Roberts, the Instrumental Variables estimator estimates the response of hours to volume in two stages. In the first stage, the endogenous variable (FHP measured with error) is regressed on all of the exogenous variables in the primary regression [denoted by X] and the instrument [denoted by z]. Ordinary Least Squares is used to predict a value for the endogenous FHP variable that (it is hoped) is free of systematic error. The process is described in the following equation:

$\hat{q}_{it} = \hat{\alpha}X_{it} + \hat{\theta}z_{it}$ where α and θ are the Ordinary Least Squares estimated parameters. In the second stage of the estimation, q_{it} is replaced with $\hat{q}_{it}$ in the labor demand equation $h_{it} = \beta X_{it} + \gamma\hat{q}_{it} + \varepsilon_{it}$

[30] The second stage equation is also estimated with Ordinary Least Squares. The resulting Instrumental Variables estimates are β and γ. γ is the coefficient that (it is hoped) indicates the volume variability of labor demand.

[31] There are a number of rather stringent conditions that must be met for a instrument to be valid. These are explained in more detail in Appendix L. It is sufficient here to note that selecting an appropriate instrument depends on the source of the endogeneity that it is designed to overcome. Here, Roberts focuses on the risk of endogeneity caused by systematic errors in measuring FHP for a given shape. To be valid for this purpose, an instrument must not have measurement errors that are correlated with (generated by the same process as) the measurement errors of the shape FHP used in the primary regression. *Id.* at 54. Roberts believes that this

condition is satisfied because different weight/piece conversion factors are applied to different mail shapes.

[32] Roberts' results appear in Table 4 of his 2002 Paper, and are summarized in Table J-8, *infra*. They employ panel data for the period 1994-2000. They show that for 8 of 10 modeled operations, variabilities were not statistically significantly different than one.

[33] Roberts' 2002, results show that when the Ordinary Least Squares estimates are compared with estimates obtained with a fixed effects estimator, most of the estimates drop sharply. Roberts interprets this as evidence that the fixed effect estimating technique corrected for substantial omitted variables bias in primary regression. His 2002 results also show that when the Instrumental Variables technique is applied to the fixed effects model, most of the variabilities rise sharply. Roberts interprets this as evidence that endogeneity in the Fixed Effects models — either from omitted variables or from measurement errors in the FHP variable — was removed by the use of the Instrumental Variables estimator. *Id.* At 62.

(2) Roberts' March 2006 Paper

[34] In his March 2006 paper (Roberts March 2006), Roberts worked with panel data covering the period 1999 to 2004, which he gained access to as a result of the Postal Service's filing its rate request in Docket No. R2005-1. His paper emphasizes the need for mail processing labor demand models to estimate marginal cost in a theoretically clean way, rather than through imperfect proxies for volume. To that end, he explored the feasibility of modeling output not just by shape, but by various degrees of sorting that mail of the same shape requires. In doing so, his goal was to get closer to a method that distributes volume variable costs to mail classes according to the marginal effect that true piece volume would have on those costs.

[35] *Disaggregating output*. Roberts disaggregated FHP for letters into Incoming and Outgoing categories, and FHP for flats into Incoming and Outgoing categories. His

reason for doing so is that outgoing sorts are simpler and less costly, and their share of total sorting has dwindled over time as mailers enter workshared mail deeper into the system. The variability estimates that include this innovation are presented in Table 7 of Roberts March 2006, and in Table J-8 *infra*. For letters (FHP Incoming and Outgoing combined) his estimated volume variability is not statistically significantly different from one. For flats, his estimated volume variability is approximately 70 percent. *See* Table 8. The estimated variability of flats is significantly reduced from the approximately 84 percent that Roberts estimated in 2002. He attributes this to the introduction of the AFSM 100 which substantially altered the economics of flat sorting.

[36] *Seasonal effects*. Roberts' 2006 Paper examined in some depth the issue of whether mail processing labor demand models should take advantage of the substantial quarterly variation in volume or sweep that variation out of those models in order to remove such non-volume-related influences on work hours as quarterly changes in mail mix or workforce composition. He recognizes that quarterly dummy variables are statistically significant influences on work hours, and would cause omitted variable bias if left out. He is concerned, however, that myriad dummy variables sweep out a high proportion of the variation in volume that is available to model. The Postal Service's models include year dummies, quarterly dummies, and a series of lagged volume variables that average away long-term volume variation, all in addition to the fixed effect variable, which sweeps out the effect of persistent differences in productivity across plants, thus eliminating much of the effect of volume level differences across plants. He notes that this doesn't leave very much but short-run jitter with which to model the volume variability of mail processing labor. This, he suggests, makes it difficult to successfully model the response of hours to volume — especially where there are substantial errors in the measurement of the volume variable.

[37] On the other hand, he recognizes that leaving all time effects in the model would cause it to reflect the effect of evolving technology on work hours and little else. He seems to favor resolving this tension by leaving the effects of seasonal variation on volume in the model. He regards seasonal fluctuation in mail volume as primarily driven

by mailer behavior. Capturing the effect of this behavior, he implies, should be a high priority in any model of mail processing labor demand. He shows that the effect of removing the quarterly dummies is to drive down variabilities and increase standard errors. He suggests that examining the data at finer than quarterly frequencies might help deal with this dilemma. 2006 Paper at 53-60.

[38] *The proportionality assumption*. Roberts' 2006 Paper attempts to reconcile the differences between his plant-level model that uses unique pieces received by the plant (FHP) as a proxy for volume, and the Postal Service's operation-level model which uses the number of total piece handlings (TPH) as a proxy for volume. He notes that the assumption underlying the Postal Service's use of THP as a proxy for volume is that it moves in fixed proportion to plant-level volume. He argues that when the two modeling approaches are placed on a equal footing, they reveal that the elasticity of work hours with respect to output measured by Roberts' models can be decomposed into two parts — an elasticity of work hours with respect to operation-level piece handlings (TPH), which the Postal Service's models capture, and the elasticity of operation-level piece handlings with respect to "true" plant-level volume (FHP) for a given mail shape. He concludes that the Postal Service's models capture only the first component of volume variability — the elasticity of work hours with respect to piece handlings — but fail to capture the second component of plant-level volume on work hours. To obtain the complete effect of plant-level volume on work hours, he says, both elasticities must be added together.

[39] *Distribution keys*. Roberts takes note of the Postal Service's long-held view that in estimating what portion of a mail processing cost pool is output elastic, it is enough to estimate the elasticity of work hours with respect to operation-level piece handlings because it is reasonable to assume that elasticity is proportional to the elasticity of piece handlings with respect to volume.[9] He notes that the Postal Service

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[9] This is an example of the cost driver/distribution key method of estimating the marginal cost of subclasses that the Postal Service uses to analyze other kinds of postal costs.

has a secondary argument that even though its definition of piece handlings is not equivalent to volume, this inaccuracy is cured when the elastic portion of the cost pool is distributed to subclasses. At that point, the Postal Service argues, the relative subclass responsibility for hours expended in a mail processing operation as measured by IOCS tallies closely approximates the effect that each piece of a subclass would have on hours, especially for small volume changes over short time horizons. *Id*. at 20-22.

[40] Roberts points out that accurately estimating what portion of a cost pool is volume variable is a separate issue from how subclass responsibility for the volume variable portion can be accurately measured. He emphasizes that if the elasticity of work hours with respect to piece handlings is not proportional to the elasticity of piece handlings to volume, the Postal Service models will misestimate the elastic portion of the cost pool. He also argues that IOCS tallies showing subclass shares of time spent in the cost pool are not equivalent to the distribution of subclass volume in those cost pools. He notes that this matters if subclass shares of time depend on the level of output.

[41] To avoid the inaccuracies that he believes are inherent in the Postal Service's use of imperfect proxies for volume and for marginal cost, Roberts recommends that what the Postal Service labels the "constructed marginal cost" method be used. Under this method, the labor demand model would use as explanatory variables true measures of volume for each category of mail with distinct cost characteristics. With direct estimates of the marginal time incurred by the relevant mail categories, there would be no need to make assumptions about the relationship between cost drivers and distribution key subclass marginal costs. *Id*. at 26. *See also* OCA-T-1 at 11-12, fn. 4.

(3) Roberts' Testimony

[42] Roberts' testimony in this docket (OCA-T-1) was filed in September 2006. It reaffirms and builds on the theoretical observations and conclusions in his earlier papers. His testimony presents models that use panel data spanning the years 2002-2005, three

years shorter than the panel used in the Postal Service's current model. He chooses the shorter panel to restrict the data to a time when the major sorting technologies for letters (DBCS) and for flats (AFSM 100) were widely deployed. He concludes that the introduction of the AFSM 100, in particular, had a transforming effect on the economics of flat sorting. His estimated composite variability for letters of 1.361[10] would be reduced to 1.261 if he had not shortened the period covered by his data. Compare OCA-T-1, Table 4, Part A with Table 4, Part E.

[43] The September 2006 models explore the feasibility of further disaggregating FHP beyond shape and outgoing/incoming characteristics. FHP/shape/outgoing is further distinguished between barcoded and non-barcoded. FHP/letters/incoming is further distinguished between that which needs the OCR/ISS function and that which would go straight to the BCS operation. He reports that drawing these finer distinctions in the nature of output raise standard errors to the point where the estimates are not useful in ratemaking. *Id* at 7, 43-44.

[44] Rather than use quarterly dummy variables in the primary regressions, the September 2006 models initially preferred by Roberts use quarterly dummies as instruments in the Two Stage Least Squares estimation technique described previously to help control for endogeneity in the output variables. During these proceedings, the Postal Service asked Roberts to apply an appropriate overidentifying restrictions test to his instruments. For several sorting operations, the instruments that included quarterly dummy variables failed the test, indicating that some subsets of instruments were yielding results that were inconsistent with the results obtained when other subsets are used. Dr. Roberts removed the quarterly dummies from his set of instruments and reran the overidentifying restrictions test. He interpreted the results as evidence that the quarterly dummies were endogenous instruments. Consequently, Roberts concluded that his September 2006 models that did not include quarterly dummies as instruments

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[10] This composite variability for letters was obtained from his models that used quarterly dummy variables as instruments. Roberts ultimately recommended a model without quarterly dummy instruments with a composite letter variability of 1.276.

were preferable. Estimated composite letter variabilities decline from 1.361 to 1.276 as a result of this change. The estimated variability for the manual letter operation, however, declined substantially (from 1.916 to 1.520) as a result of this change. Compare OCA-T-1 Table 4, Part A with Table 4, Part B.

[45] Roberts does not recommend relying on his estimates of the volume variability of flats obtained from his September 2006 models. He notes that the AFSM 100 was introduced and widely deployed over this period and cites evidence that it substantially changed the roles of manual flat sorting and the FSM 1000. He observes for plants that do not have AFSM 100s deployed, the variability of the manual operation is much higher than for plants where it is deployed. He also notes that prior to the introduction of the AFSM 100, manual flat sorting output was very seasonal, but that when the AFSM 100 was widely deployed, the seasonal fluctuation ceased, and appeared to be transferred to the newly deployed AFSM 100. He notes that his manual variabilities drop below 0.60 where the AFSM 100 is deployed. He also notes that the estimates for the FSM 1000 are unexpectedly high where the AFSM 100 is deployed. These counterintuitive results are magnified when the quarterly dummy variables are eliminated from the set of instruments used. Roberts also cautions that except for the AFSM 100, the variabilities that his September 2006 models estimate for flat sorting operations have high standard errors. He surmises that these are symptoms of instability in the roles that these operations play that are related to the introduction of the AFSM 100 over the 2001-2003 period. He believes that more time is needed before a stable relationship among flat sorting operations is reflected in the data. *Id.* at 50.

c. Witness Neels' Testimony

[46] United Parcel Service sponsored the testimony of witness Kevin Neels (UPS-T-1).

[47] *Data quality*. Witness Neels has been critical of the quality of the MODS hours and handlings data since the Postal Service first used MODS data to model mail

processing variability in Docket No. R97-1. He asserts that the data remains error ridden. He notes that the same kind of obvious errors that characterized the data ten years ago remain common: negative values for hours or handlings; positive hours matched with zero handlings; zero handlings matched with positive hours; First Handled Pieces greater than Total Piece Handlings; intermittent cessation of reports, implausibly small or large operation throughputs, etc. Witness Neels also asserts that workers are often working in an operation that they are not clocked into by the MODS system. He calculates that mismatches between the operation that a worker is clocked into and what the worker was actually observed doing by the IOCS tally taker range from 10 percent to 49 percent, depending on the operation. UPS-T-1 at 14.

[48] Witness Neels asserts that witness Bozzo's screening of data for obvious errors at the quarterly level of aggregation retain observations with errors that would be obvious if examined at the weekly level. He shows that the percent of quarterly observations that are free of obvious errors of this kind ranges from only 43 percent for the AFSM 100 operation to 89 percent for the manual letter operation. *Id*. at 22-23. Witness Neels comments "One must wonder about the reliability of a data reporting system that produces obviously erroneous results up to 30, 40, or as much as 50 percent of the time." He notes that eliminating the additional erroneous observations revealed by disaggregating to the weekly level from the database used for modeling would have a substantial impact on the variabilities estimated for 5 of the 11 sorting operations that witness Bozzo models. *Id*. at 25. Given the poor quality of the MODS data, witness Neels doubts that it is possible to strike a balance between screening out obviously bad observations and the truncation bias that results from systematically discarding too large a portion of the available data. *Id.* at 55.

[49] *Instrumental variables. Witness* Neels applies statistical tests to the instruments that witness Bozzo uses to estimate variabilities for the various sorting operations that he models. He applies a test of the "validity" of the instruments. This tests whether the instruments are independent of the error term of the primary regression. He also tests whether the instruments are "relevant." This tests the degree

to which the output variable that is measured with error in the primary regression (TPH in witness Bozzo's models) is correlated with the instrument. In witness Neels' view, the results of these tests indicate that witness Bozzo's instruments are weak, and likely to bias the estimates of his primary models. *Id.* at 30. In other words, he doubts that they overcome the problem of errors in the output variables that witness Bozzo uses.

[50] *Technical flaws in the Postal Service's models*. Witness Neels presents what he regards as statistical evidence that witness Bozzo's models suffer from omitted variables bias. He stratifies modeled plants in several ways and tests whether the subsamples can be fit with the same estimated coefficients. He tests whether large plants can be pooled with other plants, and finds that for most operations they cannot. He tests whether growing plants can be pooled with stable plants, and finds that for most operations they cannot. These results suggest that witness Bozzo has not successfully modeled the effects of plant size and plant growth rates on work hours. *Id.* at 31-34.

[51] Witness Bozzo's main tool for avoiding omitted variables bias is the fixed effect variable. It is intended to control persistent cross-plant differences that might affect hours independently of volume. Witness Neels notes that plant-specific intercept shift variables can be viewed as a measure of the persistent differences in productivity among plants. He shows that the differences implied by the estimated values of this variable range from roughly 500 percent to over 1800 percent, depending on the operation. He contends that these differences are too large to be realistic measures of the differences in productivity among plants. He concludes that they suggest that witness Bozzo's models are mis-specified. *Id*. at 36-37.

[52] *Theoretical flaws in the Postal Service's models*. witness Bozzo's models assume that sorting operations are free-standing processes unaffected by activity in other sorting operations. Witness Neels tests that assumption for flat sorting operations. He tests whether certain flat sorting operations (manual sorting, and FSM 1000) behave the same way in the absence of the AFSM 100 operation as they do when that operation is present in the plant. He finds that they do not. He also tests whether manual parcel sorting operations behave the same way in the absence of a small parcel bundle sorter

operation as they do when that operation is present. He finds that they do not. He observes that these results conflict with the assumption underlying witness Bozzo's models that the variability of each sorting operation can be modeled independently of other sorting operations. *Id.* at 34-36.

[53] Witness Bozzo's models are predicated on the assumption that the cost behavior of individual sorting operations is stable because it follows a predetermined operating plan. Witness Neels argues such models are not able to capture the effect of changes in the mail processing network that are volume induced, and, therefore, are excessively short run in their focus. *Id.* at 55. He argues that the operating plan is an outgrowth of the stock of equipment that is available and the technology embodied in that equipment. These, he argues, are not stable over a rate cycle that typically covers several years. He presents tables showing that the mix of sorting technologies in the network shifts significantly from year to year. This is most obvious in flat sorting, he argues, where deployment of the AFSM 100 dramatically lowered the number of processing plants that rely solely on manual operations to sort flats.

[54] Witness Neels also argues that significant changes in the capability of equipment take place within cost pools from year to year. He points to the DBCS pool which has experienced a series of upgrades that include changes in their ability to read addresses, the number of output bins, and in the range of mail characteristics that are compatible with the machine. He also argues that the structure of the network changes from year to year, as plants are closed and others are brought on line — a process that will be magnified under the Evolutionary Network Development (END) network realignment program that will be underway in the test year. He presents binary logic regressions that, he argues, demonstrate that the probability of deploying standard processing equipment at a plant, such as the AFSM 100, the FSM 1000, and the SPBS, depends significantly on the levels of flat volume processed in the plant.

[55] Witness Neels says that the Postal Service's models are based on an incorrect definition of output. He refers to witness Bozzo's argument that TPH is appropriate because changes in TPH will be proportional to changes in volume because

"'identical pieces will follow the identical (expected) paths through the sorting network under the operational plan.'" *Id.* at 44 quoting USPS-T-12 at 39. Witness Neels notes that the actual path that such mail follows may be different than the expected path when conditions are not routine. As an example, he points to the use of manual flat sorting when flat sorting machines are at capacity and service standards require that the mail be processed, and argues that the frequency of resorting to non-routine processes is likely to be volume driven.

[56] More importantly, witness Neels argues, the operational plan itself changes from year to year. Like witness Roberts, witness Neels emphasizes that the data shows that the mix of processing operations changes from year to year, and the technology within operations changes as well in ways that affect the number of separations a machine can perform, how schemes can be configured, and therefore the required number of scheme changes. He notes that historically, the more specialized a plant's operations became, the more handlings a unique piece of mail might undergo. He also notes a recent trend toward multi-function sorting machines, which may reverse that trend. Both trends, he argues, conflict with witness Bozzo's assertion that TPH will change in proportion to changes in volume. *Id.* at 46. Witness Neels also criticizes the practice followed by witnesses Bozzo and Roberts of applying threshold volume screens to the data in order to remove the effects of ramping up or ramping down a sorting activity. He argues that ramp ups and ramp downs of different sorting technologies are a routine characteristic of the mail processing network that need to be accounted for in a realistic model. *Id*. at 46-47.

[57] *Unmodeled operations*. witness Bozzo's mail processing variability models cover 11 direct sorting operations, which account for roughly one-third of the costs of the mail processing network. The other two-thirds are incurred in "allied" (support) operations in the processing plants, and in the operations of the bulk mail centers. Witness Bozzo recommends that the Commission use the weighted average variability estimated by his models (85 percent) as a proxy for the volume variability of the unmodeled two-thirds of mail processing network costs. Witness Neels opposes this

proposal. He takes note of witness Bozzo's argument that the nature of the work performed in the modeled and the unmodeled operations is similar, and are driven by the activities in the sorting operations. Witness Neels rejects this argument. He contends that the only way to discover the true relationship between direct sorting and allied operations is to model the effect of true volume on those operations. *Id.* at 49.

[58] *Witness Neels plant-level model*. Witness Neels presented a model that he believes addresses and overcomes the shortcomings of the Postal Service's models. He concedes that it is not a fully-articulated model because he had to develop it within the narrow window of time that is available to intervenors when they participate in formal Commission hearings.

[59] The model is a multi-variate model which estimates the response of work hours in the entire plant to changes in FHP for each of the major shapes — letters, flats, and parcels. Witness Neels contends that a plant-level model captures layers of volume effects that are ruled out by the Postal Service's models. In addition to within-operation volume effects, it captures volume-driven changes in the mix of operations of the same shape, and volume-driven interactions among shape mailstreams. Witness Neels contends that a plant-level model also provides a sound way to integrate allied operations and overhead activities into the model. It also would be more tolerant of errors arising from assigning hours or volumes to the wrong MODS operation, since that would cancel out at the plant level.

[60] Witness Neels' model defines output as FHP for each shape. This avoids the need to determine whether TPH is proportional to volume. Volume-driven shifts in the ratio of TPH to FHP are included in the affects being modeled.

[61] Witness Neels' plant-level model is much simpler than the Postal Service's models because he thinks that some of the terms in the Postal Service's models, such as the plant-level capital, are endogenous variables, and others, such as relative wage terms are not able to play a meaningful role in models of autonomous operations. *Id.* at 50. The only terms that he retains from the Postal Service's models are plant-specific intercepts, delivery points in the area served by the plant, and a time trend. *Id.* at 51. He

uses RPW volumes by shape, and TPH counts by shape as instrumental variables. His model is log-linear.

[62] Witness Neels uses observations for each individual MODS operation that are free from obvious errors, since bad data in any operation will have a biasing impact on the response of plant-level work hours. The need for clean data in all contemporaneous MODS operations requires extensive screening of the data. Screening for obvious errors at the weekly level requires him to discard over 90 percent of the available plant-level observations. Because such heavy screening entails risk of truncation error, he estimates an alternative model with data screened at the quarterly level. This requires him to discard almost 80 percent of the plant-level observations. *Id.* at 52-53.

[63] These models yield an estimated plant level variability of 1.14 when data screened at the weekly level are used, and 1.03 when data screened at the quarterly level are used. The latter estimate is not statistically different from 1. Witness Neels does not endorse the use of these variability estimates to make rates. He believes that the poor quality of the MODS data and the severe truncation of the sample which poor data quality requires undermine the credibility of his results. *Id.* at 54.

d. Witness Haldi's Testimony

[64] Valpak Direct Marketing Systems Inc. and Valpak Dealers' Association, Inc. (Valpak) sponsored the testimony of witness Haldi (VP-T-2). His testimony did not focus on the quality of the MODS data, or the merits of the Postal Service's econometric models. Instead, it focuses on the implications to be drawn from the variabilities estimated by those models if they were to be used as a basis for setting rates.

[65] Witness Haldi asserts that if variabilities that are substantially less than 100 percent are used as a basis for making rates implies that the remainder of accrued mail processing costs would then have to be analyzed to see how much of that cost should be attributed as an "intrinsic" cost to one subclass of mail. Witness Haldi notes that the

main operational explanation that the Postal Service offers to support its estimates that the variability of mail processing labor is substantially less than 100 percent is that the time required to set up and take down most sort schemes is independent of the volume run on those schemes. Viewed this way, the cost of setting up and tearing down sort schemes in the 11 sorting operations modeled by witness Bozzo is more than $700 million. He notes that this implies set up and tear down costs of $2.3 billion if the aggregate variability of 85 percent for the 11 modeled pools were imputed to the other two-thirds of mail processing labor costs. VP-T-2 at 14.

[66] Witness Haldi argues that all of the cost of changing sort schemes is incurred for the benefit of only one shape of mail, and that much of it is incurred for the benefit of only one class, or one subclass of mail as well. He asserts that outgoing letter sorting schemes are typically segregated between First-Class Mail and Standard Mail in order to satisfy service standards for First-Class Mail. He also asserts that outgoing flat sorting schemes are typically segregated between First-Class Mail and other mail, although other classes might be present in incidental amounts. *Id.* at 45. He acknowledges that the Postal Service has not provided evidence that would allow the cost of scheme changes to be associated with specific subclasses. He is uncertain whether the current IOCS data collection system provides a basis for quantifying these distinctions within a MODS cost pool, but he asserts that it would not be difficult to modify it so that it could. *Id.* at 43 He concludes that if the product-specific incremental costs of scheme changes were quantified, much of it would be attributed, leaving attributable cost totals little changed from where they would be under the Commission's established conclusion that mail processing labor costs are nearly 100 percent volume variable. *Id.* at 16.

