

Analysis of Recall Effect on the Reporting of Expenditures For the Consumer Expenditure Interview Survey December 2006

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Key words: Recall, Means, Multiple Comparisons

I. Introduction

The Consumer Expenditure Survey is a nationwide household survey conducted by the United States Bureau of Labor Statistics to find out how Americans spend their money. One of the primary uses of the data is to provide expenditure weights for the Consumer Price Index.

The Consumer Expenditure Survey consists of two separate surveys, the Diary (CED) and Quarterly Interview (CEQ) surveys. The purpose of the CED is to obtain detailed expenditure data on small, frequently purchased items such as food and apparel. The purpose of the CEQ is to obtain detailed expenditure data on large items such as property, automobiles, and major appliances; and on expenses that occur on a regular basis such as rent, utility bills, and insurance premiums. Approximately 3,500 households are visited each quarter of the year in the CED, and 15,000 households in the CEQ. This paper will focus on the CEQ.

The CEQ has a 3-month recall period in which survey respondents are asked to report their expenditures from the previous three months. Over the years researchers have noticed that the level of reported expenditures tends to decrease across recall months, with the highest expenditure reported for the most recent recall month (*recall month 1*), lower expenditures reported for the middle month (*recall month 2*), and the lowest expenditure reported for the most distant month (*recall month 3*). This pattern is generally believed to be caused by respondents gradually forgetting about their expenditures over

time, although other theories have been put forth as well.

In this paper, we will show that certain expenditure categories have a greater memory recall problem than others.

II. Past Research

Silberstein (1989) examined recall effects for two item categories (apparel and services, and house furnishings), using data from the 1984 CEQ survey. Relationships of recall effects to demographic characteristics of the respondent were examined. Significant effects were identified for several demographic characteristics, including age, education, and household size. The study concluded that recall effects are not solely a function of recentness of the purchase, but that respondent characteristics also play a role.

Silberstein and Jacobs (1989) examined recall effects for several item categories, including house furnishings, apparel and services, and others. Significant recall effects were found for most categories studied. One part of the analysis involved comparing means of expenditures for the most recent recall month to the most distant. The authors found that mean expenditures “were between 15% and 40% lower” for the most distant recall month compared to the most recent.

Cho et al. (2004) examined the association between interview characteristics (such as interviewer workload and interview number) and the overall reporting rate in the Interview survey. Reporting rate was defined as “the proportion of CE questionnaire items that receive a nonzero expenditure report from

that household.” The authors found that reporting rates exhibit a statistically significant decline from first to second month, and are about the same for second and third month.

III. Methodology

Recall effect for this study was examined at the UCC (Universal Classification Code) level. A UCC is a 6-digit member of a coding scheme used by the Consumer Expenditure (CE) survey to classify expenditures. It is the lowest level at which CE expenditures are tabulated. Examples of UCCs include Food on Out of Town Trips, Fuel Oil, and Lawn and Garden Equipment. Our goal was to identify items for which expenditures in recall month 1 were significantly higher than those in the other recall months.

The mean expenditure per UCC for recall month 1, recall month 2, and recall month 3 were calculated for expenditure years 2000, 2001, and 2002. Pooled variances were calculated for each UCC using the Balance Repeated Replication method in order to perform the Multiple Comparison Test.

Multiple comparison tests of the recall month means for each year were implemented using the Least Significant Difference (LSD) test and Tukey's testsee (Ott 1992).

The LSD test identifies the minimum difference between two sample means necessary to declare the corresponding population means different. All three pairs of sample means for each UCC are compared. If the absolute value of the difference in sample means is greater than the LSD statistic, the population means are declared to be different. For each pairwise comparison of means, the probability of a Type I error is fixed at a specified value of alpha. The major drawback of this test is that unless the chosen alpha is small, the probability of falsely declaring at least one pair of means to be different is quite large.

The Tukey test also compares the difference between two means, but unlike the LSD test, it uses a multiple comparison utilizing a controlled experimentwise error rate. Thus, the probability of observing an experiment with one or more pairwise comparisons falsely declared significant is specified at alpha. The choice of which test to use was not a major issue since the tests gave similar results.

For this study the level of significance was set at 5%.

IV. Data

Similar data inputs were used to identify UCCs for which recall month 1 is significantly higher than the other recall months. The periods of analyses are for expenditure years 2000, 2001, and 2002. The data show expenditure ratios (recall month 1 vs. 2 and recall month 2 vs. 3) were very consistent across the years showing slight inflation throughout the period.