[67] If variabilities that are substantially less than 100 percent are used as a basis for making rates, it also implies that worksharing discounts would shrink substantially from those that the Postal Service currently offers. Worksharing discounts are intended to reflect the cost avoided by worksharing activities. Witness Haldi explains that their amount depends on what portion of the accrued cost pool is estimated to be

variable. The smaller the percentage that is considered variable, the smaller the percentage that is potentially avoided by worksharing activity. Therefore, adopting the results of the Postal Service's variability models will substantial alter the discounted prices charged for most rate categories. "[V]iewed in this way," he says, "the wisdom behind the current Commission practice of treating mail processing costs as being 100 percent volume variable becomes more apparent." *Id*. at 55.

[68] Much of witness Haldi's testimony is devoted to an attempt to place the results of the Postal Service's labor demand models in the proper theoretical perspective. He argues that those models, by focusing narrowly on the effect of workload on hours in individual sorting operations, are not measuring a response that is useful for either ratemaking or network planning. Witness Haldi argues that by modeling within-operation effects, the Postal Service's models capture only short run economies of "density" or "fill". These reflect the fact that if more pieces make use of a particular resource whose capacity is fixed during the period examined, unit costs go down.

[69] Witness Haldi observes that economies of density can occur in the use of a variety of mail processing resources. He discusses two pertinent examples — the capacity of a sorting machine to absorb volume (within the available time window), and the capacity of a specific scheme configured on that machine to absorb volume (within the available time window). He notes that the effect of rising volume on the fixed resource is discontinuous, meaning that rising volume spreads such "overhead" until capacity is reached. Once capacity of the fixed resource is reached, witness Haldi observes, several things can happen.

[70] If another unit of the "fixed" resource is obtained, diseconomies set in since capacity is initially underused. As volume rises further, the cycle of economies and diseconomies of density is repeated. Over a wide-enough range of volume, economies and diseconomies of density net out.[11] Witness Haldi says that this cycle of economies

[11] This would be a long-run response, which the Postal Service's models would not capture, since they hold capital stocks fixed.

and diseconomies can be observed even for small changes in volume. Citing Postal Service witness McCrery, he describes the Postal Service's practice of merging Standard and First-Class Mail in a single outgoing sort scheme if there is not enough volume to justify setting up and tearing down separate schemes. In this scenario, a diseconomy of density would occur as rising volume warranted setting up separate sort schemes for the two classes. *Id.* at 29. The triggering event, witness Haldi observes, could be only a few thousand pieces of mail. Tr. 23/8594-95.

[71] Rather than add units of a "fixed" resource when a capacity constraint is reached, an alternative response would be for the plant manager to turn to an older, less productive technology (such as the FSM 1000, if the AFSM 100s are fully occupied, or manual sorting, if both mechanized operations are fully occupied). Marginal costs within each operation might not rise, but marginal costs for the plant as a whole would as the mix of operations becomes less efficient. Witness Haldi points out that under this scenario, the designed capacity of the plant is exceeded, but the Postal Service's models would not be able to capture the effect, since they model only within-operation effects. *Id*. at 21-22.

[72] Witness Haldi is critical of the Postal Service's models because they do not reflect the full range of possible volume-related adjustments and therefore do not measure economies of scale. He is also critical of those models for not providing any useful indication of the effects of plant size on variability — a crucial issue in the Postal Service's network restructuring program that is now underway.

[73] Witness Haldi is not explicit about the period that mail processing variability models should cover, or the increment of volume that they should reflect. But he clearly considers it necessary for these models to be able to reflect the longer-run scenarios that he describes in his testimony in which volume can surge past the design capacity of a plant, in either a temporary or a sustained way, and the plant must adjust by either changing the mix of operations or by adding sort schemes or entire machines. He implies that it is realistic to expect such scenarios to occur over a rate cycle, and that mail processing variability models should be designed to measure their effects.

e. Witness Elliott's Testimony

[74] The IOCS questionnaire was revised in FY 2005. It now identifies changing the sort scheme on a sorting machine (setting it up and tearing it down) as a discreet activity. In Table 2 of his testimony, witness Bozzo compiles the new IOCS data for the 11 sorting activities that he models. USPS-T-12 at 27. Table 2 shows relative shares of tallies by activity in these sorting cost pools. Setup/tear down activity is shown to vary from 4 to 9 percent of total time in those pools. The composite average for letters and flats is 6 percent. In response to a request from a group of Periodicals mailers[12] the Postal Service provided similar data for non-modeled operations where there are sort schemes to change. Tr. 10/2508-26.

[75] Witness Stuart Elliott (MPA et al.-RT-2), on behalf of these Periodicals mailers, agrees with the Postal Service's operational witnesses that set up/tear down labor time is predominantly fixed. He downplays the argument that some sort schemes are volume variable because they run in parallel on multiple machines. He cites a single-day "snapshot" of processing activity taken by Postal Service witness McCrery that shows that roughly 5.7 percent of DBCS sort schemes ran simultaneously on multiple machines, and that roughly 13. 3 percent of AFSM 100 sort schemes ran simultaneously on multiple machines. MPA et al.-RT-2 at 3, citing Tr. 11/2896. He assumes that the time associated with the remaining sort schemes running on only one machine should be considered fixed, and therefore sort scheme costs as a whole should be considered fixed. He asserts that because they can now be quantified, the costs associated with scheme changes should be used to augment the categories of mail processing activities that the Commission treats as fixed per se under its established approach to estimating mail processing variability.

[76] Witness Elliott describes the Commission's established binary approach to estimating the volume variability of mail processing labor costs, which distinguishes

[12] Magazine Publishers of America, Inc., Alliance of Nonprofit Mailers, American Business Media, Dow Jones & Co., The McGraw-Hill Companies, Inc., and National Newspaper Association.

between mail processing activity that is considered to be fixed from that which is considered to be 100 percent variable based on engineering/operational observation. In order to quantify the costs that he believes should be added to the fixed component under the Commission's approach,[13] witness Elliott converted the IOCS data provided by the Postal Service into dollar estimates of set up/tear down costs for the 11 modeled sorting operations and for the unmodeled mail processing operations. He combines them with the roughly 4 percent of mail processing costs that are considered fixed under the Commission's current attribution method. He deducts this combination of fixed costs from all other mail processing costs, which the Commission treats as 100 percent variable. He calculates that volume-variable mail processing costs under the augmented Commission method would come to $5.6 billion, or 93.9 percent of accrued mail processing costs.

[77] Elliott also asserts that the results of his augmented Commission method of estimating mail processing variability conflict with the estimates of more than 100 percent variability obtained from the econometric models of witnesses Roberts and Neels. He calculates that letter sorting operations are 92.3 percent variable under his augmented Commission method. Using this figure as a benchmark, he notes that Roberts' estimate of letter sorting variability of 127.6 percent, together with its standard error of 6.1 percent, yield a 95 percent confidence interval of 115.6 to 139.6 percent, well above his 92.3 percent benchmark. Similarly, he notes that witness Neels' alternative estimates of plant-level variability of 114 percent and 103 percent have confidence intervals that are above the "augmented" Commission benchmark estimate of 92.2 that witness Elliott calculates for the direct sorting operations modeled by witness Roberts. *Id*. at 7-8. He implies that his benchmarks are either theoretical or operational maxima above which mail processing variability may not credibly go.

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[13] The activities that the Commission considers fixed with respect to volume are relatively minor. They include such things as time waiting on the platform for the arrival of trucks to unload. Fixed activities make up about 4 percent of total mail processing labor cost under the Commission's method. Consequently, under the Commission's method, mail processing labor is about 94 percent volume variable.

[78] Witness Elliott also disagrees with witness Haldi's conclusion that much of the cost of changing sort schemes could be attributable to classes or subclasses of mail as "intrinsic" incremental costs if substantial portions of the pools of costs modeled by witness Bozzo were found not to be volume variable. He cites the testimony of Postal Service witness McCrery that incoming secondary sort schemes make up the bulk of sort schemes and that most of those schemes sort more than one subclass of mail. *Id*. at 11-12.

f. Witness Oronzio's Testimony

[79] Roberts estimates that the volume variability of the manual letter sorting operation is 152 percent, with a 95 percent confidence interval of 144.5 to 159.5 percent. Postal Service witness Oronzio (USPS-RT-15) argues that there are no credible operational explanations for manual letter sorting variabilities this high. He rejects Roberts' speculation that these variabilities reflect a tendency to use manual sorting to deal with overflow from the automated operations.

[80] Witness Oronzio asserts that there is no shortage of capacity in the DBCS letter sorting operation, which has all of the machines needed throughout the system to accomplish the sort to Delivery Point Sequence, which defines the peak requirement for those machines. If there were a shortage of DBCS machines during that operation, he asserts, automation letters are unlikely to be diverted to manual processing because OCR machines, which are usually idle and available at the time, could sort the overflow at least to the carrier route level.

[81] He says that there are additional disincentives to divert automation compatible mail to the manual operations. Manual sorting skills require scheme knowledge (knowledge of individual addresses in a local area) which, he says, has not been maintained in the plant workforce as the need for manual sorting has declined. Finally, he says, space is currently scarce in plants, and the cases needed to sort letters beyond the 3-digit level have been reduced to a minimum, "so even if somehow there

were manual clerks with the necessary skills available, there wouldn't be anywhere for them to work in the plant." USPS-RT-15 at 11.

[82] Witness Oronzio offers as an alternative explanation for the high variability that Roberts' model estimates the "greeting card" effect — the rise in the proportion of single-piece letters during the Christmas quarter. He speculates that Roberts' models are capturing the effect on work hours caused by this change in the composition of the mailstream, as opposed to changes in volume. *Id*. at 12.

[83] He also speculates that Roberts' results reflect unreliable FHP data. He explains that managers do not trust and do not use FHP data for a number of reasons. He says that FHP counts are not reliable because of the need to weigh the mail to estimate volume.[14] He also says that managers have little use for FHP counts because they are hard to define below the plant level. In addition, he says, FHP counts are a poor measure for comparing the performance of one plant to another because the spread between the sort level of mail entering a plant, and the sorting improvement performed at the plant, varies widely across plants. He argues that FHP does not capture the differences in sorting work effort expended at plants on a given amount of FHP volume. *Id*.

3. Commission Analysis

a. The Theoretical Debate

[84] Ever since the Postal Service first presented its approach to modeling the volume variability of mail processing labor costs in Docket No. R97-1, the debate was joined between the Postal Service and its critics about whether the Postal Service's

[14] Witness Oronzio mentions that conversion factors used to derive FHP counts from volume can be thrown off by seasonal changes in mail mix, and even by changes in humidity.

model was on sound theoretical footing. The Commission's opinion in that docket identified the main issues.

[85] One of those issues is whether the Postal Service's models were labor demand functions that were grounded in articulated cost functions that minimize costs according to relationships specific in an identified production function. The research of witness Mark Roberts conducted on behalf of the OCA has gone a long way toward supplying these necessary theoretical underpinnings of an appropriate labor demand variability model. *See* 2002 Paper, Section II. There, output is carefully defined as unique mailpieces processed in the plant. The role of capital equipment is identified in a way that recognizes that the essential technologies in use are shape based and that they interact with the degree of use of other technologies in a plant. Roberts' cost function allocates a proper role to the price of inputs, including a relative wage, and allows relative prices of automated and manual labor to influence the mix of technologies used in the plant. The Commission concludes that Roberts has brought much-needed theoretical clarity to the problem of modeling mail processing labor demand, and agrees with the basic assumptions that his theoretical framework embodies.

(1) Definition of "Output"

[86] One issue that the Postal Service's models raise that Roberts has put in clearer theoretical perspective is whether the number of piece handlings (TPH) is a theoretically sound definition of output — one that can be used to recover marginal cost for specific mail products. A related issue is whether the number of piece handlings can be made to function as a sound measure of output when the resulting variable cost pools are distributed to subclasses with IOCS distribution keys. Other related issues are whether the number of piece handlings (TPH) is proportional to volume in the plant (FHP) and whether volume in the plant is proportional to volume in the system (RPW).

[87] *Problems with defining output as TPH*. Roberts would resolve these issues by observing that given the nature of the mail processing production function, calculating

economically meaningful marginal costs for postal products requires that one use “real” plant-level volume to find the variable portion of mail processing costs, and one must distribute those costs in proportion to “real” RPW subclass volume. Under Roberts’ production model, the mail processing system takes pieces of unsorted mail as its fundamental input, and transforms them into sorted pieces. The number of unique pieces of mail received by the plant that undergo this transformation, therefore, is the proper definition of the “product” or “output” of this process. The relationship of interest is the response of work hours to the number of unique pieces that are finalized, since that is the mail processing system’s purpose.

[88] In the MODS data system, first handled pieces (FHP) counts the number of unique pieces that enter a plant. The reason that the Postal Service records FHP (by shape) is that it provides a basis for the plant manager to project what work effort will be required to transform unsorted pieces into sorted pieces. The manager uses FHP (by shape) to determine how much work (how many total piece handlings, or TPH) will be required in the various operations in the plant. The manager does this by estimating the propensity of each FHP to generate TPHs in subsequent operations. He thereby estimates the work hours that will be required to finalize those pieces. These estimated propensities to require work effort are called “downflow densities”. Because downflow densities change, they must be recalculated every at least every six months to remain effective in predicting the work effort that will be required. *See MODS Handbook M-32 at 4-12.2.*

[89] The planning that the manager does on the basis of FHP counts is the essence of Roberts’ labor demand model. The manager’s task is to find the propensity of plant-level FHP to generate operation-level TPH. TPH is treated as a proxy for work effort. The plant manager must also estimate the propensity of TPH to generate work hours. From a theoretical perspective, FHP is simultaneously the measure of input to the process, but is also an exact measure of plant output. TPH is a measure of work effort (a proxy for work hours) that will be needed to produce the output of the plant. The Commission agrees with witness Roberts that it does not make theoretical sense to use

TPH, which is essentially a measure of work effort, to predict the amount of work effort that will result.

[90] The Postal Service complains that plant-level FHP is not a theoretically perfect measure of volume. (*See USPS-T-12 at 41-42)* Its point is well taken. Since the purpose of the labor demand modeling exercise is to find the optimal rate to charge for pieces of mail, the relationship of interest is the marginal effect of pieces purchased on mail processing work hours (which is readily translated into labor cost). Pieces purchased would be all pieces entered into the postal system, i.e., the volume reported in the RPW database.

[91] Just as it is the plant manager's job to estimate the propensity of each FHP count to generate TPH counts, the modeler of labor demand needs to estimate the marginal propensity of each RPW piece to generate FHP counts, and then to estimate the marginal propensity of each FHP count to generate work hours. FHP counts are once removed from the ideal measure of volume (RPW). But the propensity of RPW pieces to generate FHP counts must be estimated, unless there is reason to assume that RPW pieces are proportional to FHP.

[92] We do not know whether the ratio of FHP to RPW changes over time, but there is reason to suspect that it does. FHP is a measure of how many processing plants a typical RPW piece encounters. This number is likely to be changing over time, as the practice has grown of entering workshared mail deeper and deeper into the system, and there is reason to think that it would change noticeably over a rate cycle of several years. Not being able to estimate the rate at which the ratio FHP/RPW changes is one drawback of using FHP as a proxy for volume in witness Roberts' models. It remains a significant obstacle to successfully modeling the volume variability of mail processing labor demand.[15]

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[15] The "intelligent mail" volume tracking program is scheduled to begin implementation before the test year. It apparently has the potential to be a comprehensive volume tracking system, going beyond bulk entered mail. If so, it has the potential to provide accurate and detailed volume data at the plant level. The absence of such data currently is the most serious of all the obstacles to successfully modeling the variability of mail processing labor demand.

[93] Since FHP is only one step removed from system volume, however, it remains a better proxy for RPW piece volume than TPH. Using TPH as a proxy for system volume requires one to assume both that FHP is proportional to RPW, and TPH is proportional to FHP. While one can speculate that the former assumption is unrealistic, it has been effectively demonstrated that the latter assumption is unfounded. witness Roberts has demonstrated that the ratio of TPH/FHP changes both over time (within a typical rate cycle) 2006 Paper, Table 1, at 67, and across plants, *Id*. at 68. He has also demonstrated econometrically that TPH does not vary in proportion to FHP in most sorting operations.[16]

[94] The proportionality of TPH and FHP is a fundamental assumption required to validate the Postal Service's model. TPH is two levels removed from system volume, and the record shows that the relationship between operation-level "volume" and plant-level "volume" is one that must be modeled rather than assumed. Because the proportionality assumption is basic to the Postal Service's models, and is unfounded, the volume variability estimates of the Postal Service's models are not useful for ratemaking purposes. They are not a complete measure of the marginal effect of volume on costs.[17]

[95] *Problems with defining output as FHP*. While FHP is closer to the theoretically correct measure of volume than TPH, it is not perfect. An FHP count will exceed an RPW count by the number of processing plants that an RPW piece enters after the originating plant. If operation-level work hour responses are being modeled, a

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[16] Roberts adapted his variability model by substituting TPH for the dependent variable "hours" and running the regression. The results demonstrate that TPH is not directly proportional to FHP in four out of five letter sorting operations, and four out of six flat sorting operations. OCA-T-1 at 13-15.

[17] As witness Roberts points out, TPH is an inherently erroneous measure of plant-level volume and system-level volume, since it is actually a measure of factor inputs. Nevertheless, witness Bozzo defends it on the ground that it de-averages the effects that it measures to a finer degree than does FHP. This is a valid point. Where FHP reflects the number of plants that touch an RPW piece of mail, TPH reflects the number of times that operations touch an RPW piece of mail. Therefore, TPH is a better indication than FHP of how much work an operation within a plant is doing relative to the hours logged into that operation, or how much work a plant overall is doing relative to the hours logged in that plant. While TPH is a useful tool for analyzing productivity from an engineering standpoint, the ratio of TPH to FHP is a more direct indicator of economic efficiency.

plant-level FHP count will not distinguish between mail-pieces that are re-handled in the same operation, and will not distinguish pieces that need less effort per handling due to its initial level of presort. These characteristics can be expected to have distinct effects on hours and therefore costs. Definitional problems arise because FHP is defined according to the sequence of operations that a piece undergoes. For example, standard FHP accounting would reflect that a local, turnaround mailpiece receives a handling in its first outgoing operation, but would not reflect any incoming handlings that it receives. This asymmetry becomes a significant drawback if FHP is disaggregated into Outgoing and Incoming categories for modeling purposes, as Roberts recommends, since the impact of incoming processing on hours would not be captured.

[96] Roberts recognizes that aggregate FHP counts might be too blunt a tool to produce accurate estimates of the variable portion of labor costs that mail with heterogeneous cost characteristics impose on individual sorting operations. He therefore attempts to disaggregate FHP to ways that recognize the most important differences in cost-driving characteristics.

[97] In Roberts' 2006 Paper, he disaggregates FHP into FHP Outgoing and FHP Incoming for each shape, and regresses hours in an operation on each of these plant-level output measures. He defines output the same way in his preferred results, but he also investigates the effect of further disaggregating the incoming or outgoing output categories into ones that reflect whether the output did or did not have to go through the OCR function to obtain a barcode. He examines the results, and generalizes that compared to a single-output model (plant-level FHP by shape) the two-output model (FHP by shape and incoming/outgoing) yields plausible estimates for each category, but that the aggregate variability for a given shape is little changed. He says that further disaggregating these output categories according to whether they need to use the OCR function still yields plausible results for each category, and does not change the aggregate variability very much. He notes, however, that because of the likely correlation of these categories, and the loss of degrees of freedom, most of the results are not meaningful, due to high standard errors. Accordingly, he concludes that there is

no added benefit from disaggregating FHP beyond shape and whether it will require an outgoing or an incoming sort. *Id.* at 41-43.

[98] *Distribution keys*. witness Roberts emphasizes that the goal of modeling the variability of mail processing labor demand is to calculate marginal costs for individual postal products. He argues that the Postal Service's models can not estimate marginal cost by product because they use the cost driver/distribution key method of attribution even though the restrictive assumptions necessary for using that method are not satisfied. This causes it to mis-estimate the size of the variable portion of a given cost pool. It also causes it to distribute those costs on the basis of piece handlings, rather than on actual RPW volume.

[99] As concluded above, there is a gap in the Postal Service's models. They estimate the effect of the cost driver (TPH) on hours in an operation, but not the effect of plant-level volume on the cost driver. Therefore, they apply only a partial elasticity to the cost pool for a given operation. There is no way to transmit the portion of marginal cost that this method omits through to specific postal products. The Postal Service argues that this is somehow corrected when the elastic portion of the cost pool is distributed to subclasses using the IOCS distribution key. *See* Docket No. R97-1, Tr. 34/18219-23. IOCS tallies represent the relative subclass shares of time spent sorting each subclass in the operation. As witness Roberts points out, they have no effect on the size of the cost pool they distribute.[18]

[100] Because witness Roberts' approach defines output as plant-level FHP, he does not need to assume that TPH in a given MODS pool is the cost driver for that pool.[19] Nor does he need to assume that there is any relationship between a cost driver and the subclass distribution of volume in a cost pool in order to obtain an economically meaningful estimate of subclass marginal cost. Under the Postal Service's approach one must assume that this relationship is proportional in order for its IOCS distribution key to produce subclass marginal cost.

[101] In witness Roberts' view, once marginal costs have been correctly estimated, they must be distributed in proportion to relative subclass piece volume if they

are to be economically meaningful product marginal costs. To obtain such costs, he believes it is necessary to disaggregate shape FHP into its components with distinct cost characteristics and treat each component as an output variable to be modeled. To take marginal cost to the subclass level, pools of marginal cost by disaggregated output category would be distributed according to subclass shares of piece volume observed within each category. This approach dispenses with the need to assume particular relationships between the piece-handling cost driver and either plant-level shape volume or subclass shares of volume. Tr. 23/8437.

[102] The alternative proposed by Roberts is difficult to apply, given the lack of detailed volume data at the plant level and below. As described above, Roberts believes that he reached the useful limit by which FHP can be disaggregated and modeled when he divided shape FHP into four categories (incoming/outgoing/auto/non-auto). Roberts asked the Postal Service to construct distribution keys showing subclass shares of piece volume in the incoming and outgoing categories of FHP by shape that he modeled. He considers the Postal Service's response as an illustration that such distribution keys can be constructed. He did not evaluate the results sufficiently, however, to recommend that this key be used. *See* Tr. 23/8292-95. Roberts believes that it may be possible to use detailed MODS and IOCS data to infer subclass shares of RPW piece volume for the

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[18] *Id.* at 11. Even if the Postal Service method had scaled the elastic portion of the cost pool correctly, the IOCS distribution key is an imperfect mechanism for distributing those marginal costs to products. The Commission has noted in the past that subclass shares of time reflected by IOCS tallies are not the equivalent of the subclass distribution of TPH, and that the subclass distribution of TPH is not the equivalent of the subclass distribution of pieces. PRC Op. R97-1, ¶ 3157. The Postal Service argues that IOCS tallies could be viewed as the equivalent of a productivity-weighted distribution of TPH. Under this liberal view, the Postal Service argues, the elasticity of MODS pool costs with respect to this proxy measure of subclass TPH, by the chain rule of calculus, could be multiplied by the subclass distribution of pieces to get subclass marginal cost. The subclass distribution of pieces, however, is not known. It would equal subclass TPH only if changes in the level of pieces would not affect the subclass distribution of TPH. *Id.* at ¶3155. There is ample reason to think that year-to-year changes in volume would affect that relationship. Existing kinds of equipment, and equipment that embodies new technology, are constantly being deployed or retired throughout the mail processing network. Their deployment causes new patterns of piece handlings in the plants in which they are deployed. Decisions to deploy these machines turn, in part, on the expected volume of mail of various classes.

[19] The Commission's method of estimating the variability of mail processing labor costs does not need to assume anything about this relationship either.

more disaggregated categories of output that he advocates, but he recognizes that it would require a great deal of hands-on postal expertise that he does not have.[20] Roberts March 2006.

[103] Because he has been unable to obtain data on the distribution of subclass volume at the operation level that is necessary to construct theoretically correct distribution keys, Roberts suggests an interim approach. He suggests that his models that distinguish FHP only by shape be used. A cost pool at that general level would allow RPW subclass volume to be used as a theoretically correct distribution key for subclass marginal cost. He seems to concede that more disaggregated categories of marginal cost would be needed if they were to be used to design detailed rates. Tr. 23/8440.

[104] *Non-modeled costs*. As noted earlier, Roberts believes that it is necessary to model variable mail processing labor costs using plant-level volume, and necessary to distribute those costs in proportion to RPW subclass shares in order to get economically meaningful subclass marginal costs. He recognizes, however, for this approach to succeed, it must be applied to all mail processing cost pools. As Haldi points out, the models proposed by Bozzo and Roberts cover only 11 sorting operations comprising one-third of total mail processing costs. Extending an approach that focuses on modeling the costs of individual processing operations to individual allied operations and bulk mail center operations may be difficult. The approach suggested by witness Neels of modeling costs at the plant level may be a more realistic one if the goal is to estimate comprehensive subclass marginal costs directly from volume data.

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[20] IOCS tally data includes fine distinctions about the subclass and rate category of the mail being processed in a particular MODS operation. Examples would be whether a First-Class letter is stamped, metered, etc. In constructing its engineering models of avoidable cost which form the basis of the Postal Service's discount, the Postal Service is able to use this information to construct estimates of the volume of mail within a subclass with certain cost-driving characteristics that is being processed in a particular MODS operation. It is an open question whether the Postal Service, given sufficient motivation, could produce reasonably accurate distribution keys for the kind of output category that Roberts would need in order to estimate subclass marginal cost by cost characteristic — for example, machinable and nonmachinable letters. Identifying the volume of mail in a plant that exhibits certain cost-driving characteristics, as Roberts' modeling approach would require, should prove much easier once the Intelligent Mail tracking system is in place.

(2) Endogeneity, Separability, and Proportionality

[105] The basic idea underlying the Postal Service's mail processing cost models is that mail processing consists of separate stages of production (MODS operations) and that each stage is independent of the other. Each stage has a cost driver (TPF or TPH) that is unique to that operation. There is no substitution of one sorting technology for another, and no role for the relative price of either labor or capital to play in determining the mix of operations that will be used in the plant. The plant manager has no discretion to reallocate workload among operations to minimize costs based on the relative prices of the labor or capital input available to him. The mix of operations is determined by the operating plan that is in force at the time. The operating plan hard wires the path that a piece of mail will take through the plant, based entirely on its physical characteristics (e.g., shape, machinability, barcoded or not). Bozzo emphasizes this point with flow diagrams showing the inevitability of the path that each mail piece will take through the plant. UPSP-T-12 at 17, 20.

[106] *The Separability Assumption*. Roberts questions the Postal Service view that each sorting operation is a stand-alone production process. He says that this may reasonably characterize the mail sorting process on a day-to-day basis. But over a longer time period, such as a quarter, or a rate cycle, management has discretion to change the operating plan and substitute some inputs for others, depending on the circumstances — in other words to actively manage the plant. 2006 Paper, Section II. The discretion to actively manage the plant makes the number of piece handlings (TPH) in a given operation "endogenous" or determined, in part, by managerial choice as to how to deal with volume arriving at the plant.

[107] Roberts asserts that managers adjust operating plans to accommodate changes in the workforce, equipment, plants served, or which schemes to run on which vintages of equipment. He described, for example, the flexibility that a manager has to configure sort schemes to accommodate seasonal changes in high-volume destinations, or to accommodate requests from downstream facilities to adjust the sorting depth in

which the mail is received. He described how managers have the discretion to exploit their older, under-used equipment by creating secondary sort plans to process mail rejected by more modern equipment. As a result of manager's decisions, sort schemes vary, and TPH counts vary with them. *Id.* at 34-35.

[108] Roberts tested the separability assumption statistically. He hypothesized that the capital stock in other operations was jointly significant in explaining the level of work hours demanded in the operation being analyzed. He demonstrated that, except for the FSM 1000, the main sorting operations for both letters and flats were affected by the capital equipment available in related operations. Tr. 23/8290-91.

[109] The separability assumption underlying the Postal Service's models is unrealistic because it denies the existence of economies of scope in mail processing. *See* PRC Op. R97-1, ¶ 3055. It is transparently false for time frames as long as a quarter or a rate cycle — the relevant period for ratemaking. It is clear that the workload flowing to the OCR cost pool, for example, depends on the whether a plant has added OCR capability to the equipment in operations that are both upstream of the OCR (the AFCS) and downstream of the OCR (the D/BCS operation). Tr. 10/2655. It is also clear that the widespread deployment of the AFSM 100 transformed the roles that the other flat sorting operations now play (Manual Flats and the FSM 1000). *See* 2006 Paper at 48-50 and Figure 1. The use of older, less capable machines for sorting rejects of the newer, more capable machines described by Postal Service witness Oronzio is an example of the dependence of workload in one operation (OCR) on the state of technology in another (the D/BCS operation). USPS-RT-15 at 10-13.

[110] *The proportionality assumption*. Even if the separability assumption were true, TPH would be the wrong cost driver to use to estimate the marginal cost of postal products. That is because TPH is a measure of output that is peculiar to the operation in which it is found. TPH neither implies the same amount of work hours from one operation to another, not the same degree of improvement in the condition on the mailpiece. The marginal costs that it implies for a given cost pool cannot be aggregated

across pools using TPH to get a comprehensive marginal cost for a piece of mail. Roberts 2002 Paper at 14.

[111] The problem with using machine counts of piece feedings into sorting machinery is that the number of times that each piece is fed into a machine before it is finalized will depend on the type and capacity of sorting equipment that is used and the managers' decision on how to program the sorting schemes. Machinery that can sort to half as many bins as another will require twice as many TPH to achieve the same improvement in mail condition. A model using TPH as a cost driver will interpret the data for the lower capacity machine as having incurred more hours, but produced twice as much output as the higher capacity machine. This will affect the variability estimated. A model that uses FHP in this scenario, however, will not measure any difference in output, but will attribute the difference in hours to something other than volume (e.g., to a control variable such as capital stock, or to error) *Id.* at 10-11.

[112] Using TPH as a cost driver will bias the result under the scenario just described because the TPH count generated by the low-capacity machine differs from the TPH count that the high-capacity machine would generate producing the same output. In other words, the proportion of TPH to FHP changes, depending on the type and capacity of the machine. Clearly, a model is mis-specified if its measure of output varies according to the inputs used. That is the basic flaw in the Postal Service's models.

[113] The Postal Service says that this is a non-issue in practice, because TPH will change in proportion to plant FHP. But this is transparently false over periods ranging from a quarter to a rate cycle. Consider, for example, an unbarcoded mailpiece that requires a piece handling in both an OCR and a D/BCS in order to be finalized. When the D/BCS is upgraded with OCR capability, it can do both in a single handling. The same output that formerly generated a TPH in two separate cost pools, now generates one TPH in one cost pool. The change in the mix of operations changes the ratio of TPH to plant FHP, even though output did not change. This will not affect a model that defines output as plant FHP. This will be misinterpreted as the effect of

volume variation in a model, such as the Postal Service's model, that defines output as TPH.

[114] Roberts points out that the proportionality assumption is contradicted by the data. Tables 1 and 2 in Roberts March 2006 demonstrate that the ratio of TPH to FHP changes both over time and across plants, for both letters and flats. Technical Issues.

[115] Roberts did some analysis to see whether the Postal Service's models of the effect of piece handlings (TPH) in individual operations on work hours in that operation could be reconciled with his models of the effect of volume (FHP/shape) in the entire plant on work hours in individual operations. His model focuses on the elements that, when added together, yield the marginal cost of a letter. He reformulates his model to incorporate the Postal Service's assumption that each operation is a stand alone process with a unique cost driver. He decomposes the marginal cost of a letter into two components — the elasticity of work hours with respect to TPH, and the elasticity of TPH with respect to volume in the plant FHP. He regresses TPH/operation on FHP/shape for the plant to find the second elasticity. He then tests the hypothesis that the elasticity of TPH/operation with respect to FHP/shape is equal to one. The results are presented in the table below.The hypothesis that TPH in individual operations varies in proportion to FHP for the plant is rejected in eight of the 11 operations modeled. *See* OCA-T-1 at 11-13.

[116] Dr. Bozzo altered the Roberts' reformulated model. He argues that it is more appropriate to test the assumption that TPH/shape varies in proportion to FHP/shape. He therefore regresses TPH/shape in the plant on FHP/shape in the plant. The results reject the proportionality assumption for both letters and flats. Dr. Bozzo further argues that since FHP recorded as manual never flows to the automated operations, the FHP/shape explanatory variable used by Dr. Roberts should be disaggregated into manual FHP and automated FHP. USPS-RT-5 at 65-68. Disaggregating the FHP/shape explanatory variable in this way resulted in hypothesis tests that do not reject their proportionality with TPH/shape.

Table J-2

Test of Proportionality Assumption ($\delta = 1$) (Regressing TPH on to FHP)

	Roberts		Bozzo		Bozzo	
	Regresses a TPH/operation on FHP/shape [compatible with Roberts' conceptual model]	Hypothesis that the proportionality assumption holds ($\delta = 1$)	Regresses a TPH/shape on FHP/shape [compatible with Roberts' conceptual model]	Hypothesis that the proportionality assumption holds ($\delta = 1$)	Regresses TPH/shape on disaggregated (automated and manual) FHP/shape (coefficient standard errors are combined) [compatible with Bozzo's conceptual model]	Hypothesis that the proportionality assumption holds ($\delta = 1$)
Manual Letters	1.726 (.069)	rejected				
MPBCS	2.210 (.207)	rejected				
DBCS	.866 (.034)	rejected				
Agg BCS	.951 (.033)	not rejected				
OCR	1.675 (.064)	rejected				
Manual Flats (plants with an AFSM)	.716 (.132)	rejected				
FSM1000 (plants with an AFSM)	1.044 (.117)	not rejected				
AFSM (plants with an AFSM)	.792 (.017)	rejected				
Manual Flats (plants without an AFSM)	1.057 (.106)	not rejected				
FSM881 (plants without an AFSM)	1.237 (.098)	rejected				
FSM1000 (plants without an AFSM)	.372 (.069)	rejected				
Letters			1.041 (.027)	rejected	0.852 (.13)*	not rejected
Flats			.794 (.013)	rejected	1.129 (.15)*	not rejected
Notes:	**Standard errors in parentheses** *** Standard errors carried out to 3 decimal places and combining method is not presented** **Source: Docket No. R2006-1, OCA-T-1 at 11-13, USPS-RT-5 at 65-68, USPS-LR-L-192: USPSmod_threestep.log**					

[117] In terms of hypothesis testing of the proportionality assumption, there may not be a clear winner on this record. However, the Commission notes that to legitimize his models, Dr. Bozzo needs to show that operation-level TPH is proportional to plant level FHP, because his models use operation-level TPH, not plant-level TPH, as a proxy for volume. If the proportionality assumption doesn't hold at that level, Dr. Bozzo's models are mis-specified.

[118] Of more significance than the hypothesis testing that has been conducted on this record is the fact that the proportionality assumption is violated by simply looking at the ratio of TPH/FHP and seeing how it changes, both over time and across plants. *See* Roberts March 2006, Tables 1 and 2.

b. Technical Issues

(1) Data Quality

[119] The Postal Service's Management Operating Data System (MODS) records work hours and piece handlings incurred in each mail processing operation in each mail processing plant. Like most self-reporting systems, MODS generates a mountain of observations at the level at which the data are first collected and reported. The obvious downside to such a scheme is that the data set may be quite inaccurate, since the quality controls exercised at the source are likely to be minimal. The MODS reports are also susceptible to censorship and manipulation because the basic purpose of MODS is to enable management to evaluate the performance of the Service's mail processing plants. *See* PRC Op. R2005-1, Appendix I, at 23 of 62.

[120] Since these data were first made the basis for econometric modeling of mail processing cost variability, the Commission has consistently concluded that they are too error ridden to produce estimates that are sufficiently free of bias to be relied upon for ratemaking. *See* PRC Op. R97-1 ¶¶ 3040-3046; PRC Op. R2000-1 at 90, 97; PRC Op. R2005-1, Appendix I, at 29-33, 37, 52.

[121] *Significance of error in the output variable*. Measurements of the variables that are to be used as explanatory terms in the estimated variability models must be error free. The Commission has warned since Docket No. R97-1 that the consequences that follow from using a sample that contains a substantial level of error can be severe. When fit to the sample, the model's estimated coefficients are likely to be biased and inconsistent. "Biased" means that the estimated coefficients are expected to be different from those of the true coefficients. "Inconsistent" means that the bias will remain even if the sample is large. PRC Op. R97-1 ¶¶ 3041-3043.

[122] Measurement errors in an explanatory variable bias the estimated coefficient on that variable toward zero if these errors are independent and identically distributed.[21] The greater the variability in the measurement error, the greater the downward bias. This is clear in the case of a model with a single explanatory variable, but in a multi-variable model, there is a general tendency for the set of estimated coefficients to collectively move toward zero.[22] This effect is magnified when estimators are used that difference the data, and thereby remove much of the cross-sectional variation in the panel. This is true of all of the models proposed in this docket, all of which use fixed effect estimators. See the relevant econometric literature summarized in 2006 Paper at 50.

[123] *Significance of error in the work hours variable*. The dependent variable in the mail processing labor demand models under review is work hours in the sorting operation, or the plant as a whole. These hours are calculated from clock rings in which the worker is responsible for swiping a badge across the appropriate reader whenever he enters or leaves a MODS operation. Employees are sometimes not sufficiently motivated to ring in and out of an operation if changes in assignment are frequent or

[21] When there are many bad observations present, the regression can present a description that mixes measurement of how the dependent variable is related to the explanatory variables in the correctly observed portion of the sample, and how the bad observations were generated in the erroneous portion of the sample. This reduces the apparent response of the dependent variable to the independent variable.

[22] Robert S. Pindyck and Daniel L. Rubinfeld, *Econometric Models and Econometric Forecasts,* 2nd ed, McGraw-Hill, 1981, at 177.

short term and their pay is not affected. Witness Neels demonstrates that misclocking is common in the MODS data, as indicated by the observation of data collectors in the overlapping IOCS system. UPS-T-1 at 15.

[124] If measurement error (misclocking) in the work hours variable has a zero mean with a constant variance, is additive, and uncorrelated with the right-hand-side explanatory variable, then the error is likely to be incorporated into the regression disturbance term, resulting in an unbiased and consistent least-squares estimate of the explanatory variable coefficient as long as the measurement error and the regression disturbance term are uncorrelated.[23] But if the measurement error is systematically related to the dependent variable, then least-squares estimation can cause bias in the estimate of the output coefficient.[24] A systematic relationship between misclocking and output might plausibly occur, for example, if work hours are underreported by workers whose productivity is evaluated on that basis relative to other workers.

[125] Also, when there are many bad observations in the dependent variable, there can be an increased probability of finding observations with outlying residuals, which is likely to disproportionately affect the estimates. *See* PRC Op. R2005-1, Appendix I at 36 of 62.

[126] *Evidence of error in the MODS data*. At the conclusion of Docket No. R97-1, the Commission observed "[e]conometricians are accustomed to using data as they find it, however the MODS data…are far below the common standard." PRC Op. R97-1, ¶ 3041. Nothing has been done in the ten intervening years to cause the Commission to reconsider that observation.

[127] The nature and extent of the errors in the MODS piece handling data were thoroughly documented in Docket Nos. R2000-1 and R2005-1, and again by witness Neels in this docket. In Docket No. R97-1, a study of MODS data quality by the Postal

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[23] Pindyck and Rubinfeld, at 177.

[24] Jeffrey M. Woolridge, *Introductory Econometrics: A Modern Approach*, South-Western College Publishing, 2000, at 293.

Inspection Service was cited which concluded that there were large variances between the piece handling figures contained in the MODS system and actual piece counts. *See Id.,* ¶ 3044. Most of this kind of error, however, is not extreme enough to be detected without a special study like that conducted by the Inspection Service.

[128] Added to this implicit error are a wide variety of explicit error — error that is so blatant that it is self identifying upon inspection. Errors of this kind abound in the MODS data. They include hours or handlings with negative values, instances where hours are positive and handlings are zero (or vice versa), instances where First Handled Pieces are greater than Total Piece Handlings, and (for automated operations) instances where Total Piece Handlings are greater than Total Pieces Fed. There are also instances where the ratio of hours to handlings implies productivities that are either too low or too high to reflect actual operating conditions. There are numerous "drop outs" (periods when reporting of values intermittently ceases). The Postal Service does not distinguish reporting drop outs from valid zero observations (those that indicate that a relevant operation was temporarily shut down).

[129] MODS data are collected by shift, and rolled up by day, week, Accounting Period, and Quarter. Errors that would be explicit by shift tend to be masked when rolled up into a daily count. The masking increases with the level of aggregation. The degree of masking can be considerable by the time that MODS data are rolled up into Quarters — the level at which it is used in the various models under review in this docket.

[130] For MODS data compiled at the weekly level, the frequency of explicit errors is quite high. Table J-3 and Table J-4 below were constructed by witness Neels. They show the frequency of explicit errors in the observations for automated and for manual operations.

[131] For automated operations, Table J-3 shows unrealistic productivities (measured by Total Pieces Fed per hour) range from 34.5 percent of observations for the AFSM 100 to 3.9 percent for the BCS incoming operation. Most automated operations are mid-way between these frequencies. UPS-T-1 at 18.

Table J-3
Data Errors for Automated Cost Pools

Line	Label	BCS Outgoing	BCS Incoming	OCR	FSM 1000	AFSM 100	Total SPBS
1	**Total records in Analysis Data set**	10,304	10,304	10,304	10,304	10,304	10,304
2	**Valid zeros: Count of records where operation was not present at plant, or plant was not reporting data to MODS system**	1,521	1,250	2,335	3,902	6,045	4,207
3	**Potentially Valid Records**	8,783	9,054	7,969	6,402	4,259	9,097
4	**Gaps in the Data**	141 (1.6%)	96 (1.1%)	1 (0.0%)	24 (0.4%)	12 (0.3%)	172 (2.8%)
5	**HRS, TPF, FHP or TPH < 0**	512 (5.8%)	194 (2.1%)	44 (0.6%)	41 (0.6%)	8 (0.2%)	12 (0.2%)
6	**HRS, TPF, or TPH=0**	1,178 (13.4%)	847 (9.4%)	180 (2.3%)	286 (4.5%)	132 (3.1%)	1,082 (17.7%)
7	**Record Fails Threshold or Productivity Screens at the Quarterly Level**	257 (2.9%)	104 (1.1%)	189 (2.4%)	197 (3.1%)	578 (13.6%)	65 (1.1%)
8	**TPH Fails Threshold or Productivity Check at the AP or Weekly Level**	652 (7.4%)	336 (3.7%)	1,196 (15.0%)	780 (12.2%)	1,365 (32.0%)	228 (3.7%)
9	**TPF Fails Threshold or Productivity Check at the AP or Weekly Level**	726 (8.3%)	354 (3.9%)	1,120 (14.1%)	840 (13.1%)	1,469 (34.5%)	226 (3.7%)
10	**FHP > TPH**	1,946 (22.2%)	1,279 (14.1%)	3,063 (38.4%)	1,155 (18.0%)	1,529 (35.9%)	910 (14.9%)
11	**FHP > TPF**	1,252 (14.3%)	1,150 (12.7%)	1,110 (13.9%)	779 (12.2%)	882 (20.7%)	634 (10.4%)
12	**TPH > TPF**	16 (0.2%)	27 (0.3%)	3 (0.0%)	41 (0.6%)	67 (1.6%)	129 (2.1%)

Source: UPS-T1-Neels-WP-1 MODS Data/Data Errors/Output/Data Error Counts.xls (UPS-T-1, Table 4 at 18)

[132] For manual operations, Table J-4 shows unrealistic productivities (measured by Total Pieces Handled per hour) range from 10.7 percent for Manual Letters to 54.2 percent for Manual Parcels. As many of the other manual operations are near the maximum as are near the minimum of that range. UPS-T-1 at 20.

[133] The explicit errors in observed productivity are extraordinarily high for a database to support valid econometric work. They reflect only one of the half-dozen

Table J-4
Data Errors for Manual Cost Pools

Line	Label	Manual Flats	Manual Letters	Manual Parcels	Manual Priority	Cancellations
1	**Total records in Analysis Data Set**	10,304	10,304	10,304	10,304	10,304
2	**Valid zeros:Count of records where operation was not present at plant, or plant was not reporting data to MODS system**	1,301	1,219	2,052	2,071	1,589
3	**Potentially Valid Records**	9,003	9,085	8,252	8,233	8,715
4	**Gaps in the Data**	65 (0.7%)	32 (0.4%)	100 (1.2%)	203 (2.5%)	33 (0.4%)
5	**HRS, FHP or TPH < 0**	16 (0.2%)	2 (0.0%)	5 (0.1%)	47 (0.6%)	5 (0.1%)
6	**HRS or TPH = 0**	120 (1.3%)	104 (1.1%)	1,310 (15.9%)	967 (11.7%)	212 (2.4%)
7	**Record Fails Threshold or Productivity Screens at the Quarterly Level**	589 (6.5%)	176 (1.9%)	1,747 (21.2%)	1,145 (13.9%)	259 (3.0%)
8	**TPH Fails Threshold or Productivity Check at the AP or Weekly Level**	2,106 (23.4%)	971 (10.7%)	4,470 (54.2%)	3,500 (42.5%)	1,052 (12.1%)
9	**FHP > TPH**	32 (0.4%)	24 (0.3%)	41 (0.5%)	113 (1.4%)	0 (0.0%)

Source: UPS-T1-Neels-WP-1 MODS Data/Data Errors/Output/Data Error Counts.xls (UPS-T-1, Table 5 at 20)

categories of explicit error in the MODS data. Such rates of explicit error must be regarded as symptomatic of a data measuring, recording, verifying, auditing, and archiving process that is broken. The Commission agrees with Neels that "One must wonder about the reliability of a data reporting system that produces obviously erroneous results up to 30, 40, or as much as 50 percent of the time." *Id.* at 26.

[134] Witness Bozzo argues that his screens are effective at removing explicit error in the MODS data, and implies that the implicit errors that remain are not significant. As evidence, he cites the results of a sensitivity check that he conducted, using his preferred models. Witness Bozzo re-estimates his variability models using a sample constructed by using threshold and productivity screens at the weekly and accounting period level. He obtains a composite variability of 84 percent from his models

with strict screens compared to the composite variability of 86 percent that he obtains from his model with quarterly screens. He concludes screening at the stricter level

> [h]ad relatively little effect on most variabilities. Stricter screening does not serve to systematically increase or decrease the variabilities. The exception is that the IV models for manual parcels and manual Priority show increases in the point estimates but also rapidly increasing standard errors.

USPS-T-12 at 97.

[135] Bozzo neglected to evaluate what his results show when manual priority variability is left in. Using weekly screens causes manual priority variability to triple to 228, manual parcel to rise from 80 to 97 percent, and cancellation to rise from 50 to 59 percent. The composite variability rises from 85 to 93 percent.