A. Criteria for determining relevant UCCs for this study

1. Type of expenditure question

Expenditure questions in the CEQ fall into four general classes which can be found in Appendix I:

1. month of expenditure
2. bills recorded by month they were received,
3. 'usual' monthly expenditures, and
4. current month.

Only questions that specifically ask for "month of expenditure" or "when did you purchase it?" are relevant for recall effect analysis. Sections that ask for "usual monthly expenditures" were excluded.

2. To isolate recall effects, only those parts of a UCC that are relevant to the month of expenditure question and unadjusted reporting month were included in this study. The criteria of relevant expenditure question and time adjustment method (when an expenditure is assigned to a particular month when it is not recorded) were applied to determine whether to include or exclude a UCC.

3. For each UCC, a reporting rate was calculated as the percentage of households that reported at least one expenditure in the UCC. Reporting rates were calculated for each UCC, by recall month for each expenditure year. Zeroes are used in the calculation of the means and variances of the expenditures. This study used only UCCs with reporting rates greater than 1% in order to give the analyzed UCCs some credibility.

4. Adjusted expenditure records excluded

The next step in deriving the appropriate data for this study involved removing expenditures that had been imputed. In addition to these modifications, in order to create Expenditure Year estimates from collected year data, additional adjustments had to be made. For example, data collected in February 2003 referencing November 2002 or December 2002 had to be included in Expenditure 2002 data.

V. Findings

There were approximately 400 UCCs in-scope for this study and 134 of them had a reporting rate of 1.00% or higher.

Of these 134 UCCs:

1. 53 UCCs showed significantly higher recall month 1 estimates than month 2 and month 3 **for all 3 years, 2000, 2001, and 2002**. This tended to be irregular purchases or at least non-monthly purchases such as clothing, vehicle services, and out-of-town trips. See Table 1 which shows the results for Expenditure Year 2002.
2. 57 UCCs showed significantly higher recall month 1 estimates than recall month 2 **for all 3 years**. This contains four additional UCCs that were not captured in the 53 above { 1) Amount borrowed excluding interest on vehicles, 2) Lamps and lighting fixtures, 3) Women's active sportswear, 4) Auto parts, equipment, and accessories }.
3. 83 UCCs showed significantly higher recall month 1 estimates than recall month 3 **for all 3 years**. This shows that about 60% (83/134) of the UCCs are have statistical significance between recall month 1 and recall month 3
4. 13 UCCs show recall month 1 vs. recall month 2 and recall month 1 vs. recall month 3 are statistically significant but not recall month 2 vs. recall month 3 **for all 3 years**
5. 15 UCCs show all three possible comparisons are significant. This implies that there is a recall effect for all comparisons as you work backwards through the 3 month interview period.

6. 18 UCCs showed no significant recall month 1 effect for any comparison of means. Specifically, these were UCCs for utilities, and monthly principal and interest. These items are consistent and relatively easy to remember from month to month.

The presence of a recall effect is shown most vividly by result number 3 in which Month 1 is significantly greater than Month 3 for more than 60% (83/134) of the UCC's. That is substantial, especially since we are using the more conservative Tukey test. In addition, as shown by result number 2, over 40 % (57/134) of the UCCs show Month 1 is significantly greater than Month 2. Result number 1 shows nearly 40% (53/134) of the expenditures have a one-month recall effect compared to months 2 and 3. Table 1 shows this more in detail.

VI. Summary

Previous work in the 1980's by Silberstein examined a small number of selected item categories. She convincingly established that a recall effect existed for the particular item categories she studied. The research we performed updated her results using more current data. Our research was also a more systematic investigation into the issue by examining every relevant UCC instead of just the small number of selected items previously used.

We confirmed her findings that a recall effect really exists and we determined which types of items are affected most by it. Not surprisingly, it is irregularly purchased items such as clothing that show the effect most. Expenditures made on a regular basis such as utilities are not as susceptible to the recall problem.

VII. References

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APPENDIX 1

The following shows the question wording in the CEQ, relevant to the recall analyses for this study, by section:-

Section 1 – GENERAL SURVEY INFORMATION

Section 2 – RENTED LIVING QUARTERS

Section 3 – OWNED LIVING QUARTERS AND OTHER OWNED REAL ESTATE

In what month did you close on this property? How much were the closing costs? **OPB**

In what month did you sell this property? What was the selling price **OPD**

Section 4 – UTILITIES AND FUELS FOR OWNED AND RENTED PROPERTIES (UTA/P/B/C)

What was the total amount of bill

In what month was the bill received?