[136] When Bozzo moved from quarterly screens to weekly screens, he dramatically reduced the size of the samples that he used, as shown in Table J-5 below. The operations whose variabilities were most affected by stricter screens are generally the same ones whose experienced the largest reduction in sample size. Whether the substantial changes in variability estimates were caused directly by eliminating erroneous observations or indirectly through changes in the composition of the sample is not known, but the ultimate cause of the changes in variability estimates is the need to mitigate errors in the output variable. Bozzo's sensitivity check strengthens the Commission's conclusions that screening for explicit error does not eliminate errors-in-variables bias, and that quarterly screens do not catch all of the errors that matter.

[137] Analyzing the tables constructed by witness Neels reinforces the conclusion that the level at which one inspects the MODS data has a substantial effect on the frequency at which explicit errors appear. Neels shows that when one moves from the quarterly level to the weekly level, the frequency with which obviously unrealistic productivities are recorded rises sunstantially for automated operations but rises

Table J-5

Changes in Variabilities Resulting from Stricter Quality Standards

Cost Pool	Recommended Variabilities – Quarterly Screens	Weekly Level Screens	Percent Difference
BCS Outgoing	1.06	1.09	3%
BCS Incoming	0.82	0.81	-1%
OCR	0.78	0.68	-13%
FSM/1000	0.72	0.70	-3%
AFSM100	0.99	0.90	-9%
SPBS	0.87	0.84	-3%
Manual Flats	0.94	0.89	-5%
Manual Letters	0.89	0.87	-2%
Manual Parcels	0.80	0.97	21%
Manual Priority	0.75	2.28	204%
Cancellations	0.50	0.59	18%
True Composite	0.85	0.93	9%
Composite excluding Manual Priority	0.86	0.84	-2%
Source: UPS-T-1 Table 8 at page 25 (USPS-T-12, Table 26)			

dramatically for manual operations. *See* UPS-T-1 at 18 (Table 4, rows 7-9), and at 20 (Table 5, Rows 7-8).

[138] When witness Neels developed his plant-level model of mail processing variability, he performed a similar sensitivity analysis. Witness Neels argues mail processing labor variability should be modeled for the plant as a whole, rather than at the level of individual operations or sets of operations within the plant. To be reliable, a plant-level model requires error-free data for the entire plant.

[139] In preparing a database free of explicit error for the entire plant, Neels found that the cumulative effect of screening out explicit error at the weekly level is dramatic. As can be seen from Table J-6 above, only 920 out of 10,304 records (about nine percent) were valid for the entire plant. At the quarterly level, the results of screening are much less severe. At the quarterly level, 2,155 out of 10,304 records (about 21 percent)

Table J-6

Sample Size Reduction for Plant Level Models

Line No.	Description	Flats	Letters	Parcels	Priority	Models
1	Potentially Valid Records	10,304	10,304	10,304	10,304	10,304
2	Gaps	10,203	10,110	10,035	10,101	10,271
3	HRS, TPF, FHP, or TPH < 0	10,138	9,390	10,018	10,054	10,266
4	HRS, TPF, or TPH = 0	9,638	7,729	7,906	9,099	10,055
5	Record Fails Threshold or Productivity Screens at the Quarterly Level	8,461	7,380	6,316	8,024	9,848
6	TPH Fails Threshold or Productivity Check at the AP or Weekly Level	6,457	6,298	4,960	6,583	9,213
		Strict Sample		**Loose Sample**		
7	Records that are valid across all shapes	1,978		3,297		
8	Records for plants not in operation	816		816		
9	Records with no missing variables	1,162		2,481		
10	Records for plants with more than one record (final sample size)	920		2,155		

Source: UPS-T-1 Table 20 at 52.

were valid for the entire plant. The difference in screening level produced significantly different variability estimates. Neels' model, using data screened at the weekly level, produced an aggregate plant variability of 114 percent. At the quarterly level, estimated variability was 103 percent.

[140] The sensitivity analyses performed by Bozzo and Neels result in dramatic reductions in the size of their usable samples, and significant differences in their variability estimates. These results strongly imply that enough explicit error remains in the data when screened at the quarterly level to make the resulting estimates unreliable for ratemaking.

[141] *Problems with the capital data*. Witness Roberts has noted that when new mail processing machines are deployed in a plant, there is a time lag between MODS labor and output data recorded in an operation and the capital data recorded in the Personal Property Asset Master (PPAM) and Property and Equipment Accounting System (PEAS) OCA-T-1 at 20. The MODS data will begin to log labor hours and volume (TPF, FHP) for the new machines several time periods before it is recorded as capital in the capital measures coming from the PPAM/PEAS property reporting systems.

[142] Two workarounds that have been used by witnesses Roberts and Bozzo are described in OCA-T-1 at 20. One deletes a plant's data for the first year in which the AFSM is operating in the plant. Roberts contends that this does not really fix the problem. If the pattern of equipment deployment reflects errors in data reporting, he says, then whenever there is an increase in investment in the plant, the capital variables will not accurately measure the change in the right time periods. Bozzo shifts the capital variables backward in time, but Roberts argues that this is not a substitute for getting the information in the two data systems (MODS and PPAM/PEAS) correctly synched.

[143] The effects that the mismatch between hours and piece handling data and capital equipment deployment has on the size of the estimated capital coefficients and their significance are largely unknown. Witness Bozzo uses an alternative capital series based on "quarterly" updating, USPS-T-12 at 100-101. Comparing the results using the annual updates with those obtained using the quarterly updates, he finds relatively little difference. *Id.* at 101.

[144] Witness Bozzo also found very little difference when estimating log-linear models using the constructed capital measures by witness Roberts' aggregated constant dollar investment expenditure capital measures (FSM, DBCS, MPBCS, SPBS, other) and his own (aggregated investment expenditure capital measure across plants using constructed plant-level shares). *Id.* at 92.

[145] Witness Roberts argues that the Postal Service's models are misspecified because they aggregate capital from several operations and include it as an explanatory variable in all the labor demand equations. He says that this is not consistent with

Bozzo's assumption that the production stages are separable. Nor does it allow the capital in one operation to be substituted for labor in another related operation without being interpreted as a change in output. *See* 2006 Paper at 19, 24-25, and 2002 Paper at 11-12.

[146] Witness Bozzo recognizes that his estimated capital elasticities are small, often statistically insignificant, and mixed in arithmetic sign. USPS-T-12 at 81. He says that these results are consistent with his assumption that "the main way in which capital affects labor input is by providing capacity in higher productivity (automated) operations, rather than by making specific (existing) mail processing operations more productive." *Id.* This, however, would only be true in the very short run. It is unlikely to be true over a rate cycle.

[147] A Hausman or comparable test of the exogeneity of capital variables constructed from the PPAM/PEAS system would be potentially valuable in helping to assess the potential bias from measurement error that appears to infect these variables.[25].

(2) Correcting for errors in the MODS data.

[148] Most of the sources of the implicit and explicit errors in the MODS data described above are not known. Two potential sources of error are acknowledged as likely, but their relative contribution to the errors described above is not known. Misclocked work hours contribute to the errors described above because they are the denominator of the ratio of piece handlings to work hours in the manual sorting operations. The other acknowledged source of error is the set of factors used by the Postal Service to convert pounds of mail to pieces. When it is not practical to count mail, the Postal Service weighs it and infers the number of pieces from national standard

[25] In order to implement this test, a set of instruments would be needed that predicts the level of capital at specific plants. This is an example of the need for site-specific data in order to identify valid instruments and make progress on the econometric estimation of mail processing variability

conversion factors. Conversion factors are inaccurate because they are not plant specific, and many years go by between updates. Conversion factors are needed to compute FHP in each operation. They are also the basis of TPH counts for the manual operations. Both Drs. Bozzo and Roberts treat error from conversion factors as the major source of error in FHP.

[149] Roberts demonstrated that errors arising from conversion factors are potentially large. He estimates that the use of obsolete conversion factors prior to 1999 had led the FHP count of letters to be overestimated by 18 percent, and of flats to be overestimated by 11 percent. *See* Roberts 2002 at 49. Drs. Bozzo, Roberts, and Neels acknowledge that the conversion factors used to estimate FHP counts are potentially a source of substantial measurement error that risks errors-in-variables bias, and all have turned to the use of Instrumental Variables estimators as a way of mitigating that risk.[26]

[150] *The need for instruments*. Instrumental variables are commonly used in econometric modeling to overcome the endogeneity of a regressor (the correlation of a regressor with the regression error term). Instruments are variables that partly cause the endogenous regressor. This causal relationship can be used to recover an estimate of the conditional mean of the endogenous regressor.[27]

[151] As explained in the Commission's summary of Roberts' research, instrumental variables is a method used to get consistent estimates of an economic relationship when the "causing" variable (in this context pieces or piece handlings) transmits more than the cause to the outcome variable. For example, FHP transmits the effect of both volume variation and measurement error to work hours.

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[26] Bozzo is so confident that the use of Instrumental Variables solves the problem of errors-in-variables bias that he regards screening of all data that is identifiably erroneous as unnecessary. USPS-RT-5 at 27.

[27] A common method for consistently estimating the parameters of a linear model with a right-hand-side endogenous variable is called Two-Stage Least Squares. The first stage of the analysis takes the endogenous variable in the regression of interest and regresses it on the remaining right-side variables in the equation of interest and the instrumental variables. The second stage of the analysis inserts the fitted value of the dependent variable from the first-stage back into the regression of interest and computes the least squares estimates of this regression.

[152] All of the econometric witnesses agree that imprecise weight-to-pieces conversion factors measure FHP with error. To the extent that it is imprecisely measured, variation in FHP transmits both the effect of variations in volume and the effect of measurement error to work hours. As explained in the previous section, mixing these effects is likely to bias the estimated response of work hours to volume downward.

[153] Roberts acknowledges that this is especially true for the Fixed Effect models under review. Fixed Effects models remove much of the variation in the volume variable that is available for modeling. This magnifies measurement error relative to the volume variation that remains. Roberts March 2006 at 50.

[154] *Conditions for valid instruments*. The conditions that instruments must meet in order to be valid, however, are quite demanding. The basic idea of Instrumental Variables regressions is to find an instrument that causes or explains only the variation in the volume variable that is "true" volume variation, but is independent of the variation in the volume variable that represents other things — such as measurement error in that variable.

[155] As explained in Appendix L, these are rigorous requirements. In order to be valid, the instrument must be exogenous to the underlying model, that is, it must affect work hours only through its effect on the endogenous "volume" variable (FHP). It must not affect work hours directly.[28] (If the instrument affected work hours directly, it would belong in the set of control variables in the regression of interest). In addition, the instrument must be "relevant," that is, it must cause or verifiably explain the portion of the variation in the endogenous "volume" variable that is not caused by omitted variables or by measurement error.[29] If it explains any of the erroneously measured part (if a factor that makes the measure of the "volume" variable erroneous also makes the measure of the instrument erroneous) the instrument will transmit the error in the "volume" variable through to work hours. This would defeat the instrument's purpose.

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[28] Holland, P.W., "Causal Inference, Path Analysis and Recursive Structural Equation Models," *Sociological Methodology*, 18, 449-84, Angrist, J. and Imbens, G. "Estimation of Average Causal Effects," *Journal of the American Statistical Society*, 91, 444-72.

[156] As explained in Appendix L, it is impossible to demonstrate that an instrument is valid through a statistical test.[30] To be credible, an assertion that an instrument actually eliminates endogeneity, such as that caused by measurement error, needs a convincing theory that identifies the cause of the endogeneity, and a convincing theory that explains why the instrument is independent of that cause. In addition, the instrument must capture the "true" variation in the "volume" variable, not just coincidental correlation. This also requires a sound theory as to why the instrument is a partial cause of the "volume" variable, rather than simply responding to common factors that cause them both.

[157] *Relevance of the instruments under review*. Although all three researchers have employed instrumental variables in their models, and their instruments differ. *See* Table J-7 below), Roberts has shouldered most of the burden of identifying plausible instruments, providing a theoretical justification for their use, and testing their validity. The Commission's conclusions with respect to the validity of the instruments that he uses generally will apply to the instruments used by the others.

[158] To illustrate, in Roberts September 2006, Roberts uses as instruments for FHP/letters: FHP flats/incoming, FHP/flats/outgoing, quarterly dummy variables, and the number of destinating letters, flats, and parcels in a plant's service area. He asserts that:

> [a]ny exogenous source in the demand for mail services will lead to fluctuations in the FHP variables that are not correlated with the error term and, as a result, will be useful as an instrumental variable. In short,

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[29] Angrist, J. and Kreuger, A., Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments, *Journal of Economic Perspectives* — 15, No. 4 (Fall 2001), at 73. The causal effect must run from the instrument to the endogenous "volume" variable, not the other way. If some intervening force should change the value of the "volume" variable, it must not affect the instrument. *See* Rubin, D.B., Statistics and Causal Inference: Comment: Which Ifs Have Causal Answers," *Journal of the American Statistical Association*, 81, 961-962 (1986).

[30] It is possible, of course, to increase one's confidence that an instrument is relevant by testing the significance of the instrument's coefficient in the first stage of a Two Stage Least Squares regression and obtaining a high '"t" value. That will indicate the strength of the correlation of the instrument with the endogenous explanatory variable, but it will not indicate whether the correlation is theoretically meaningful, or merely coincidence.

> variables that measure fluctuations in the demand for mail services will be good instrumental variables (IVs) because they will be correlated with FHP but not correlated with the technology shocks or output measurement errors captured by the error terms.

OCA-T-1 at 28.

[159] These criteria are broad, vague, and conclusory. By themselves, they do not have the theoretical rigor required to provide reasonable assurance that variables that meet them would be valid instruments.

[160] Roberts is a bit more specific with respect to why FHP/flats is a valid instrument for FHP/letters. He asserts that FHP/flats

> reflect variation in the demand for mail services that can result from differences in the mix of business and household mailers in the plant's service areas, differences in population and its growth over time, and other sources of differences in demand across plants.

Id. FHP/flats is much like true RPW flat volume. The volume of flats that arives at a plant will certainly be a function of the mix of mailers, population trends, and other factors in the plant's service area, just as the volume of letters that arrives at a plant will be a function of these factors. It is not enough, however, that the level of FHP/flats entering a plant and the level of FHP/letters entering a plant are both a function of local business conditions and consumer wealth characteristics. To be valid, an instrument for FHP/letters must not just be correlated with the FHP/letters, it must partially cause variation in FHP/letters.

[161] It is not plausible to characterize variation in FHP/flats as a source of variation in FHP/letters. The plausible sources of variation in FHP/letters include such things as the profile of local business mailers (utility billers, credit card issuers, etc.), the disposable income of local recipients of mail, the pace of local household formation, the price and availability of competing forms of communication and advertising, etc. The proximity of other postal facilities, and their capacity and function are also plausible causes of the amount and kind of mail that a plant receives. These are much the same

Table J-7
Instrumental Variables Compared

Level of Analysis	Analyst	Dependent variable	Endogenous explanatory variable	Source of endogeneity	Instrument(s) used
Operations Level Manual Letters	Bozzo	Letter Hours	TPH	Conversion Factor	**FHPfsm881, FHPfsm1000, FHPafsm100, TPHmanualflats, DestinatingLetterVol**
Operations Level Manual Flats	Bozzo	Flats Hours	TPH	Conversion Factor	**FHPocr, FHPmpbcs, FHPdbcs, TPHmanualletter, DestinatingFlatsVol**
Operations Level Priority	Bozzo	Priority Hours	TPH	Conversion Factor	**FHPocr, FHPmpbcs, FHPdbcs, FHPfsm881, FHPfsm1000, FHPafsm100, DestinatingPriorityVol**
Operations Level Parcels	Bozzo	Parcel Hours	TPH	Conversion Factor	**FHPocr, FHPmpbcs, FHPdbcs, FHPfsm881, FHPfsm1000, FHPafsm100, DestinatingParcelsVol**
Operations Level Cancellation	Bozzo	Cancellation Hours	TPH	Conversion Factor	**FHPocr, FHPmpbcs, FHPdbcs, DestinatingLetterVol**
Plant Level Shape-based Letters	Roberts	Letter Hours	FHP	Conversion Factor	**FHPflats outgoing, FHPflats incoming, DestinatingLetterVol, DestinatingFlatsVol, DestinatingParcelsVol**
Plant Level Shape-based Flats	Roberts	Flats Hours	FHP	Conversion Factor	**FHPletters outgoing, FHPletters incoming, DestinatingLetterVol, DestinatingFlatsVol, DestinatingParcelsVol**
Plant Level Letters, Flats, and Parcels	Neels	Total Plant Hours	FHP	Measurement Error	**TPHletters, TPHflats, TPHparcels, DestinatingLettersVol, DestinatingFlatsVol, DestinatingParcelsVol**

Source: Docket No. R2006-1, USPS-T-12, USPS-LR-L-56; OCA-T-1, OCA-LR-L-2; UPS-T-1, UPS-Neels_WP-1

Table J-7 (Continued)

Instrumental Variables Compared (part 2)

Is the instrument correlated with measurement error in the endogenous output variable?[a]	Theory for why the instrument causes the endogenous explanatory variable	Is the endogenous explanatory variable and the instrument likely to be caused by the same phenomena?	Will the instrument directly affect the dependent variable?
Probably	None	Yes	No
Probably	None	Yes	No
Probably	None	Yes	No
Probably	None	Yes	No
Probably	None	Yes	No
Probably	Correlation Explanation	Yes	No
Probably	Correlation Explanation	Yes	No
Probably	None	Yes	Yes

a/ Where destinating volume is used as an instrument it is not likely to be correlated with measurement error in the endogenous output variable.

as the plausible sources of variation in FHP/flats. This would make FHP/flats a spurious instrument for FHP/letters.[31] FHP/flats cannot be used to extract the "relevant" portion of the variation in FHP letters that is free of confounding effects. It can only mimic FHP/letters. If one were to imagine an array of intervening forces that could affect FHP/letters (e.g., a local recession, a surge of home construction) most of them would be expected to affect FHP/flats as well. This means that FHP/flats is not a well-defined instrument for FHP/letters.[32] Instead of FHP/flats, plausibly valid instruments for FHP/letters would by the underlying causes of variation in both. These would include measures of the economic and business conditions in the service area of a plant described above.

[162] Roberts included quarterly dummy variables in what was initially his preferred model. P values from a test of the joint significance of Roberts' group of instruments showed that quarterly dummies made a large contribution to explaining variation in FHP/letters in the first stage of a Two Stage Least Squares estimate. OCA-T-1, Table 2 at 32. As theoretical support for using quarterly dummies as instruments, Roberts observes that the volume of FHP/letters and FHP flats fluctuates markedly by quarter. *Id.*, Figure 1, at 30. He argues that

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[31] An intuitive example of a spurious correlation would be sales of ice cream and sales of soda by local outdoor vendors. Both are likely to rise strongly in summer, as outdoor recreation increases. A statistical test would reflect the strong correlation. But sales of ice cream do not logically cause sales of soda. The true cause is the warm weather, which encourages both. Ice cream sales would be a spurious instrument to use to predict sales of soda, despite their close correlation. A true causal relationship likely exists between the quantity of chips and soda sold by outdoor vendors. Warm weather increases outdoor recreation, causing outdoor sales of both chips and soda to rise. But, because salty chips increase thirst, they independently encourage sales of soda. This correlation would be meaningful because there is a plausible causal theory to explain the correlation. For this reason, sales of chips (in an earlier period) should be a valid instrument for sales of soda.

In the mail processing context, the relationship between FHP flats and FHP letters is analogous to the relationship between sales of soda and sales of ice cream in the above example. They are correlated, but the correlation is not meaningful. They are spurious instruments for each other. The local business cycle is analogous to the weather in the above example. It is a plausible cause of variation in both FHP letters and FHP flats, and might make a theoretically relevant instrument for either.

[32] *See* Rubin, D.B., Statistics and Causal Inference: Comment: Which Ifs Have Causal Answers," *Journal of the American Statistical Association*, 81, 961-962 (1986).

> [t]his quarterly variation is due to the actions of mailers and is a nice source of exogenous variation in FHP. The quarterly dummy variables satisfy the requirements for good IVs.

Id. at 29.

[163] While the seasonal variation of FHP/letters is pronounced, and is mailer-induced, quarterly dummies do not capture that seasonal variation cleanly. Quarterly dummies, therefore are not “exogenous” in the sense required to be a valid instrument. To be exogenous, an instrument for FHP/letters should not have a direct effect on work hours. While quarterly dummies will capture the effect that seasonality has on the quantity of FHP/letters, they are also likely to capture such things as seasonal shifts in the composition of the workforce (such as the percent that is casual labor) and seasonal changes in the composition of the mail (such as the percent of letters that are single-piece and non-machinable). The latter two factors can affect work hours directly. This violates the condition that instruments not have a direct effect on the dependent variable in the equation of interest.[33]

[164] Roberts’ group of instrumental variables includes the number of destinating letters, flats, and parcels in a plant’s service area. As justification for using them as instruments for FHP/letters, Roberts notes that they

> are measured externally to the MODS data using ODIS…and are potentially useful measures of differences in mail demand across plants and time periods.

OCA-T-1 at 29.

[165] Roberts does not actually discuss the theoretical relationship between destinating volume for each shape in a plant’s service area and FHP/letters in a plant. The theoretical relationship between FHP/letters and destinating flats, and FHP/letters and destinating parcels, however, is much the same as the relationship between

[33] Wooldridge, J., Introductory Economics: A Modern Approach, South Western College Publishing (2000) at 463.

FHP/letters and FHP/flats. It is not plausible to characterize variation in FHP/letters as a "function of," "caused by," "explained by," or "encouraged by" either destinating flat volume or destinating parcel volume. These variables, however, all have plausible common sources--such things as the business cycle in the plant's service area, the mix of local businesses (e.g., catalogue mailers, fulfillment companies), disposable income of local recipients of mail, etc. Because the plausible sources of variation in destinating flat volume and destinating parcel volume are shared with FHP/letters, they should be considered to be spurious instruments for FHP/letters. Neither destinating flats nor destinating letters could be used to extract just the "relevant" portion of the variation in FHP/letters free of confounding, non-volume effects. At best, they might mimic the variation observed in FHP/letters because of their common sources. That their variation reflects common sources is also seen when one hypothesizes intervening forces that could affect FHP/letters (e.g., a local business recession, a surge of home construction). These interventions are as likely to affect destinating flat volume and destinating parcel volume as destinating letters. For these reasons, destinating flats and destinating parcels are not well-defined instruments for FHP/letters.

[166] Of all the instruments employed by Roberts, destinating letter volume appears to meet the theoretical requirements of a valid instrument for FHP/letters. Destinating letter volume can be viewed as the immediate cause of FHP/letters/incoming, since it is precisely what generates FHP/letters/incoming. Destinating letter volume is also the immediate cause of that portion of FHP/letters/outgoing that is made up of local, turnaround letters. FHP/letters can be considered a partial function of destinating letter volume. Destinating letter volume is exogenous, since it will not affect work hours in a letter sorting operation directly, but only as it causes FHP/letters to vary.

[167] In the context of Roberts models, the problem with using destinating letter volume as an instrument for removing the endogeneity of FHP/letters is empirical, rather than theoretical. Since incoming letter processing accounts for over two-thirds of the cost of all letter processing, one would expect the correlation between FHP/letters in a

plant and destination letter volume to be very high. Roberts, however, characterizes his destinating volume instruments as not very significant in estimating "true" variation in FHP/letters, as the P values presented in OCA-T-1, Table 2, confirm. By themselves, destinating letters would constitute weak instruments. In the context of Two Stage Least Squares estimation, weak instruments run the risk of adding bias to the estimated results. Of the instruments in the group that Roberts used, destinating letter volume is the only instrument that can be shown to be theoretically relevant to FHP/letters.

[168] In contrast to Roberts, Bozzo's underlying model of labor demand variability defines output at the operation level. It estimates the response of work hours within an operation to variations in piece handlings (TPH) within that operation. He believes that only the manual and cancellation operations risk bias from measurement error. He also believes that TPH in an operation is exogenous, since he theorizes that each sorting operation is autonomous and unaffected by the level of work performed in other operations. Docket No. R2005-1, USPS-T-12 at 26-27.

[169] As an instrument for TPH in a given operation, Bozzo uses FHP for aggregated sorting operations of the opposite shape. A second instrument is destinating volume of the opposite shape in the plant's service area. The first instrument for TPH/letters, therefore, would be an aggregation of FHP/manual flats, FHP/FSM1000, and FHP/AFSM 100. The second instrument would be the volume of destinating flats in the plant's service area.

[170] Bozzo asserts that Roberts has established the theoretical relevance of FHP of the opposite shape as an instrument for operation-level TPH. (He asserts, as well, that Roberts has established the theoretical grounds for believing that measurement error in FHP is independent of the measurement error in TPH.) Bozzo adds only that "[t]he desired properties for an instrumental variable are correlation with the 'true' regressor and independence from the observed regressor's measurement error." *Id.* at 26.

[171] For the reasons explained above, the Commission has concluded that while FHP of one shape may be correlated with FHP of a different shape, it is not plausibly a

function of, or caused by, FHP of a different shape. Because the correlation stems from common latent causes, FHP of a different shape is a spurious instrument. This applies to Bozzo's TPH variable all the more, because it is an operation-level rather than a plant-level variable. It is difficult to view variation in plant-level FHP flats as a significant source of variation in TPH for the Manual Letter operation. Taking this view should be especially difficult for Bozzo, who theorizes that each sorting operation is unaffected by the level of activity in other operations in the plant. The same analysis applies to Bozzo's use of destinating flat volume as an instrument for TPH/letters.

[172] Neels tested the relevance of Bozzo's instruments. While a first-stage F statistic testing the incremental explanatory power of the instruments shows that they are jointly significant, Neels concludes from partial R-square statistics that the instruments add little explanatory power to the first stage regression. Neels notes that use of weak instruments raises the risk of biased estimates. UPS-T-1 at 29-30.

[173] Bozzo dismisses Neels' assertion that his instruments are weak and arbitrary. He argues that it is not based on a benchmark or critical value that is accepted in the economic literature. USPS-RT-5 at 33-34. Neels' criterion for concluding that Bozzo's instruments are weak and arbitrary is subjective. It leaves the technical issue of the strength of Bozzo's instruments unresolved. However, this issue is immaterial. Whether or not his instruments are weak, the Commission has concluded that Bozzo's instruments lack a theory that would make the correlation meaningful for estimating a causal relationship between hours and volume.

[174] As described earlier, Neels develops his own model of labor demand variability which estimates the response of work hours for the entire plant to changes in plant-level FHP for letters, flats, and parcels. It reflects his theory that labor demand reflects economies of scope in mail processing, consisting of adjustments to volume that are made within operations, across operations and across shapestreams. As a consequence many more relationships would qualify as endogenous under the Neels model than under the other models under review.

[175] As instruments for his FHP/shape output variables, Neels uses TPH counts by shape, and destinating volumes by plant, by shape. He states that these instruments pass tests of relevance and validity, but he does not offer any theoretical ground for their use. UPS-T-1 at 52.

[176] The reason that the MODS system tracks FHP is that it provides the manager a means of projecting workload and work hours in the plant that will result from the amount and kind of FHP arriving at the plant. The manager does this by calculating downflow densities based on experience that estimate the propensity of FHP with given shape and processing characteristics to generate an expected count of TPH in various operations.

[177] Using TPH as an instrument for FHP of a corresponding shape is putting the cart before the horse — effect before cause. While it is quite plausible to view variation in FHP as a source of variation in TPH, it is not plausible to view variation in TPH as a source of variation in FHP, whether at the shape level or the plant level. Roberts has made the argument that FHP is exogenous at the plant level because it results almost entirely from the habits of mailers. But there is not much room to argue that TPH is exogenous at the plant level. TPH depends on the amount of equipment in the plant, and the sophistication of the technology that it embodies — all of which are the result of discretionary decisions by management made (at least in part) in response to changes in volume over a rate cycle.

[178] TPH fails a number of the tests of theoretical relevance for an instrument that are found in the academic literature summarized earlier. TPH will not affect work hours in the plant through its effect on the endogenous FHP variable, since it doesn't have an effect on FHP. It will affect work hours directly because it depends on discretionary choices of what technology will be applied to the workload imposed by mail arriving at the plant. This violates a basic condition for a valid instrument, as explained earlier. TPH does not extract only the exogenous portion of the variability in FHP because it transmits its own endogenous effects to work hours. Almost any intervention that could be hypothesized that would affect FHP in the plant (e.g., a downcycle in the

local business climate) would affect TPH as well, which violates another condition for a valid instrument, as explained earlier. Most of the sources of variation in FHP (e.g., the business climate and consumption patterns in the area served by the plant) are sources of variation in TPH. Consequently, the common sources are the legitimate candidates as instruments for FHP.

[179] RPW volumes are system-level volumes. Variations in system-level volumes by shape would certainly be the dominant source of variation in FHP by shape at the plant level. As a theoretical matter, these variables would appear to meet all of the conditions required of relevant instruments that TPH fails. How relevant they are is an empirical matter. Neels' workpapers contain tests that show that they are statistically relevant, but Neels did not report or comment on these results. *See* Workpapers, UPS-Neels-WP-1, 3.5 Plant Level Model.

[180] *Exogeneity of the instruments under review*. In resorting to the use of the Instrumental Variables estimation technique, the main motive of all three researchers was to overcome the risk of biased estimates from errors in measuring the output variable. Drs. Bozzo and Roberts assume that conversion factors are the dominant source of measurement error in the output variable. When output cannot be counted, it must be inferred by weighing the mail and using a conversion factor to infer the number of pieces. FHP counts are based on this process, as is the major portion of TPH in manual operations.[34]

[181] Using instruments to overcome measurement error in the endogenous output variable (FHP or TPH) is based on the idea that a variable can be found that will extract that portion of the variation in FHP that is independent of measurement error (or any other source of non-volume variation). It is not necessary that the instrument itself by free of error, just that its error be independent of the error in the FHP shapestream of interest. Roberts 2002 at 54.

[34] TPH in manual operations consists of First Handling Pieces (FHP) and Subsequent Handling Pieces (SHP).

[182] Noting that different conversion factors are used for different shapes, Roberts reasons that FHP of a different shape will be free of the predominant source of measurement error in FHP of the same shape. The assumption that the error in the instrument is uncorrelated with the error in FHP cannot be proven through statistical tests. Statistical tests can only indicate that this requirement is not met by particular instruments when they are tested. Therefore, a convincing theory that explains why variation in the instrument can be assumed to be independent of error in FHP/shape is needed to be assured that use of the instrument will lead to reliable estimates.

[183] C*onversion error*. The fact that different weight-to-piece conversion factors are used for different shapes might not be sufficient to ensure that they are independent. Roberts concluded that obsolete conversion factors used prior to 1999 had caused letter FHP to be overestimated by 18 percent and flat FHP to be overestimated by 11 percent, reflecting a shared trend toward heavier pieces over time for both shapes. If the average weight per piece for mail changes in the same direction over time, or by season, conversion error could be correlated across shapes, even where the conversion factors are shape-specific.

[184] Neels demonstrated that the average weight per piece changes substantially over time for classes of mail. Tr. 23/8527. This implies that it changes substantially over time for shapes of mail as well. Witness Oronzio observes that one reason that FHP data is not trusted by plant managers is that the composition of the mail changes by season. He remarks that even humid weather can alter the weight of the mail enough to induce conversion error. USPS-RT-15 at 12.

[185] Systematic changes in weight per piece could cause corresponding changes in conversion error and the work hours required to process mail. (The ounce/rates and breakpoints common in postal rate schedules, in part, reflect the productivity of the equipment that can be used to process mail of certain weight characteristics). There appears to be a significant risk that conversion error is correlated with work hours in the manner described. Figures J -1 through -3 below show a pronounced quarterly variation

in average weight per piece for letters, for flats, and for parcels. This provides grounds for skepticism that opposite shape FHP is an exogenous instrument.

[186] *Other sources of measurement error*. Even if conversion error in FHP of one shape were truly independent of conversion error in FHP of other shapes, there are sources of significant measurement error in MODS output data that are not related to conversion whose effect is probably common to all shapes, and, therefore, correlated.

Figure J-1

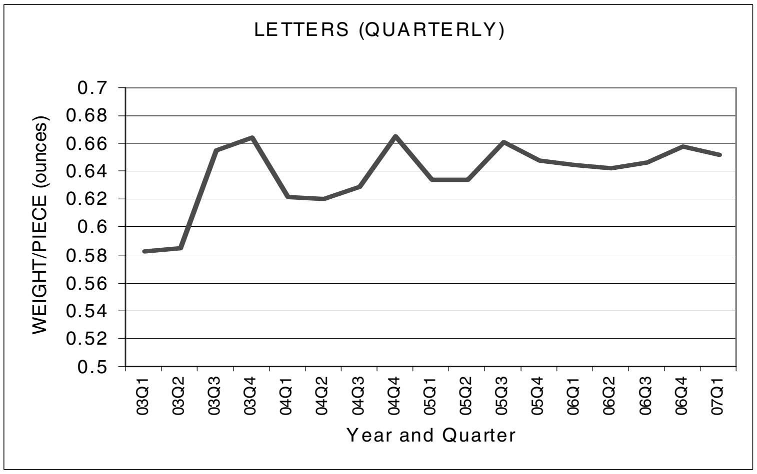


Figure J-2

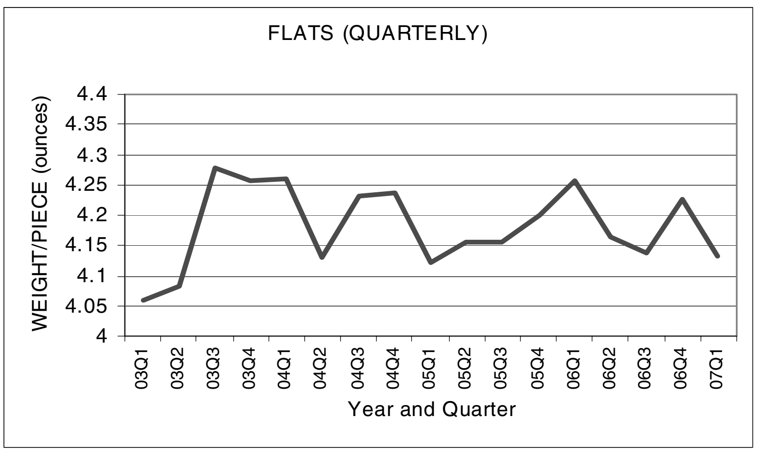
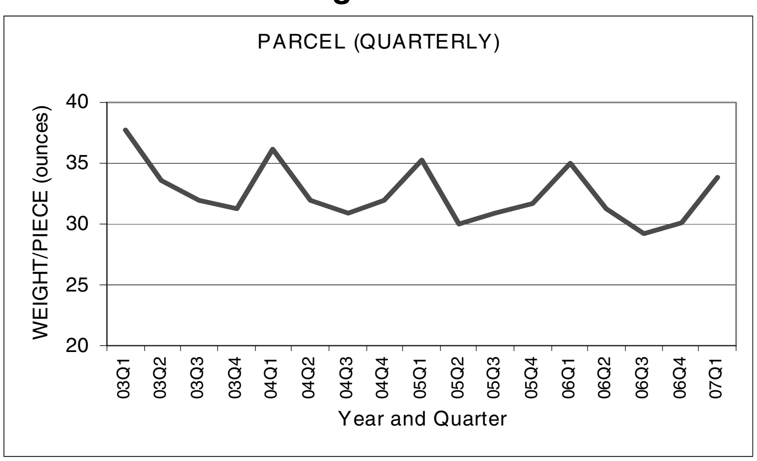


Figure J-3



[187] Kinds of measurement error that the witnesses seem not to have considered when selecting instruments for FHP are the array of gross errors in the data — the negative FHP counts, implausibly high or low productivity values, the pairing of zero hours with positive FHP and vice versa, and the discontinuities in the data that are treated as true zeros. The sources of these errors are likely to be common to all shapes of mail. If these errors are essentially failures to collect the data, to record them by the prescribed procedures, or to audit the data either at the source, or after aggregation, such failures are most likely to be the result of the administrative problems that are known to plague self-reporting data systems from which productivity can be inferred.

[188] Errors in self-reported productivity data that can give rise to the kind of obvious errors that are common in the MODS data reflect a number of possible causes. For example, they may reflect a manager's decision to devote limited staff resources to matters considered more urgent than routine data collection. The tension that exists between allocating resources between mail processing and data collecting is reflected in the old MODS manual which authorizes the director of mail processing in the plant to "assign employees to other duties to ensure full utilization on assigned tours, providing that such assignment does not interfere with the accurate recording of mail volume…" Handbook M-32, dated 1987, Section 144.2(e). Conflicts of this kind would seem to be a particular problem at times when plants operate above capacity. Instead of carefully recording, compiling, and auditing MODS data and getting the mail out, such conflicts might be resolved in favor of getting the mail out. Under high-volume conditions, the required reports might not be prepared, or be prepared but not audited. This would be all the more likely if, as witness Oronzio asserts, plant managers no longer rely on MODS FHP data. USPS-RT-15 at 12-13. The resulting errors should have a similar effect on all shapes of mail (and therefore be correlated).

[189] Handbook M-32 reveals that the MODS data collection and reporting process is an intricate process which requires the data collector to correctly apply a complicated set of conversion factors, and to correctly interpret a complicated set of mail characteristic definitions (called Source/Type codes), and activity codes. The accuracy of

the process appears to depend significantly on the motivation and skill of the employees responsible for collecting and reporting MODS data.

[190] For example, a large proportion of FHP counts depend on the meter readings of an AFCM. They require the data collector to interpret a bin report from that machine to determine where mail in each bin is destined for its first sort, because that operation is where the mail with be credited as FHP. The data collector must determine how much mail should be credited for FHP elsewhere, and deduct it from FHP for the AFCM. *See* MODS Handbook M-32 at 2-1.1.1.2 and 2-1.1.1.3. The process of identifying what subsets of volume should be credited with FHP (or TPH) in which operation is rather involved,[35] and appears to require diligence and a significant investment of time by the supervisor/data collector to be accurate. If the required investment of time and effort is not made, the resulting errors should have a similar affect on FHP counts for all shapes of mail (and therefore be correlated).

[191] The process of weighing and converting the mail by itself is complex. The piece handling conversion factors differ by container type as well as shape. This requires that the tare weight of each container type must be correctly entered along with the shape conversion factor. The data collector must also correctly distinguish between a dozen “source/types” of letter mail, and a half-dozen “source/types” of flat mail in order to apply the right conversion factor. Section 4-2.9.1. If employees do not have the time, the concern, or the skill to do it right, the impact of erroneous weighing/converting should have a similar affect all shapes of mail (and therefore be correlated).[36]

[192] Finally, as the Postal Service has recognized in the past, there is an incentive for employees to distort self-reported data that can be used to compare their

[35] Postal Service witness Oronzio concludes that “FHP productivities are conceptually difficult to define below the plant level.” USPS-RT-15 at 12.

[36] Chronic differences in such things as degree of congestion, the motivation of supervisors or the quality of staff among the Postal Service processing plants may partly explain the wide differences in productivity among processing plants that is demonstrated by the fixed affects variable estimated in the various mail processing models presented in this docket. The same factors might partly explain why easily identifiable errors are so widespread in the MODS data.

productivity with others.[37] If this introduces error into the MODS data, it is likely to affect all shapes of mail equally.

[193] In the Commission's view, the nature of the errors in the MODS data strongly suggests that the overall process of measuring, recording, and auditing of MODS data is deeply flawed. Because the source of much of the error in FHP (and TPH) is likely to be common to all mail shapes, it is likely to be correlated among shapes, which would violate a basic condition that instrumental variables must meet if they are to avoid the bias associated with measurement error in the piece handling data.

[194] The Commission concludes that there is no convincing theory that the opposite-shape output variables used as instruments in all three models are uncorrelated with the measurement error in the output variables of the same shape. It is theoretically plausible that the destinating-shape volume variables used as instruments are uncorrelated with measurement error in the FHP/TPH variables because they are obtained from an independent data collection system (ODIS/RPW). But they do not seem to add much explanatory power to any of the models under review.

[195] As noted, the assumption that the error in the instrument is uncorrelated with the error in FHP must rest on a sound theory because it cannot be proven through statistical tests. Statistical tests can only indicate that this requirement is not met by particular instruments when they are tested. The Commission, however, recognizes that the researchers in some instances tested the exogeneity of the instruments that they use and reported the results.

[196] At the request of the Postal Service, Roberts tested the exogeneity of the instruments that he initially used in Roberts September 2006 by applying an overidentifying restrictions test (ORT). This test can be applied where there are more instruments than endogenous independent variables in the equation of interest. ORT

[37] For decades the Postal Service avoided providing a comprehensive set of MODS data to the Commission, in part, because it would enable the productivity of the plants to be systematically compared, providing an incentive for "distortion of the data" by the plants for competitive reasons. *See* Docket No. RM76-5, Tr. 1/126 (August 5, 1976).

derives its name from the fact that any subset of a set of instruments can be used as instrumental variables to obtain a consistent estimate of the coefficients (βs) for the endogenous independent variables (FHP/TPH in this context) if the subset is uncorrelated with the error in those variables. If there is no correlation, the different estimators of β that involve using different subsets of instruments will converge on the true β. The test looks at the degree of agreement between the different estimates of β that involve using different subsets of instruments.[38]

[197] The forms of ORT most often used are the Anderson-Rubin test, which applies to the Limited Information Maximum Likelihood (LIML) estimator, and the Sargan test. Roberts applied the Sargan test. He reports *J*-statistics and critical values at Tr. 23/8311. The results in four of the ten modeled cost pools reject the hypothesis that the instruments used are uncorrelated with FHP/shape in the underlying model. Reapplying the tests without quarterly dummy variables implies that, in most instances, they are the source of correlation. *Id* at 8312. Roberts speculates that the correlation found is spurious (comes from a common unidentified source). These results prompted Roberts to select variability estimates for letter mail that do not include quarterly dummy variables as his preferred results. *Id.*

[198] The correlation that Roberts finds between his quarterly dummy instruments and error in FHP may be explained by the seasonal fluctuation in average weight per piece that characterizes letters, flats, and parcels. Figure J-1 through J-3 shows that there has been a substantial quarterly fluctuation for each of these shapes over the 13 quarters beginning in Quarter 1 of FY 2003 and ending in Quarter 1 of FY 2007. Such quarterly fluctuation would impart a quarterly pattern to measurement error arising from the conversion factors used by the MODS system to calculate FHP. Since quarterly variation in measurement error appears likely to affect all mail shapes, constructing an

[38] Failing the overidentifying restrictions test merely indicates that some subsets of instruments produce results that are inconsistent with the results obtained when other subsets are used. It doesn't indicate which instruments in the set might be valid and which might not.

instrument from quarterly dummies is likely to result in correlation of the instrument with the error in any FHP/shape variable.

[199] There were other statistical tests of the lack of exogeneity of instruments performed. Neels applied the Anderson-Rubin form of the ORT to Bozzo's instruments. The results reject the hypothesis that his instruments are uncorrelated with TPH/shape/operation only for the Cancellation operation. Neels' workpapers show that he applied the Anderson-Rubin test to his own model. Although he did not report the results, they appear not to reject the hypothesis that his instruments are exogenous. As explained above, such tests do not affirmatively demonstrate that these instruments are exogenous, and an adequate theory supporting their exogeneity was not provided.

[200] The purpose of resorting to the use of the Instrumental Variables estimator is to sweep out the error in the endogenous explanatory variable in the primary model, thereby avoiding the risk of downward bias in the variability estimates. For reasons explained above, the Commission does not have that confidence that the instruments selected here have accomplished that purpose.

[201] As explained in Appendix L, a more promising avenue for finding valid instruments with uncorrelated error would be to examine variables that measure the business climate and the disposable income in the service area of specific processing plants. The obstacle, up until now, to exploiting this promising source of data for instrumental variables, and for econometric research on postal matters generally, is the Postal Service's unwillingness to make the identity of specific processing plants available for this kind of research.[39] This has slowed progress in the modeling of the cost behavior of both the Postal Service's mail processing network and its delivery network. The Commission will work to encourage future research based on such data.

[39] If it were to make such information available (in a manner that reasonably protects its commercial sensitivity) this information would likely lead to the identification of much of the source of the very wide differences in productivity among processing plants. This would not only advance the prospects of successfully modeling the volume variability of mail processing labor, but should provide valuable insight to management regarding the methods that should be used to reduce the productivity gap between its processing plants.

(3) Augmented Commission method.

[202] In this docket, for the first time, the Postal Service presents IOCS data showing the time that it takes to change sort schemes on a sorting machine (setting it up and tearing it down) as a discrete activity. In Table 2 of his testimony, Bozzo compiles the new IOCS data for the 11 sorting activities that he models. USPS-T-12 at 27. Table 2 shows that setup/tear down activity varies from four to nine percent of total time in those pools. The composite average for letters and flats is six percent. The Postal Service provided similar data for non-modeled operations where there are sort schemes to change. Tr. 10/2508-26.

[203] The Postal Service's operational witnesses assert that set up/tear down labor time is predominantly fixed. On behalf of a group of Periodicals mailers,[40] Elliott agrees. He rebuts a Commission argument made in earlier dockets that some sort schemes are volume variable because they run in parallel on multiple machines. He cites Postal Service witness McCrery's survey of a single day in the system which shows the number of sort schemes that ran simultaneously on multiple DBCS machines (5.7 percent, by the Commission's calculation) and the number of sort schemes that runs simultaneously on AFSM 100 machines (13. 3 percent, by the Commission's calculation). MPA et al. –RT-2 at 3, citing Tr. 11/2897. He assumes that the balance of set up/tear down time is fixed, and therefore all set up/tear down costs should be treated as fixed, rather than variable under the Commission's binary categorization of mail processing costs as either fixed or variable. He asserts that because the new IOCS data allow costs associated with scheme changes to be quantified, the Commission should add them to the list of mail processing activities that it treats as fixed per se under its established approach to estimating mail processing variability.

[204] The Commission's established binary approach to estimating the volume variability of mail processing labor costs distinguishes between mail processing activity

[40] Magazine Publishers of America, Inc., Alliance of Nonprofit Mailers, American Business Media, Dow Jones & Co., The McGraw-Hill Companies, Inc., and National Newspaper Association.

that is considered to be fixed from that which is considered to be 100 percent variable based on engineering/operational observation. In order to quantify the costs that he believes should be added to the fixed component under the Commission's approach,[41] Elliott converted the IOCS data provided into dollar estimates of scheme change costs for the 11 modeled sorting operations and for the unmodeled mail processing operations. After combining them with the roughly six percent of mail processing costs that are considered fixed under the Commission's current attribution method, he subtracts them from all other mail processing costs, which the Commission treats as 100 percent variable. Using this augmented calculation, volume variable mail processing costs would be $5.6 billion, or 93.9 percent of accrued mail processing costs. MPA et al.-RT-2 at 13.