Section 5 – CONSTRUCTION, REPAIRS, ALTERATIONS, AND MAINTENANCE OF PROPERTY (CRB)

What was the total cost for all items purchased for this job in

(month, 3 months ago)?

(month, 2 months ago)?

(last month)?

(the current month)?

Section 6 – APPLIANCES, HOUSEHOLD EQUIPMENT, AND OTHER SELECTED ITEMS

When did you purchase it? **(APA/B)**

Section 7 – HOUSEHOLD EQUIPMENT REPAIRS, SERVICE CONTRACTS, AND FURNITURE REPAIR AND REUPHOLSTERING (EQB)

In what month was (repair done/service contract purchased)?

Section 8 – HOME FURNISHINGS AND RELATED HOUSEHOLD ITEMS

In what month did you purchase it? **(FRA/B)**

Section 9 – CLOTHING AND SEWING MATERIALS (CLA/BC/D)

In what month did you purchase it?

Section 10 – RENTED AND LEASED VEHICLES

Since the 1st of *(month, 3 months ago)*, excluding *(the current month)* what has been your expense for renting this vehicle?

Section 11 – OWNED VEHICLES (OV/B/C)

In what month did you have this expense?

Section 12 – VEHICLE OPERATING EXPENSES (VEQ VLR)

In what month did you have this expense?

Section 13 – INSURANCE OTHER THAN HEALTH

How much was paid this month?

Section 14 – HOSPITALIZATION AND HEALTH INSURANCE

Since the 1st of *(month, 3 months ago)*, were any payments made on this policy by any member of your CU? (Include those made by payroll deductions.)

Section 15 – MEDICAL AND HEALTH EXPENDITURES (MDB/C)

In what month was (were) the payment(s) made?

Section 16 – EDUCATIONAL EXPENSES (EDA)

In what month was the payment made?

Section 17 – SUBSCRIPTIONS, MEMBERSHIPS, BOOKS, AND ENTERTAINMENT EXPENSES

How much of this amount was paid this month?

Section 18 – TRIPS AND VACATIONS (TRB)

In what month did this trip end?

Section 19 – MISCELLANEOUS EXPENSES (MIS CNT)

In what month did you have this expense?

TABLE 1

The following 3 page table shows the results for Expenditure Year 2002. Columns 1 and 2 show the UCC number and description, columns 3 – 5 show the Mean expenditures by Recall Month and Columns 5 – 7 show the Tukey test results for the comparison by recall month. The Y/N indicator show whether there is statistical significance (Yes) or (No).