[205] Elliott also asserts that this volume variability estimate conflicts with the estimates of more than 100 percent variability obtained from the econometric models of Drs. Roberts and Neels. He uses a letter sorting variability of 92.3 percent calculated by the augmented Commission method as a theoretical ceiling, and shows that it is exceeded by Roberts' estimate of letter sorting variability, which has a 95 percent confidence interval of 115.6 to 139.6 percent. Similarly, he notes that Neels' alternative estimates of plant-level variability of 114 percent and 103 percent have confidence intervals that are above the "augmented" Commission benchmark estimate of 92.2 that Elliott calculates for the direct sorting operations modeled by witness Bozzo. *Id*. at 7-8. He implies that his benchmarks should be regarded as either theoretical or operational ceilings above which mail processing variability may not credibly go.

[206] Elliott's analysis of the variability of the time that it takes to change schemes on sorting machines is too superficial to reliably establish that it is predominantly fixed. The fact that 5.7 of DBCS schemes and 13.3 percent of AFSM 100 schemes run on more than one machine doesn't indicate the more relevant number which is the percent

[41] The activities that the Commission considers fixed with respect to volume are relatively minor. They include such things as time waiting on the platform for the arrival of trucks to unload. Fixed activities make up about six percent of total mail processing labor cost under the Commission's method. Consequently, under the Commission's method, mail processing labor is 94.3 percent volume variable.

of <u>machines</u>, not the percent of <u>schemes</u> that run in parallel, since some parallel schemes occupy more than two machines. The number of machines running in parallel is likely to imply higher percentages of variable scheme change time.

[207] The assumption that non-parallel schemes are fixed is largely unexamined by Elliott. The recent trend in flat sorting has been to widely deploy AFSM 100 machines at plants, one effect of which is to pull carrier route sorting of flats back into the plants from the associated delivery units. Such schemes would be volume variable, since the decision to deploy ASFM 100s rests, in part, on whether there is enough volume in the plant to keep it busy. Each new scheme brought into the plant in this manner should be viewed as an added module in which the entire cost of the scheme (runtime and set up/tear down time) is added to the plant, and therefore volume variable. The same scenario applies to newly acquired DBCS machines. When they are deployed in a plant, they pull DPS sorting schemes back into the plant from the delivery unit.

[208] As a general matter, when the threshold of volume needed to support an additional sorting machine in a plant (whether letter or flat) is crossed, the schemes run on the additional machine within the available window should be viewed as added modules, and fully variable with volume. The Commission is not aware of a way to quantify how many fully-variable schemes are added in this manner over a rate cycle.

[209] More important is the unresolved question of the degree to which scheme changes in general might vary with volume, regardless of how they might have arisen. The Postal Service witnesses assume that the time required to change a scheme is, in most circumstances, fixed. In Docket No. R2001-1 Postal Service witness Kingsley assembled data for two plants showing that the average time to change sort schemes was 8.5 minutes for flat sorting machines, 12.7 minutes for barcode letter sorting machines, 16 minutes for MLOCRs, and 31.3 minutes for SPBS machines. These average times, when multiplied by the number of scheme changes and divided by runtime, translate to a rough average of 10 percent of active machine time spent changing schemes for all of the machines surveyed.

[210] In this docket, the Postal Service provided data from which similar statistics could be calculated. It provided an End of Run report for all sorting machines for one processing day in a representative plant. *See* USPS-LR-L-198. The End-of-Run Report shows the processing windows for each machine type, their runtimes, MODS operation code, scheme identification code, and the interval between schemes. Maintenance time occurs outside the processing window, and is separately identified. There is no indication that all of the interval between scheme runs is spent changing the scheme. It can be reliably concluded, however, that the time needed to change a scheme is no longer than the time between intervals.

[211] Intervals between schemes of one minute or less are common for most of the machine types in the report. One-minute intervals make up 50 percent of the intervals between schemes for the AFCS. The numbers are 25 percent for the FSM 1000, 20 percent for the CIOSS, 11 percent for the CSBCS, eight percent for the AFSM 100, six percent the DBCS, three percent for the MLOCR. None of the intervals for the SPBS and APPS were under one minute. If schemes can be changed in a minute or less, but most scheme changes are much longer (the average scheme change lasts eight to 31 times longer according to witness Kingsley's calculation), there must be some explanation for the wide variation in what is supposed to be fixed time within a given machine type.

[212] One explanation might have been provided by witness McCrery in this docket. Explaining what managers do when the volume available for processing on a DBCS machine is thin, he observes that:

> [f]or letters, manual sorting is approximately 13 times more expensive than automated sorting, so even very short runs can be cost effective, especially since it is faster to sweep down a machine when there are only a few pieces in most stackers.

Tr. 11/3134.

[213] Because tearing down a scheme is faster when volume is thin, one must conclude that the time required to change a scheme is generally volume variable to an unknown degree. If so, it could help explain what appears (at least anecdotally) to be a pattern of wide variation in set up and tear down time on the same machine in the same plant.

[214] The degree to which set up and tear down time is volume variable is far from certain, based on the reasonable inferences available on the record. Therefore, the state of the record does not support witness Elliott's conclusion that set up and tear down time is predominantly fixed, and, therefore, does not support his proposed augmented Commission method of estimating mail processing variability.

[215] It is worth noting that even if the record had supported a finding that set up and tear down time is predominantly fixed, it would not necessarily undermine the econometric estimates of variability above 100 percent presented by Drs. Roberts, Neels, and, (for some operations), Bozzo. The Commission recognizes that true volume variability is unknown for the system as a whole, and for any given sorting operation. Its method of inferring from engineering and operational observation that work hours vary approximately in proportion to volume does not rule out that a reliable econometric estimate could come in higher.[42]

[216] *Incremental costs*. Elliott also disagrees with Haldi's conclusion that much of the cost of changing sort schemes could be attributable to classes or subclasses of mail as "intrinsic" incremental costs if substantial portions of the pools of costs modeled by witness Bozzo were found not to be volume variable. He cites the testimony of Postal Service witness McCrery that incoming secondary sort schemes make up the bulk of sort

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[42] For example, a recent empirical study in Great Britain by the LECG Consulting Group concluded that marginal costs in much of its mail processing network were greater than 100 percent. *See* LECG. *Future Efficient Costs of Royal Mail's Regulated Activities*, 2 August, 2005 at 365; *www.psc.gov.uk/postcom/live/policy-and-consultations/consutations/price-contrl/LECG* efficiency review report excised. The conclusions of this study is of particular interest because it consciously avoids the use of the relevant self-reported data that was available to it on the ground that it was unreliable. In addition, it uses analytical methods that do not involve a need to resort to the use of instrumental variables of questionable validity.

schemes and that most of those schemes sort more than one subclass of mail. MPA et al.-RT-2 at 11-12.

[217] Haldi's point is conceptually sound. A sort scheme that is run exclusively for a single subclass of mail would qualify as an incremental cost "intrinsic" to that subclass, and therefore qualify as an attributable cost, as the statute currently defines those costs. Elliott doesn't question this conclusion, but argues that there are few such costs in the processing network.

[218] The record contains only qualitative indications of the extent of these subclass-specific schemes. Although the sort-scheme picture is exceedingly complex, it indicates, generally, that schemes tend to be single subclass in the outgoing sorting operations in order to preserve service distinctions, and tend to be mixed class during incoming sorts where these distinctions are less relevant. See the observations of postal operations witness McCrery that have been compiled in Elliott's testimony. MPA et al., RT-2 at 9-12. Since outgoing sorting accounts for a minority of overall sorting costs, single-subclass scheme change costs are likely to be a minority of those costs. Nevertheless, single-subclass scheme change costs are a potentially significant attributable cost that would need to be analyzed if variability estimates substantially below 100 percent, such as Bozzo's, were adopted.

c. Seasonal effects.

[219] Mail volume varies substantially by quarter. In his March 2006 paper, Roberts examined in some depth the issue of whether that variation should be exploited by mail processing labor demand models or whether that variation should be swept out of such models in order to remove such non-volume-related influences on work hours as quarterly changes in the mix of mail or the composition of the work force. He recognizes that quarterly dummy variables have a statistically significant influence on work hours, and would cause omitted variables bias if left out of the model. At the same time, he is

concerned about the amount of volume variation that has already been removed from the model.

[220] He notes that using a plant-specific fixed effect variable sweeps out the cross-plant effects of scale, essentially leaving only volume variation over time in the model. He also notes with concern that models such as Bozzo's already rely on a wide variety dummy variables that "blindly" sweep suspect variability out of the models. He says that in such models, there is not much variability left but short-run "jitter" to model, which he doubts is economically meaningful. 2006 Paper at 53-60.

[221] Roberts theorizes that the time series movements in volume that remain in the Fixed Effect models basically reflect four sources of variation: 1) quarterly variation arising from mailer behavior, 2) technical change as generations of sorting machinery are phased in, 3) short-term change as new equipment is ramped up and old equipment is ramped down, and 4) high-frequency variation arising from day-to-day oscillation of mail volume, staff shortages, equipment breakdown, bad weather, etc.

[222] Source 4, Roberts says, is controlled for by summing the volume data to the quarterly level; source 3 is controlled for by eliminating the first year of observations when new technology is introduced to the plant; source 2 is controlled for by using year dummies. It is source 1, he says, that is explicitly used to estimate the volume variability of labor demand.

[223] Roberts illustrates these different sources of volume and work hour variation graphically (*see* 2006 Paper, Figure 1), and then illustrates how models dramatically alter these patterns depending on the technique used to remove some components of variation and emphasize others. *Id.* at Figure 2. For instance, he leaves all time-related variation in volume and work hours in the model. He interprets this technique as leaving in the effect of substituting new technology for old, and little else. The resulting correlation between work hours and volume is negative and not statistically significant.

[224] He then takes out year dummies. He interprets this technique as removing both the effects of shifts in technology but also shifts in demand (for workshared over raw mail). As a result, quarterly variation dominates. The correlation between volume and

work hours becomes positive and statistically significant. He offers theoretical reasons for believing that this correlation is causal (such as the quarterly pattern in mailings of catalogues). He concludes that quarterly movement in volume is the kind on which estimates of the volume variability of labor demand should be based. *Id.* at 57.

[225] Roberts then removes both yearly and quarterly variation (by using only the differences between yearly and quarterly means). He interprets this as leaving in the model only the factors that appear at higher frequencies. The correlation between volume and work hours again is negative and not statistically significant. He concludes that this idiosyncratic variation in volume might, nevertheless, be useful if it can be effectively measured at the plant level, and the plant responds to it. He also warns that it could reflect noise in the hours and output data that an effective econometric model would have to separate out.

[226] Roberts' effectively makes the point that which kind of variation should be swept out of the model, and which kind should be left in, is a judgment call because of the trade offs involved. Leaving in yearly dummies will de-emphasize the influence of gradual technological change, but will miss the effect of long-term trends in demand. Leaving in quarterly dummies will de-emphasize the influence of changes in the mix of part- and full-time labor on work hours, but will miss the effect of the seasonal rise and fall of volume resulting from mailer behavior.

[227] Roberts argues that year dummies should be used, because the effect of gradual technological change dominates the effect of long-term change in the demand for mail. Conversely, he argues, quarterly dummies should be left in, because technological change is less apparent at that level, and volume fluctuations from mailer behavior is likely to dominate.

[228] Roberts shows that for both letters and flats, including quarterly dummies has the effect of systematically reducing estimated variabilities while increasing the estimates' standard errors. Compare Tables 4 and 5 with Table 8 in 2006 Paper.

[229] Roberts argues that there should be a debate about the use of quarterly variation in output in the model similar to the extensive debate that has occurred in prior

dockets about the use of cross-plant variations in volume to model labor demand variability. Plant-level fixed effect variables and quarterly dummies both pass the test of statistical significance and would induce a degree of omitted variables bias if left out. Unlike Bozzo, who often speaks as though passing a test of statistical significance should end the debate, Roberts has analyzed the trade offs involved in terms of the sources of volume variation that will be emphasized or de-emphasized and the non-volume variation that will be emphasized and de-emphasized, and has provided theoretical grounds for choosing between them.

[230] The Commission's tentative conclusion is that quarterly variation in output should be reflected in models of mail processing labor demand. Roberts' has provided a well reasoned theory for believing that the models should reflect this variation, noting that it provides a large share of the total volume variation that is available for modeling, and is a consequence of mailer behavior. Such variation should not be excluded by the use of quarterly dummy variables. The solution to the omitted variables bias that this would entail is to find adequate statistical measures of important non-volume-related seasonal effects on work hours that would allow variables to be constructed that would explicitly control for them. The most prominent candidates would be seasonal changes in the proportion of mail that is difficult to process (e.g., non-machinable letter mail) and changes in the proportion of the workforce that is part- or full-time.

[231] It should not be particularly difficult to develop data sufficient to quantify these non-volume seasonal effects. The MODS manual instructs plant managers to identify and record the amount of mail entering the plant according to whether it is machinable or non-machinable, regardless of the operation in which it is processed. *See* Handbook M-32 at 2-2.1 If these instructions are being followed, it should be possible to construct a variable from those data that could control for the seasonal variation in the proportion of mail entering the plant that is non-machinable. Since RPW data are compiled quarterly in great detail, other seasonal shifts in the mail mix that are likely to have an effect on work hours are likely to be measurable through data available from that source. Detailed records on employee category (full-time, part-time, casual) and type

(clerks, mailhandlers) and rates of pay by Accounting Period are also available in national reports, and, presumably, are derived from plant-level reports.

[232] Quarterly volume variation is a large portion of the mail processing volume variability that is available to model, and is the kind of exogenous, mailer-determined volume variation that theory says a mail processing model should reflect. However, the nature of MODS data may provide a major obstacle to modeling the effects of seasonal changes in the level of volume.

[233] Letters, flats, and parcels all exhibit pronounced quarterly variation in their average weight per piece, as Figures J-1 through J-3 shows. This means that the measurement error for these mail shapes will rise and fall in a quarterly pattern when the MODS data collection system converts pounds to pieces using standard national conversion factors for each shape. This will induce errors-in-variables bias in a model that leaves quarterly volume variation in the model. Further, it ensures that quarterly dummy variables will be correlated with measurement error, and ineligible to be used as instruments to avoid the effects of measurement error.

[234] The Commission offers a general comment on Roberts' analysis of the issue of seasonal variation in mail processing volume. His approach to this issue is an excellent example of marrying thorough theoretical evaluation of an issue with empirical data. It reflects the advantages of econometric research that is allowed to develop over time, with reasonable access to data beyond that which is available in a single rate hearing. It illustrates an approach to econometric research that the Commission wishes to encourage both currently, in formal Chapter 36 hearings, and in substantive rulemaking in the future under the recently adopted Postal Accountability and Enhancement Act.

d. Reasonableness of the Model Results.

[235] In evaluating the models under review in terms of the reasonableness of their behavior and results, the overriding circumstance that should be borne in mind is

that they all depend on error-ridden MODS data, and none of them have found valid and relevant instruments that overcome the risk of bias that results from errors in the definition and the measurement of volume. Consequently, none of the model results can be trusted to be unbiased, and none provide a suitable basis for estimating the variability of mail processing labor demand. The task here is to identify the model with the fewest infirmities.

[236] The results of the various models under review are summarized in Table J-8 below.

[237] These results bracket the approximate 94.3 percent variability that results from application of the Commission's engineering/observational assessment of the volume variability of mail processing labor demand. The shaded variability estimates are statistically indistinguishable from the Commission's estimate. Due to the formidable obstacle that MODS data quality presents to econometric modeling, none of these estimates is more reliable than the Commission's operational assessment of variable mail processing labor costs.

[238] *Postal Service models*. The most significant properties of Bozzo's models that the Commission has not previously had an opportunity to evaluate are the results of using log-linear Instrumental Variables estimators. Bozzo investigates using these estimators for all 11 modeled operations, but recommends using the results only for manual and cancellation operations. Table J-8 shows the effect of applying log-linear Instrumental Variables estimators (row 2) and compares them to the results of using Bozzo's traditional translog Fixed Effects estimators (row 1).

[239] Table J-8 shows that when Bozzo's traditional translog, Fixed Effect estimator is applied to manual and cancellation operations, it yields variability estimates below 50 percent for all but the Manual Flat operation. There is no plausible operational explanation for manual sorting variabilities this low, for reasons that the Commission explained in Appendix F to Docket No. R2000-1.[43]

[240] When the log-linear Instrumental Variables estimator is applied to the manual and cancellation operations, estimated variabilities consistently rise, by astonishing amounts. Manual letter variability rises by more than 50 percent points,

Manual Parcels and Manual Priority rise by more than 30 percentage points, and Manual Flats rises by 17 percentage points. Bozzo interprets such results as verification of the Commission's suspicion that attenuation bias due to measurement errors in the FHP variable drive the Fixed Effects estimates downward. *See* Docket No. R2005-1, USPS-T-12 at 57.

[241] The Fixed Effects estimator traditionally used by Bozzo yields less extreme results when applied to automated operations, but the variabilities are still less than 100 percent for all but outgoing DBCS and the AFSM 100. When the Instrumental Variables estimator is applied to the same operations, estimated variabilities for three of the operations rise above 100 percent, while the estimated variabilities for the OCR and the FSM 1000 drop dramatically to 53 percent and 44 percent, respectively (levels that are operationally unexplainable for automated operations). There is little that could explain why some automated operations would be more than 100 percent variable, but others are half that.

[242] For many operations, the results from Bozzo's models are operationally implausible without using the Instrumental Variables estimator, but a different set become operationally implausible when the Instrumental Variables estimator is used. These results do not inspire confidence in the Bozzo models.

[243] Another reason that the Commission doubts that Bozzo's variability estimates are reliable is that they are not consistent across subsamples. In the recently concluded network realignment docket, the Commission asked Bozzo to calculate mail processing labor cost elasticities for small, medium, and large plants based on workload, using the models that he presented in Docket No. R2005-1. The results are relevant here because his R2005-1 models are essentially the same as the models that he

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[43] In this docket, Postal Service witness McCrery attempts to justify an estimated variability of 50 percent for the Cancellation operation by asserting that employees clocked into the operation are intermittently rotated to other activities during lulls in arriving mail, but that the employees seldom reclock as the rules require. USPS-T-42 at 39. While this may explain why such an estimate might occur for the Cancellation operation, it does validate the estimate. Such misclocking constitutes measurement error, since it allocates time spent outside the Cancellation operation to the Cancellation operation.

endorsed in this docket. The results are reproduced in the Table J-9 below. They show that estimated variabilities for the majority of the modeled operations, are statistically significantly different depending on the size of the plant being modeled.

[244] Neels also presents statistical evidence that Bozzo's models are not robust to subsampling. He tests the hypothesis that in Bozzo's models, small plants can be pooled with large plants and finds that they cannot be fitted with the same coefficients. He reaches the same conclusion with respect to growing and static plants, and with respect to plants in which a key sorting technology is, or is not, present (AFSM 100 or SPBS). UPS-T-1 at 31-36. Neels evaluates the coefficients that Bozzo estimates for his plant-specific Fixed Effect dummy variables. His results are presented in the Table J-12 below

[245] He finds that they imply that productivity for specific sorting operations differs among plants by such wide ranges that they are not credible. They imply that the most productive plant is anywhere from roughly 500 percent to 1800 percent more productive than the least productive plant performing the same operation. Neels notes that this implies that a staff of five in one plant accomplishes as much work as a staff of 50 in another plant doing the same task with the same technology. Neels concludes that the Fixed Effect variable cannot reasonably be interpreted as capturing productivity differences across plants, and can think of no other sensible interpretation of these coefficients. UPS-T-1 at 37-38.

[246] Bozzo replies that Neels is evaluating the coefficients that he estimates for his Fixed Effect variable unfairly. He asserts that when Neels' model is subjected to the same analysis, his estimated Fixed Effect coefficients imply a comparable range of productivities. He says that Neels ignores the fact that it is a random variable that is being estimated, and that one should expect to find some extreme values as a result of sampling error.

[247] The trouble with Bozzo's argument is that the MODS data giving rise to these estimates of implied productivity have already been heavily screened for outliers. The Commission agrees with Neels that there is something wrong will all of the models

Table J-8

Estimated Mail Processing Volume Variabilities Using Alternative Models

			DBCS	BCS	BCS/ DBCS	DBCS INCOMING	DBCS OUTGOING	OCR	FSM	FSM 1000
[1]	Bozzo[a] R2006	Translog	0.88			0.823191 (.068115)	1.0562 (.059433)	0.782744 (.054455)		0.718714 (.032568)
[2]	Bozzo[a] R2006	Instrumental Variables (IV)				0.82 (0.07)	1.19 (0.19)	0.53 (0.08)		0.44 (0.12)
[3]	Bozzo[b] R2005	Translog		.900603 (.052790)	.845527 (.068091)			.776198 (.061174)	1.01154 (.035003)	.729935 (.025664)
[4]	Bozzo[b] R2005	IV		1.65810 (.309484)	1.09149 (.136760)			.457234 (.090385)	1.06562 (.031710)	.518063 (.102005)
[5]	Roberts[c] R2006	IV without Q dummy IVs	1.132 (.091)					1.204 (.241)		2.219 (.595)
[6]	Roberts March 2006	Single output IV model (Total letter and flats categories are two output models)	1.421 (.130)					1.374 (.222)	.769 (.086)	.674 (.222)
[7]	Roberts May 2002	IV	1.241 (.161)					.882 (.084)	.803 (.054)	.739 (.247)
[8]	Neels R2006	Strictly scrubbed data IV								
[9]	Neels R2006	Loosely scrubbed data IV								

Notes: Standard errors in parentheses.

a/ USPS-LR-L-56. The Postal Service recommends using translog models for the automated operations and the Instrumental Variables estimator for the manual and cancellation operations. Docket No. R2006-1 manual translog results from USPS-T-12, Table C1. Docket No. R2006-1 automated IV results from USPS-T-12, Table C2.

b/ USPS-LR-K-56.

Table J-8 (continued)

Estimated Mail Processing Volume Variabilities Using Alternative Models

AFSM 100	SPBS	Manual Flats	Manual Letters	Manual Parcels	Manual Priority	Cancellation	Plant-wide Letters, Flats, Parcels	Flat Sorting Operations Only	Letter Sorting Operations only
0.99295 (.078844)	0.866437 (.049220)	0.77 (0.03)	0.38 (0.03)	0.47 (0.05)	0.43 (0.04)	0.41 (0.08)			
1.03 (24.43)	1.03 (.011)	0.936682 (.066975)	0.892369 (.092588)	0.797821 (.177479)	0.751602 (.087483)	0.50476 (.067071)			
1.03030 (.085109)	.767010 (.057114)	.745848 (.030574)	.401641 (.028135)	.501930 (.049435)	.389531 (.038896)	.462868 (.094876)			
.589316 (.136270)	1.14100 (.120207)	.903388 (.133322)	.869365 (.073855)	.783397 (.180859)	.761965 (.078599)	0.45965 (.065778)			
1.054 (.091)		.275 (.361)	1.520 (.075)					1.098 (.162)	1.276 (.061)
.928 (.083)		.610 (.143)	.969 (.091)					.704 (.079)	.990 (.081)
		.884 (.075)	1.002 (.051)						
							1.14 (.06)		
							1.03 (.04)		

c/ Dr. Roberts recommends 2 output models. For presentational convenience, aggregate variables are presented for each model.
Shaded cells: 95% confidence that the volume variability factor is the same as 94.3 (PRC) cost pool weighted average).

Table J-9
Subsampling Volume Variability by Plant Size

[1] Operation	[4] USPS Volume-variability (Elasticity)	[5] Standard Error	[6] Lower bound of 95% confidence interval	[7] Upper bound of 95% confidence interval	[8] Volume variability factor falls within the 95% confidence intervals of the other two plant sizes
D/BCS Incoming					
Small	0.752	0.145	0.7310	0.7730	0 out of 2
Medium	0.819	0.092	0.8105	0.8275	0 out of 2
Large	0.734	0.100	0.7240	0.7440	1 out of 2
D/BCS Outgoing					
Small	0.753	0.084	0.7459	0.7601	0 out of 2
Medium	1.011	0.065	1.0068	1.0152	0 out of 2
Large	1.057	0.079	1.0508	1.0632	0 out of 2
OCR					
Small	0.822	0.083	0.8151	0.8289	0 out of 2
Medium	0.892	0.066	0.8876	0.8964	0 out of 2
Large	0.654	0.092	0.6455	0.6625	0 out of 2
FSM/1000					
Small	0.752	0.054	0.7491	0.7549	0 out of 2
Medium	0.807	0.045	0.8050	0.8090	0 out of 2
Large	0.628	0.061	0.6243	0.6317	0 out of 2
SPBS					
Small	0.845	0.070	0.8401	0.8499	0 out of 2
Medium	0.657	0.082	0.6503	0.6637	0 out of 2
Large	0.853	0.069	0.8482	0.8578	0 out of 2
Manual Flats					
Small	1.518	0.301	1.4274	1.6086	0 out of 2
Medium	0.635	0.114	0.6220	0.6480	0 out of 2
Large	0.716	0.103	0.7054	0.7266	0 out of 2
Manual Letters					
Small	0.934	0.131	0.9168	0.9512	1 out of 2
Medium	0.784	0.437	0.5930	0.9750	0 out of 2
Large	0.160	0.099	0.1502	0.1698	0 out of 2
Manual Parcels					
Small	0.307	0.154	0.2833	0.3307	0 out of 2
Medium	1.778	0.965	0.8468	2.7092	0 out of 2
Large	0.957	0.545	0.6600	1.2540	1 out of 2
Manual Priority					
Small	2.880	3.210	-7.4241	13.1841	1 out of 2
Medium	0.660	0.081	0.6534	0.6666	1 out of 2
Large	0.339	0.289	0.2555	0.4225	1 out of 2
Cancellation					
Small	0.857	0.101	0.8468	0.8672	0 out of 2
Medium	0.198	0.122	0.1831	0.2129	0 out of 2
Large	0.356	0.185	0.3218	0.3902	0 out of 2
AFSM 100					
Small	1.101	0.108	1.0893	1.1127	1 out of 2
Medium	1.094	0.104	1.0832	1.1048	1 out of 2
Large	1.135	0.145	1.1140	1.1560	0 out of 2

Source: Recommended Decision. N2006-1, Appendix A, Page 3

Table J-10
Productivity Differentials Implied by the Postal Service's Fixed Effects Models

Cost Pool	Min	Max	Implied Productivity Differential
OCR	0.532	2.980	560%
FSM1000	0.245	2.658	1084%
SPBS	0.284	2.048	722%
BCS_IN	0.397	2.528	636%
BCS_OUT	0.449	2.905	647%
MANUAL FLATS	0.541	3.425	633%
MANUAL LETTERS	0.421	2.119	503%
MANUAL PARCELS	0.233	3.743	1607%
MANUAL PRIORITY	0.443	2.821	637%
CANCELLATION	0.274	5.013	1828%
Source: Docket R2006-1, UPS-T-1 page 27, Table 16			

under review, since their estimates all depend so heavily on the plant-specific Fixed Effect variable, and the estimated coefficients for that variable have no sensible interpretation.

[248] Roberts criticizes what he describes as the "ad hoc" nature of Bozzo's models. By separating the BCS operation into incoming and outgoing processes, Roberts explains, Bozzo is adding an assumption to his models that these are stand alone production processes. If this assumption holds for one operation, he says, it should hold for all. The Commission notes that Bozzo's models are ad hoc in another respect. While he separately models outgoing and incoming BCS operations, he estimates his AFSM 100 model with a multi-variate model, including variables for both outgoing and incoming piece handlings in the same model. This implies that a separability assumption is appropriate for the BCS, but not for the AFSM 100 operation. Bozzo provided no explanation for these different approaches.

[249] The Commission notes that the estimated variability of 50 percent for the Cancellation operation that Bozzo recommends is credible only if witness McCrery's explanation is correct that staff frequently moves in and out of the operation without re-clocking. USPS-T-42 at 39. While this might reflect measurement error rather than a modeling flaw, the fact remains that Bozzo's variability estimate for the Cancellation operation must be regarded as invalid.

[250] Bozzo took the models estimated in Roberts March 2006 and modified them in four ways that he felt were improvements. He compares the results obtained from his "update" of the Roberts March 2006 models with the results of his models, notes that they "differ little," and suggests that the results of his "update" of Roberts corroborate his own results.

[251] In performing this exercise, Bozzo added a more current year of data (for FY 2005), used a capital index that was updated quarterly, re-weighted the variability results to favor the most current year, and redefined the D/BCS operation to be consistent with his model. He characterizes the results of this "updated" version of Roberts March 2006 as little different from the results obtained from his models. For aggregate letters he notes that his update of Roberts estimates a variability of 87 percent compared to 88 percent for his own. For aggregate flats, his update of Roberts estimates a variability of 78 percent, compared to 92 percent for his own.

[252] Bozzo says

> [t]he reason for the relatively small differences in results is that while Prof. Roberts misspecifies sorting outputs by using FHP aggregates instead of operation-specific total piece handlings, FHP does not badly mismeasure sorting output in most cases — and the IV estimation procedure helps correct the resulting measurement error…. It follows from both approaches using statistically consistent methods to estimate the same economic quantities that the results should substantially coincide.

USPS-T-12 at 103.

[253] The Commission notes that while the results of this exercise are very close for aggregate letters, they are not close for aggregate flats. If the premise that they are close were correct, the conclusion that they “estimate the same economic quantities” essentially the same way, is not. Models that define output as operation-level TPH and models that define output as plant-level FHP measure “the same economic quantity” only if TPH is proportional to FHP. The data demonstrate that it is not. Almost all of the theoretical differences between the two approaches (separability, endogeneity, short-run vs. longer-run effects) still divide them.

[254] *Roberts' models*. The Commission views Roberts' modeling approach as being more sound from a theoretical standpoint than that of Bozzo. It endorses his definition of output (plant-level FHP by shape) as being much closer to an economically meaningful definition of volume than operation-level TPH, and it endorses the key assumptions that underlie it, including the assumption that volume levels affect the mix of operations within a plant. It also endorses his conclusion that categorizing output according to its cost-driving characteristics, and distributing the variable costs caused by each category to subclasses according to their true (RPW) volume share of that category would come closer to an economically meaningful product marginal cost, provided the data were available. The question then becomes whether Roberts' theoretically superior approach can be successfully applied, given the limitations of the data.

[255] Roberts explores many variations of his models and is not strongly wedded to the results of any variation of his FHP/shape models that use a Fixed Effects, Instrumental Variables estimator. Like Bozzo, Roberts finds that output variabilities decline dramatically with the inclusion of a plant-specific Fixed Effects variable, and rise dramatically when an Instrumental Variables technique is used, suggesting that measurement error in the output variable has been causing substantial downward bias in the estimates. *See* 2002 Paper, at 60-61.

[256] The results of Roberts evolving models are presented in Table J-8 above. In Roberts 2002 (row 7), Roberts modeled panel data for the period 1994-2000. In

Roberts March 2006 (row 6) his model covered the 1999-2004 period. In Roberts September 2006 (row 5), his model covered the period 2002-2005.

[257] In Roberts 2002, Roberts developed single-output (FHP/shape) models. He obtained variability estimates for the various letter sorting operations that were not statistically significantly different from one, except for the minor BCS category. He obtained estimates for Manual Flat sorting that were not statistically significantly different from one. The same result was obtained for the FSM 881 and FSM 1000 when they were combined into a single model. This result for flats was partly due to the large standard errors in many of the estimates. His models did not yield estimates of the variability of the FSM 1000 operation with acceptable precision. Roberts attributes this to the fact that it was being phased in during this period. *Id.* at 61, 65.

[258] In Roberts March 2006, Roberts disaggregated his plant-level FHP/shape output variables by outgoing and incoming categories. Roberts plausibly argues that the variabilities for incoming processing are far higher than for outgoing processing because incoming processing accounts for a much larger share of total mail processing time in each sorting operation. *Id.* at 44. He used data for only 214 plants to 291 plants out of the 351 plants in the database, depending on the operation modeled. He concluded that the remaining plants were non-representative, primarily in the sense that certain types of equipment were not deployed or deployment was not complete. While such heavy truncation of the database might well be needed to get consistent results, the fact that it is necessary raises concerns that these models suffer from truncation bias.

[259] The variability estimated for Manual Flat sorting fell from 0.881 in Roberts 2002 to 0.604 in Roberts March 2006, and the standard error rose. Roberts attributes that to a change in the role performed by manual flat sorting as a result of the introduction of the AFSM 100. He concludes that the role of absorbing quarterly volume fluctuations was transferred from Manual Flats to the AFSM 100 as it was becoming fully deployed. This operational interpretation of this shifting pattern of variability among operations is plausible. That Roberts' models capture these interactions among

operations lends credibility to his model specification. It also confirms the value of generalizing mail processing models to allow them to reflect cross-operation effects.

[260] The capital and labor coefficients in the Roberts March 2006 models are consistent with Roberts' theory that demand for labor in one operation depends on capital in another operation. These coefficients are positive for capital equipment in the same operation, raising the demand for labor there, and negative for capital equipment in other operations of the same shape, indicating that they lower the demand for labor in the other operations. *Id.* at 47, 49. This lends credibility to Roberts' model specification.

[261] In Roberts September 2006, Roberts further subdivided output into FHP/shape/outgoing/automated and FHP/shape/outgoing/non-automated. He dealt with what was apparently a sea change in flat sorting by modeling only the period in which the AFSM 100 was fully deployed (2002 onward).

[262] One way to determine whether Roberts' models are robust is to examine their results over time, bearing in mind the models gradual evolution. In Roberts 2002, overall letter variability ranged from 0.951 to 1.026 depending on the assumptions made. In Roberts March 2006, overall letter variability was 0.990 (0.890 for FHP/in and 0.100 for FHP/out). In Roberts September 2006, overall variability rises substantially to 1.276 (1.016 for FHP/in and 0.345 for FHP/out). The main source of the overall increase is the increase in Manual Letters variability. It rises from 0.914 (0.869 for FHP/in and 0.045 for FHP/out) in the March 2006 study (*see* Roberts March 2006, Table 4) to 0.1.520 (0.911 for FHP/in and 0.609 for FHP/out) in the September 2006 study. *See* OCA-T-1, Table 4, Panel B. If the model period is extended to 1999-2005, and only FHP/flats are used as instrumental variables, the Manual Letter variability drops to 1.02 (0.861 for FHP/in and 0.159 for FHP/out), which is very similar to the Roberts March 2006 results. Although Roberts recommends the higher Manual Letter variabilities from his Table 4, Panel B, he considers the choice of which to use a judgment call.[44] Roberts' aggregate letter

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[44] To his credit, Roberts did not cherry pick his Manual Letter results in order to increase the chance that his models would be perceived to be robust over time.

variabilities, therefore, could be viewed as stable or as rising significantly over time, depending on which of relatively minor model variations are considered.

[263] Another way to judge whether Roberts' letter models are robust is whether his estimated aggregate letter variabilities are stable across reasonable variants of his models. Table 4 of his testimony [OCA-T-1] shows variants in the instrumental variables chosen, whether the BCS operation is disaggregated, whether his sample of plants is reduced, and whether the period covered by the model is expanded. Aggregate letter variabilities remain in a narrow range (from 1.276 to 1.361) over these variants of his models. His letter models are quite stable in this respect.

[264] When Dr. Roberts further disaggregates his output variable to distinguish between automated and non-automated categories, standard errors become uncomfortably high. Some variability estimates lose their statistical significance (particularly for OCR) or become counterintuitive (particularly FHP/in/non-automated). *See* OCA-T-1, Table 5, Panel D. This illustrates the practical limit of disaggregating the output variable, given the nature of the MODS data that are available.

[265] Dr. Roberts estimates that the volume variability of the manual letter sorting operation is 152 percent, with a 95 percent confidence interval of 144.5 to 159.5 percent. Postal Service witness Oronzio argues that there are no credible operational explanations for manual letter sorting variabilities this high. He rejects Roberts' speculation that these variabilities reflect a tendency to use manual sorting to deal with overflow from the automated operations.

[266] Witness Oronzio asserts that there is no shortage of capacity in the DBCS letter sorting operation, which has all of the machines needed throughout the system to accomplish the sort to Delivery Point Sequence, which defines the peak requirement for those machines. If there were a shortage of DBCS machines during that operation, he asserts, automation letters are unlikely to be diverted to manual processing because OCR machines, which are usually idle and available at the time, could sort the overflow at least to the carrier route level.

[267] In addition, he says that there is little incentive to choose to sort letters manually because manual sorting to carrier route requires scheme knowledge, which most workers in the processing plants generally no longer have, and that to sort mail even to the ZIP Code level requires a manual case. He asserts that space is currently scarce in plants, and the cases needed have been reduced to a minimum, "so even if somehow there were manual clerks with the necessary skills available, there wouldn't be anywhere for them to work in the plant." USPS-RT-15 at 10.

[268] Witness Oronzio offers the "greeting card" effect — the rise in the proportion of collection mail during the Christmas quarter--as an alternative explanation for the high Manual Letters variability that Roberts' model estimates. He speculates that Roberts' model is capturing the effect on work hours caused by the higher proportion of mail that is difficult to process. *Id*. at 12. Witness Oronzio offers as another possible explanation the unreliability of FHP data. He says that as the share of manual sorting has declined, management has less need of FHP, suggesting that the integrity of this source of data is not maintained. *Id*. at 12-13.

[269] These suggestions by witness Oronzio of the different ways that Roberts high variability estimates for Manual Letters could reflect non-volume effects may be valid. Witness Oronzio's testimony, and his written response to questions from the bench, however, suggest other ways in which Roberts' high variabilities might legitimately reflect the effects of volume.

[270] From the bench, witness Oronzio was asked to provide data on the sources of letters sorted manually. His response describes the difficulty in estimating what share of this mail is collection mail that is culled out of the AFCS as non-machinable at the outset, and what share is automation rejects.[45] He explains that an automation reject often accounts for multiple TPFs, since if it is found to be non-machinable or non-readable on one machine, it is often tried on another. He corroborates this by noting

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45 Notice of United States Postal Service of Filing Responses to Questions Raised by Commissioner Tisdale During Oral Cross-Examination of Postal Service Rebuttal witness Oronzio, December 22, 2006.

that when all TPF that indicate rejection from an automated letter sorting operation are added together, they are 18 percent greater than total Manual Letter TPH. This implies that when the share of total letters that are collection mail rises in the Christmas quarter, TPF in automated operations would rise faster than TPH in Manual Letters. This would not explain Roberts' Manual Letter variability estimate, which implies that opposite.

[271] Witness Oronzio might have provided a plausible explanation for Roberts' high estimated variabilities for Manual Letters when he described the increasingly poor technology (loss of scheme knowledge, no sorting case) that is available to perform manual letter sorting at the plant. Despite witness Oronzio's assertion that manual letter processing is no longer important and would never be used as a discretionary strategy, the Postal Service still makes substantial use of manual letter sorting. It still accounts for one third of letter processing costs. Tr. 23/8591. A substantial amount of that activity must be performed somewhere in the plant, by someone. If the plants have not retained the tools to do that work efficiently, that would cause work hours to rise faster than piece handlings, which would be consistent with Roberts' estimate.

[272] The bottom line, here, is that there are a number of plausible explanations for Roberts high estimated variability for the Manual Letter operation — some of them volume related, others not. A high Manual Letters variability is not necessarily counterintuitive.

[273] Roberts has had more difficulty modeling the variability of flat sorting operations than letter sorting operations, particularly for the period that straddles the introduction of the AFSM 100 technology. Roberts 2002 estimates that the variability for aggregate flat sorting operations ranged from 0.838 to 0.956, depending on the model variant chosen. Standard errors were rather high for Manual Flats and the FSM 1000. The aggregate estimate declined to 0.704 in Roberts March 2006. Roberts attributes this largely to the decline in the elasticity of Manual Flat sorting. Standard errors, however, remain rather large.

[274] In Roberts September 2006, the aggregate variability for flats rose to 1.098, with a reasonable standard error. The estimates for some individual operations,

however, were counterintuitive, and not statistically meaningful because of very large standard errors. Manual Flats fell from 0.610 to 0.275 (which is less than the associated standard error), and the estimate for the FSM 1000 rose from 0.674 to 2.219. *See* Table J-8, row 5.[46] Roberts believes that these results reflect the impact of the deployment of the AFSM 100 over the model period, which appears to have changed the role the Manual Flats from an operation used by managers to deal with quarterly fluctuations in flat workload, to one that is devoted to flat mail that is difficult to process, thus weakening its link with volume. OCA-T-1 at 46.

[275] Roberts' theory that the AFSM 100 has taken over the role of Manual Flats in dealing with quarterly fluctuations in volume, and destabilizing the flat sorting process, is supported by his separate variability estimates for plants that do not use the AFSM 100. *See* OCA-T-1, Table 7, Row D. Manual Flats sorting has an intuitively reasonable estimated variability of 0.895 with a reasonable standard error. The FSM 1000 has a variability of 0.578 and the FSM 881 has a variability of 1.213, both statistically meaningful. Overall flat variability for these plants is 1.000, very similar to overall flat variability for plants with the AFSM 100. The dramatic changes that the AFSM 100 has made in the roles of remaining flat sorting technologies that appear to be destabilizing the results of Roberts' models is evident from the graph of man hours in flat sorting that appears in Figure 4. There it can be seen that the AFSM 100 takes over the workload formerly borne by the FSM 881 and manual flat sorting.

[276] It is significant that the sea change brought about by deployment of the AFSM 100 does not destabilize the models developed by Bozzo. This might support an inference that Bozzo's models are more robust than Roberts'. A more plausible inference is that Bozzo's models, because they define output as within-operation piece handlings, do not capture such transformations of roles among operations.

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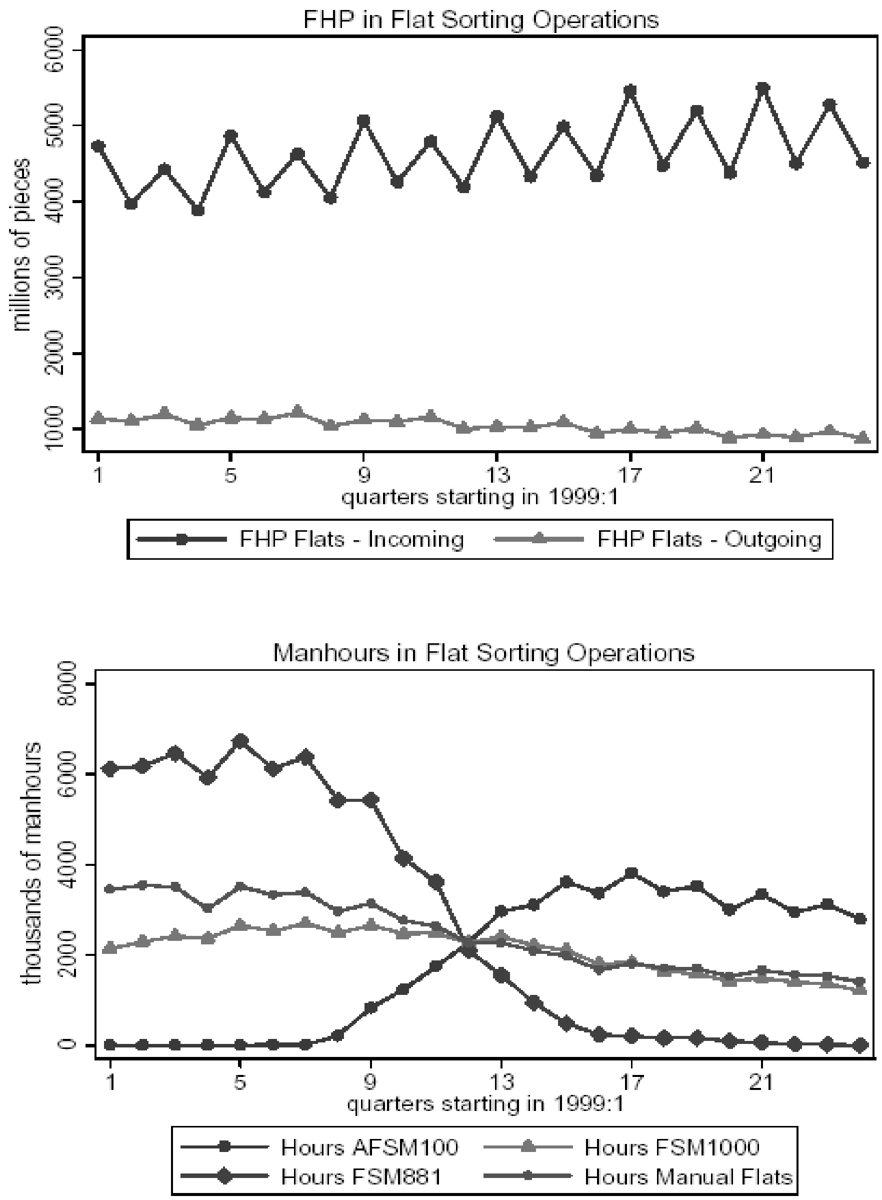
[46] As was the case with his letter models, Roberts estimates a variant of his flats models (his single-output models) that has more intuitively reasonable results and more acceptable standard errors than his other models. He does not recommend its use for ratemaking, however, because it is not consistent with his beliefs about the nature of the underlying process being modeled.

[277] Roberts' September 2006 flats models have a relatively wide range of estimated variabilities over time for individual operations, and for flats in aggregate, Table 7 of his testimony shows that relatively minor variants in his models also yield significantly different results. For example, taking quarterly dummy variables out of the set of instruments used drives Manual Flat variability dramatically down, and FSM 1000 dramatically up. Changing the output variables from two-output to single-output greatly moderates the variabilities estimated for Manual Flats and the FSM 1000, but it lowers aggregate flat variability significantly.

Figure J-4



[278] Roberts' models seem to produce stable variability estimates for letter sorting operations across time and across relatively small variants in model specification. His letter variabilities are also intuitively reasonable, if one believes that variability estimates above 100 percent are operationally reasonable, as most witnesses on the record do. The same cannot be said for Roberts' variability estimates for flat sorting operations. It is difficult to pinpoint the reasons for his unstable and sometimes counterintuitive variability results for flats.

[279] The record suggests that flat sorting is in too much flux due to the technological upheaval brought about by deployment of the AFSM 100 to be successfully modeled by plant-level models that capture the disruptive effects. Another possible explanation is that the process being modeled is so diverse across the set of plants included in the MODS system that it is not practical to try to fit statistical models that will capture such wide underlying diversity. The huge productivity differences implied by the plant-specific Fixed Effect coefficients in the models under review support this view.

[280] Another possible explanation for Roberts' difficulties in modeling the variability of flat sorting operations is the most obvious, and the most likely one. Gross errors in measuring the FHP output variable are widespread in the data. Since the likely source of such errors is a dysfunctional data collection and reporting process, it may be inferred that errors that are not so extreme as to be self-identifying are also widespread, and remain in the data unscreened. This inference is supported by the fact established on the record that the more the data are disaggregated, the more gross errors appear.

[281] In addition to the persistence of widespread explicit error and implicit error in the MODS piece handling data, Roberts' models might be suffering from another form of measurement error. The definition of volume that his models employ — plant-level FHP by shape and other cost driving characteristics — is not the theoretically correct definition of volume. From a theoretical standpoint, processed volume is the number of RPW pieces finalized and ready to leave the mail processing system. FHP is one step removed from the correct definition of volume, since it reflects the number of RPW pieces in the system that were finalized multiplied by the number of plants that were required to finalize them. The ratio of FHP to RPW pieces is known to change over time, for example, as the practice of dropshipping mail deeper into the system increases. Failing to account for this changing relationship might contribute to Roberts' difficulty in modeling the flat processing network.

[282] Lastly, the Commission's analysis has shown that Roberts' Instrumental Variables estimators, which were designed to avoid errors-in-variables bias, were not able to identify truly exogenous instruments that were also relevant. It is reasonable to

infer that this is an important reason that his models are ineffective in capturing the underlying variability.

[283] *Neels' models*. Neels developed multi-variate models that estimate the response of work hours in the entire plant to changes in FHP for each of the major shapes — letters, flats, and parcels. He argues that the virtue of his models is that they capture cross-operation and cross-shape effects of volume, as well as within-operation effects. Any changes in the relationship of TPH to FHP have been reflected in his models' results. Neels contends that a plant-level model also provides a sound way to integrate allied operations and overhead activities into the model. It also tends to net out that portion of the errors in the MODS data that mismatch hours and volumes in specific operations.

[284] Neels uses two sets of data to estimate his models. One consists of data in which errors in any operation identified as obvious by screening at the weekly level cause all data simultaneously recorded for the plant to be discarded. The other data set is screened in this manner on a quarterly basis. The first screening rule discards roughly 90 percent of the plant-level operations. The second screening rule discards roughly 80 percent of the plant-level observations. The plant-level variability estimated under the first screening rule is 114. The plant-level variability under the second screening rule is 103. UPS-T-1 at 54. Neels does not recommend these as fully articulated models suitable for serving as the basis for setting rates. He believes that the poor quality of the MODS data, and the severe truncation of the sample which poor data quality requires, undermine the credibility of his results. *Id.*

[285] Neels models successfully demonstrate that screening MODS data at different levels produces meaningfully different results. They are also valuable in the sense that they treat the processing plant as an organic whole where mail processing of all shapes is brought together to take advantage of economies of scope. Economies of scope are found in the sharing of allied and overhead costs (dock functions and staging and prepping activity) among the shape streams. These models illustrate how modeling might overcome the artificial selectivity of modeling only 11 direct distribution operations

and then extrapolating the results to the other two thirds of mail processing that consists of allied and overhead activities. In the Commission's view direct modeling of these activities is required, since there is reason to believe that the bulkier shapes of mail (flats and parcels) account for a greater proportion of such costs than of the costs of the direct sorting operations.

[286] *Conclusions applicable to all models*. There are fundamental obstacles to obtaining economically meaningful marginal costs for mail processing labor through econometric modeling. The most important obstacle is that the Postal Service does not have data on the theoretically correct definition of volume--unique RPW pieces finalized to exit the mail processing system. The Postal Service does not have data that can track RPW pieces as they move through plants, or through operations in plants. The Postal Service's models appear not to be motivated by theory so much as by the ready availability of detailed data on total piece handlings, at least for the narrow set of operations that handle pieces of mail individually.

[287] TPH is a measure of work effort — not production. TPH yields measures of work effort expended as it rises and falls at different points in the plant — a measure that can be de-averaged to a fine degree. What is needed, however, is a de-averaged measure of the burden that the volume of mail entering the plant imposes on the various activities throughout the plant.

[288] Because TPH is not unique pieces, and can't be reliably converted to unique pieces, it only has meaning within an operation. Dollars spent in one cost pool can be compared to dollars spent in another, but TPH incurred in one cost pool is not comparable to TPH in another. TPH does not represent the same amount of work, or accomplish the same improvement in mail condition, from one pool to another. It therefore cannot be used to measure how labor is being allocated among sorting activities. *See* 2002 Paper at 10-14. TPH cannot even be relied on to represent the same amount of work effort, or improvement in mail condition, within a cost pool from one period to another, because the technology that defines the cost pool often evolves, and the boundaries of the cost pool change.[47]

[289] Plant-level FHP is one level closer to true volume (RPW finalized pieces) than TPH. It measures the average propensity of a unique piece of mail entered into a plant to generate work hours finalizing a piece of mail, not the propensity of an intermediate handling to generate work hours, as TPH does. FHP is linked directly to volume in the plant, and therefore is a potentially more consistent measure of the plant-wide burden that a piece of mail imposes on the plant. To be truly consistent, however, FHP must be disaggregated into incoming/outgoing, and machinable/non-machinable categories, etc. Roberts recognized this, and found that the data do not yield sufficiently precise estimates when they are disaggregated.

[290] This leaves those wishing to accurately model the variability of mail processing labor demand in a dilemma. The Postal Service has a wealth of data with which to measure TPH, disaggregated to the nth degree, but it is a localized, partial, and biased measure of the effect of true volume on work hours. On the other hand, the data required to disaggregate FHP to the necessary degree to find the marginal effect of variation in true volume on work hours is not available. Even if the data were to become available, there would still be bias when FHP is used to compare volume effects across plants.[48] The bias inherent in TPH, and the lack of data that are sufficiently detailed to properly model with FHP, are partly to blame for the failure of econometric methods to reliably measure the variability of mail processing labor costs.

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[47] An example would be the OCR cost pool. The OCR function has gradually migrated away from the OCR pool itself into the AFCS and the D/BCS. More time is spent, and more improvement in mail condition occurs in the latter two cost pools when an address is read, and a barcode applied, prior to the actual sorting of the piece. Yet the TPH count won't change if a piece receives one aspect of this service, or all three. Differences in the work content of the TPH over time within a pool will result in a biased elasticity estimate, especially in a plant-specific Fixed Effect model, which focuses on variation over time. Other examples would be the gradual migration of DPS level sorting of letters, and carrier route sorting of flats, from the plant, to the delivery unit, and back to the plant as technology changes. When this occurs, in tacitly redefines TPH for the pools affected in terms of the improvement in mail condition that a TPH represents. This, too, will lead to biased estimates of the effect of TPH on work hours.

[48] The Managed Mail program shifts volume dynamically among plants according to the spare capacity of plants. It illustrates that there are volume effects that occur across plants that need to be reflected in valid models of mail processing variability.

[291] The lack of plant-specific data on true volume that has long prevented successful modeling of its effects on work hours could, however, be remedied in the near future by the Postal Service's "Intelligent Mail" program. Apparently, that program envisions applying a powerful, four-state barcode to all mail that can be passively scanned. The objective of the program is to be able to monitor the path of each RPW mailpiece through the mail processing network. This raises the prospect of being able to record the number of unique RPW pieces with relevant cost driving and subclass characteristics in an automated sorting activity and correlate it with work hours spent on that activity. This could provide a direct method of calculating the marginal cost of processing each postal product (or, at least, each postal product that is machinable). This method might be extended to the two-thirds of mail processing activity that currently is not modeled, since mail might be effectively tracked even when it is handled in bulk in containers.

[292] True volume, however, is not the only data that is required in order to successfully model the variability of mail processing labor. Valid data on the capital stock by operation is needed, properly matched to the time of deployment and retirement. As Roberts has pointed out, the Postal Service data on its capital equipment do not accurately record the time of deployment and retirement of equipment. Since timing of deployment is a major factor in Fixed Effect models, errors of that kind undermine the ability of such models to accurately capture the underlying production process.

[293] For the reasons described above, econometric modeling of mail processing labor demand variability seems to have reached an impasse. Bozzo has chosen to model partial, short-run effects of output (loosely defined) on a very detailed level and does not obtain stable or intuitively reasonable results. Roberts has chosen to model longer-run, more comprehensive effects of output (more correctly defined) and does not obtain stable or intuitively reasonable results, at least at the operation level. He has also reached the limit of disaggregation of his output variable short of that which is necessary to estimate true marginal costs for subclasses. Neels results, though intuitively

reasonable, vary according to the level of data screening, and require such massive truncation of the available data that Neels, himself, does not trust the results.

[294] All three witnesses presenting econometric models grasp the serious risk of bias from relying on TPH and FHP data of poor quality and attempt to avoid that risk through the use of Instrumental Variables estimators. The instruments selected, however, are not valid, either because they are not supported by plausible theories that they are exogenous, or are not sufficiently relevant to effectively capture the variability of interest. This reflects the paucity of data that are available from which valid instruments could be fashioned.

[295] If the system by which MODS piece handling data are collected is not reformed, or a comprehensive substitute measure of volume is not provided through the Intelligent Mail program, econometricians will have few alternatives but to continue to search for valid instruments. This search is not likely to bear fruit, however, unless a new category of data is made available for their use. Econometricians need to be able to access (with reasonable safeguards) the wealth of location-specific information that exists with respect to processing plants in the network. This would allow measures of local economic activity, and local business and consumer profiles that would be expected to drive mail volume, to be analyzed for their value as instrumental variables. *See* Appendix L.

[296] Until data of the kind described is made available, the vacuum left by unsuccessful econometric models of mail processing variability will have to be filled with the estimate of approximately 100 percent variability that the Commission applies to most mail processing activities, based on engineering and operational analysis.

DESCRIPTION OF NEWLY AVAILABLE CARRIER STREET TIME DATA

[1] During Docket No. R2005-1, the Commission learned that the Postal Service conducted a study in 2004 that updated the data collected in the 2002 City Carrier Street Time Survey (CCSTS). Docket No. 2005-1, Tr. 6/1997. The existence of the 2004 study was revealed too late in the proceeding for the Commission to use the 2004 study in its findings.

[2] In its request initiating the current rate case, the Service again relied on the 2002 CCSTS data rather than 2004 study. Therefore, in Presiding Officer's Information Requests Nos. 4 and 16 the Commission requested the Postal Service: (1) provide the 2004 CCSTS data; (2) perform certain regression analyses on the 2004 data that were performed on the 2002 data in Docket No. R2005-1; and (3) discuss the differences between the 2002 and 2004 data as to sample features, data collection, and regression models.

[3] The Service responded to the Commission's request on October 12, 2006, at which time the proceeding was too advanced to allow participants a fair opportunity to review and comment on the Service's submissions. Tr. 19/6737, 6756, 6824. The Commission, therefore, did not rely on the 2004 CCSTS data or the associated analyses for its findings in this case. Nonetheless, to further discussion and future analysis, this appendix discusses some of the main features of the 2004 CCSTS data and analyses.

[4] The Postal Service employed sampling techniques and data collection procedures for the 2004 CCSTS data similar to those used for the 2002 data. However, several differences distinguish the two data sets. In the 2004 set the Service:

— Included fewer ZIP Codes (122 vs.154). *Id.* 6764.

— Obtained mail volume for letters, flats, and sequenced mail from DOIS reports, but did not verify the volumes with local study participants. *Id.* at 6744.

— Hand-recorded carrier pickup mail on specially-designed forms. USPS-LR-L-179 at 10.

— Recorded collected mail volumes using container measures (as opposed to converting the height of the collected mail based on an average amount of mail per inch or foot). Tr. 19/6831, 6743. *See also* USPS-LR-L-180.

— Obtained scans for packages scheduled for carrier pickup. USPS-LR-L-179.

— Collected scans to indicate a route pivot while on the street, i.e. when a carrier began delivery on a new route. Tr. 19/6825.

— Carefully evaluated time scan pairs that were difficult to assign. This resulted in a significant increase in parcel-accountable delivery time and confirmed a Commission supposition made in Docket No. R2005-1. *Id.* at 6749. *See also*, PRC. Op. R2005-1, para. 4079.

[5] The Service also made several modeling modifications when analyzing the 2004 data, including combinations of models that:

— Selectively dropped only cross-product terms belonging to delivery points, similar to the Commission's suggestion to limit removal of terms interacting with small parcels. Tr. 19/6748. *See also*, PRC Op. R2005-1, para. 4079.

— Added variables reflecting the extent to which routes in a Zip Code were motorized and the extent to which deliveries in a Zip Code were made primarily to businesses. Tr. 19/6749.

— Used a three bundle delivery of regular mail, where bundles consisted of mail that was delivery point sequenced (DPSed), mail that was cased (cased letters, flats, and small parcels), and sequenced mail. *Id.*

— Employed mostly full quadratic models. *Id.*

[6] The Postal Service presented variability estimates derived from six alternative models using the 2004 data. These estimates can be compared to the variabilities proposed in Docket No. R2005-1, which were based on the 2002 data. A comparison establishes that the most recent variabilities for: (1) either flats or the combined letter, flat, and small parcel shape variable, rose from between 50 to 100 percent; (2) sequenced mail were generally stable, although two alternatives reduced sequenced mail variabilties between 50 to roughly 75 percent; and (3) collection mail

were reduced between 80 to 90 percent. *Id.* at 6750. *See also,* Docket No. R2005-1, USPS-T-14 at 39.

[7] Finally, the nearly-full quadratic model of the 2004 data attained the greatest percent of variables that were significantly different than zero (44 percent) as compared to the other models of the 2004 data. Although the multi-collinearity remained higher for the model of the 2004 data that selectively removed interaction terms[1] than the restricted model of the 2002 data, the nearly-full quadratic model's 44 percent was relatively close to the 53 percent achieved by the restricted quadratic model presented in Docket No. R2005-1. USPS-LR-L-180. *See also,* Docket No. R2005-1, USPS-T-14 at 37-38.

[8] *Commission analysis.* The Commission finds the addition of the carrier pickup variable a valuable addition to the data set, and finds the additional steps taken to assign complicated scans an improvement over the previous study. Furthermore, the Commission finds the distinction between motorized and non-motorized route types; the three bundle approach; the extent to which routes in a ZIP Code are business routes; and the selective elimination of interaction variables to be alternatives to the current model worthy of further examination and exploration. Finally, the 2004 CCSTS submission improvements appear unrelated to data collection. The Commission strongly encourages the Postal Service to improve the quality of any future data collection assCommission strongly encourages the Postal Service to improve the quality of any future data collection associated with CCSTS.

[1] Variance inflation factors, an indicator of the degree each explanatory variable is correlates with other explanatory variables, were generally higher for the 2004 CCSTS submission than the model proposed by the Postal Service in Docket No. R2005-1.

CHALLENGES IN APPLYING INSTRUMENTAL VARIABLES PROCEDURES TO ESTIMATE MAIL PROCESSING VARIABILITIES

Instrumental variable estimation procedures have significant promise to provide more credible volume variability estimates. However, these procedures must be properly applied to yield valid variability estimates because the values of parameter estimates and standard error estimates obtained depend crucially on the specific instrumental variables employed. Consequently, a wide range of estimates can be obtained for the same econometric model, depending on the instrumental variables used. This logic implies that the proper application of instrumental variables procedures requires a credible theory for the validity of the instruments employed in addition to a lack of empirical evidence against the testable statistical assumptions underlying the econometric model employed. This note describes a possible approach to formulating such an economic model and describes possible instrumental variables that could arise from this modeling effort. It also describes the necessary statistical tests needed to examine the maintained statistical assumptions underlying the instrumental variables procedure.

The usual rationale for employing instrumental variables techniques is that one of the regressors is correlated with the error in the linear equation to be estimated. The theoretical cause of this correlation provides the key to selecting the proper instrument for the variable that is correlated with the error term in the equation of interest. Consider the classic supply and demand example:

$$q_t = \beta_0 + \beta_1 p_t + \beta_2 w_t + \varepsilon_{1t} \qquad \text{(S)}$$

$$p_t = \alpha_0 + \alpha_1 q_t + \alpha_2 I_t + \varepsilon_{2t} \qquad \text{(D)}$$

where equation (S) is the supply function and equation (D) is the demand function, p is the market price, q is the market-clearing quantity, w is an input price index, and I is the aggregate income of consumers. Both w and I are assumed to be uncorrelated with $(\varepsilon_{1t}, \varepsilon_{2t})$. Because the observed price and quantity for observation $t, (p_t, q_t)$, are the result of the intersection of the supply and demand curves, this logic implies that both of these variables are linear functions of (w_t, I_t) and $(\varepsilon_{1t}, \varepsilon_{2t})$. Solving (S) and (D) for (p_t, q_t) in terms of the remaining variables yields,

$$q_t = \pi_{01} + \pi_{11} w_t + \pi_{21} I_t + \delta_{11}\varepsilon_{1t} + \delta_{21}\varepsilon_{2t} \qquad \text{(Q)}$$

$$p_t = \pi_{02} + \pi_{12} w_t + \pi_{21} I_t + \delta_{12}\varepsilon_{1t} + \delta_{22}\varepsilon_{2t} \qquad \text{(P)}$$

where the parameters of equations (Q) and (P) depend on the parameters of equations (S) and (D). If we assume that ε_{1t} and ε_{2t} are uncorrelated, equation (P) demonstrates that unless $\delta_{12} = 0$, p_t is correlated with ε_{1t} because p_t is a linear function of ε_{1t}. Equation (Q) demonstrates that unless $\delta_{21} = 0$, q_t is correlated with ε_{2t} because q_t is a linear function of ε_{2t}. If we assume that ε_{1t} and ε_{2t} are correlated, then even if these restrictions hold, there is correlation between p_t and ε_{1t} and q_t and ε_{2t} because of this contemporaneous correlation, even if $\delta_{12} = 0$ and $\delta_{21} = 0$.

Equations (Q) and (P) immediately suggest a valid instrument for p_t in the supply equation and for q_t in the demand equation. Recall that by assumption both w and I are uncorrelated with ε_1 and ε_2. Equation (Q) shows that q and I are correlated (q is a linear function of I), despite the fact that I does not enter equation (S). Equation (P) shows that p and w are correlated (p is a linear function of w), despite the fact that w does not enter equation D. Thus, the fact that each instrumental variable enters one equation of the supply and demand model and is excluded from the other equation of the supply and demand model makes it a valid instrument for the right-hand-side endogenous variable in the equation that it is excluded from. The need for the instrument to be excluded from the equation of interest is often stated as a necessary condition for the instrument to be valid, but the requirement that it also enter at least one of the other equations of the system of linear equations is not often discussed. However, as the solution of equations (S) and (D) demonstrates, the fact that a variable enters in one of the system of equations is precisely what is necessary to demonstrate that the instrument is correlated with right-hand-side endogenous variable.

This same logic should be followed to select instruments for the econometric model used to estimate mail processing variabilities. Let h denote the logarithm of hours devoted to a mail processing operation, v the logarithm of the measure of the volume of mail processed, and z is a vector of other observable variables that control for across-facility differences in hours not to due to changes in v. Suppose the mail processing equation takes the form

$$h_t = \beta_0 + \beta_1 v_t + \beta'_2 z_t + \varepsilon_t \qquad \text{(H)}$$

where ε_t is the random error term in the equation. If the analyst believes that v is correlated with ε, then she should follow the same procedure as the supply and demand model described above by specifying an equation for v that demonstrates the source of this correlation between v and ε. Specifically, the analyst is looking for variables that the Postal Service uses to determine the level of mail volume processed at that facility. Following the above logic, this means specifying an equation that describes the postal management's decision to process mail volume at this facility using this operation. Suppose postal management's behavior is described by the following equation:

$$v_t = \gamma_0 + \gamma'_1 m_t + \gamma'_2 z_t + \eta_t \qquad \text{(V)}$$

where m is the vector of variables the Postal Service used to determine how much mail to process at given facility after controlling for observable differences across facilities captured by the variable z. Following the same logic as that described above, the vector m can be shown to be a valid instrument for v as long as (ε_t, η_t) is uncorrelated with m and z. Equation (V) justifies the validity of the instruments, m. Equation (V) is based on Postal Service decision-making about when and where to process mail using this facility and operation. The variables in the vector m are those used by the Postal

Service to determine how much mail to process at that facility and in that operation. How much credibility the Postal Regulatory Commission (PRC) attaches to any instrumental variables estimator directly depends on how credible it views equation (V) as describing Postal Service decision-making about volume levels in that operation and at that facility.

Variables that could enter the vector m are those that impact the Postal Service's decision to process mail at this facility using this operation. Factors relating to the level of economic activity surrounding this mail processing facility are obvious candidates. One would expect that more local economic activity would increase the amount of mail processed at this facility. Local mail mix should also have an impact on both the amount mail processed at the facility and which operations are used. For example, a less homogeneous mail mix would imply more manual sorting for a given amount of volume. Another potential factor would be the number of bulk mailers located near the mail processing facilities.

Measurement error in a right-hand-side regressor also induces correlation between the error in a regression equation and the regressor. Suppose that $v_t^* = v_t + u_t$, where u_t is a sequence of independent identically distributed measurement errors, and that the analyst observes v_t^* instead of v_t. Using v_t^* in the linear equation yields

$$h_t = \beta_0 + \beta_1 v_t^* + \beta_2' z_t + \varepsilon_t^* \qquad \text{(H*)}$$

where $\varepsilon_t^* = \varepsilon_t - \beta_1 u_t$. Consequently, v_t^* and ε_t^* are negatively correlated. Finding the proper instrument for v_t^* still requires finding variables that determine the Postal Service's choice of v_t, but these variables must now fulfill the additional requirement that they are uncorrelated with both ε_t and u_t. Unless the researcher has a good idea of mechanism causing the measurement error in v_t, it is extremely difficult to find a credible instrument for v_t^*. The analyst therefore faces the double challenge of modeling the Postal Service's choice of v_t and arguing that the exogenous variables that determine this choice are also uncorrelated with the mechanism causing measurement error. In case of estimating mail processing volume variabilities, the econometric witnesses have presented very little evidence on what the sources of measurement error are in Total Piece Handlings. However, for First Handled Pieces, the major determinant of measurement error is the need to use weight conversion factors to measure total pieces. Unfortunately, many of the factors that determine the Postal Service's decision to process mail at a facility and operation are likely to be correlated with the extent of measurement error. For example, a more heterogeneous input mail quality should influence the extent of measurement error in the weight to volume conversion factors.

The potential joint determination of volume with hours by the Postal Service, combined with the potential for significant measurement error in volume that is likely to be correlated with the determinants of volume, creates an extremely challenging environment for recovering credible volume variability estimates, particularly given the instruments currently used by the Postal Service and other witnesses. If instruments that vary with both the location and specific mail processing operation can be found, it may be possible to compute more credible volume variabilities. A first step in finding these instruments would be if the Postal Service were to make the identity of the locations of its mail processing facilities in the data set available to researchers.

In general, it is impossible to test the statistical validity of an instrument. However, there are two sets of specification tests that can be performed to increase the analyst's confidence in the validity of a set of instruments. The first test asks whether the variables that are presumed to be instruments provide additional explanatory power in the first-stage regression of the right-hand-side endogenous variable. In terms of our volume variability model this would mean running the regression:

$$v_t^* = \gamma_0 + \gamma_1' m_t + \gamma_2' z_t + \eta_t ,$$

and performing the hypothesis test H: $\gamma_1 = 0$ versus K: $\gamma_1 \neq 0$. Rejection of the null hypothesis is often taken as evidence that the vector of instruments, m, provides additional explanatory power for the right-hand-side endogenous variable beyond that provided by the exogenous variables of the equation of interest. However, it is important to emphasize the general dictum that rejection of a null hypothesis does not imply the alternative is true. The second test examines the correlation between $(m_t'z_t')'$ and ε_t^*. Specifically, if there is more than one element of m (or more generally more elements of m than there are right-hand-side endogenous variables in the equation of interest), then it is possible to obtain a consistent estimate of ε_t^* and test the joint null hypothesis that $E[(m_t'\ z_t')'\varepsilon_t^*] = 0$, all of the exogenous variables are jointly uncorrelated with the error term in the equation of interest. This is the so-called J-test for over-identifying restrictions. Failure to reject this test is consistent with the hypothesis that the instruments are uncorrelated with the error term in the equation of interest. However, it is important to emphasize that the researcher can fail to reject this test, despite the fact that the instruments are invalid. Specifically, the instruments could be uncorrelated with the error in the equation of interest, but these instruments may not cause the right-hand-side endogenous variables.