UCC	UCC TITLE	Mean 1	Mean 2	Mean 3	1 vs. 2	1 vs. 3	2 vs. 3
260112	Electricity (owned home)	\$198.84	\$199.08	\$199.74	N	N	N
270310	Cable, satellite, community antenna service	\$125.90	\$125.35	\$125.64	N	N	N
560210	Dental services	\$81.67	\$79.77	\$60.80	N	Y	Y
210210	Lodging on out-of-town trips	\$76.97	\$66.59	\$50.45	Y	Y	Y
230151	Other repair and maintenance services	\$73.15	\$49.51	\$57.39	Y	Y	N
260212	Utility--natural gas (owned home)	\$69.27	\$68.83	\$70.86	N	N	N
190903	FOOD OUT OF TOWN TRIPS	\$68.04	\$55.75	\$44.67	Y	Y	Y
260111	Electricity (renter)	\$60.76	\$58.60	\$58.92	N	N	N
510110	Automobile finance charges	\$57.01	\$57.52	\$57.67	N	N	N
510901	Truck finance charges	\$54.62	\$54.67	\$54.71	N	N	N
530110	Airline fares	\$54.22	\$49.70	\$41.13	N	Y	Y
560110	Physician's services	\$53.28	\$46.89	\$42.67	Y	Y	N
690111	Computers and computer hardware nonbusiness use	\$50.87	\$46.28	\$39.99	N	Y	N
220512	CAPITAL IMPROVE MATERIALS OWND	\$42.71	\$53.86	\$34.39	N	N	N
480110	Tires - purchased, replaced, installed	\$35.17	\$24.15	\$20.80	Y	Y	Y
430120	Jewelry	\$34.30	\$28.58	\$24.58	N	Y	N
470113	Gasoline on out-of-town trips	\$33.30	\$26.67	\$22.86	Y	Y	Y
690114	Computer information services	\$32.76	\$32.16	\$33.36	N	N	N
490413	Motor repair, replacement	\$29.14	\$20.30	\$15.70	Y	Y	N
270212	Water/sewer maint. (owned home)	\$28.94	\$24.31	\$23.39	N	Y	N
490312	Lube, oil change, and oil filters	\$27.47	\$19.15	\$15.16	Y	Y	Y
230114	Heat, a/c, electrical work	\$27.40	\$24.91	\$21.50	N	N	N
520111	Vehicle registration state (as of Q20012)	\$26.98	\$23.11	\$19.93	Y	Y	Y
400310	Women's footwear	\$24.22	\$15.94	\$14.26	Y	Y	N
380331	Women's pants	\$23.79	\$17.06	\$13.43	Y	Y	Y
320410	Lawn and garden equipment	\$23.05	\$14.36	\$10.27	Y	Y	N
380313	Women's shirts, tops, blouses	\$22.33	\$15.60	\$11.98	Y	Y	Y
360511	Men's pants	\$22.05	\$17.15	\$11.04	Y	Y	Y
320231	Other household decorative items	\$21.29	\$15.36	\$16.49	Y	Y	N
490221	Brake work (New UCC in Q961)	\$19.73	\$16.36	\$12.82	Y	Y	Y
400110	Men's footwear	\$18.18	\$12.94	\$10.52	Y	Y	Y
550110	Eyeglasses and contact lenses	\$17.92	\$12.44	\$11.75	Y	Y	N
360410	Men's shirts	\$17.77	\$12.70	\$9.87	Y	Y	Y
600210	Athletic gear, game tables, and exercise equipment	\$17.65	\$14.22	\$13.49	Y	Y	N
490311	Motor tune-up	\$16.63	\$13.29	\$9.89	Y	Y	Y
480213	Parts, equipment, and accessories	\$16.34	\$11.03	\$10.29	Y	Y	N
260211	Utility--natural gas (renter)	\$16.31	\$15.42	\$16.03	N	N	N
490318	Repair tires and other repair work	\$15.94	\$8.46	\$8.87	Y	Y	N
560400	Service by professionals other than physician	\$15.80	\$12.73	\$12.88	N	N	N
310130	Color tv - portable, table model	\$15.76	\$12.10	\$10.03	Y	Y	Y
270412	Trash/garb. coll. (owned home)	\$15.04	\$11.89	\$11.80	Y	Y	N
190904	FOOD PREPARED BY CU ON TRIPS	\$14.82	\$12.80	\$10.05	N	Y	Y

380210	Women's dresses	\$14.50	\$11.33	\$7.88	Y	Y	Y
280120	Bedroom linens	\$14.50	\$10.43	\$8.76	Y	Y	Y
810400	GIFT OF TRIP EXPENSES	\$13.35	\$16.80	\$10.58	N	N	Y
290440	Wall units, cabinets and other occasional furniture	\$13.19	\$11.04	\$9.50	N	N	N
570210	Hospital service other than room	\$13.14	\$9.32	\$13.31	N	N	N
620212	Movie, other admissions, out-of-town trips	\$12.94	\$12.31	\$8.60	N	Y	Y
230113	Plumbing and water heating	\$12.63	\$13.94	\$12.97	N	N	N
250112	Fuel oil (owned home)	\$12.28	\$12.44	\$13.05	N	N	N
560310	Eyecare services	\$11.35	\$8.58	\$7.83	N	Y	N
520512	Auto rental, out-of-town trips	\$10.62	\$8.75	\$6.72	Y	Y	Y
410130	Infant undergarments	\$10.43	\$9.75	\$9.75	N	N	N
310210	VCR's and video disc players	\$9.78	\$6.56	\$6.30	Y	Y	N
610230	Photographic equipment	\$9.65	\$6.44	\$6.96	Y	Y	N
490412	Electrical system repair	\$9.62	\$7.85	\$5.41	Y	Y	Y
380312	Women's vests and sweaters	\$9.35	\$7.61	\$5.69	Y	Y	Y
560330	Lab tests, x-rays	\$9.33	\$7.66	\$8.10	N	N	N
380110	Women's coats and jackets	\$9.29	\$6.27	\$6.53	Y	Y	N
410120	Infant dresses, outerwear	\$8.61	\$6.73	\$5.06	Y	Y	Y
250212	Gas, btld/tank (owned home)	\$8.53	\$8.66	\$8.98	N	N	N
390221	Girls' skirts and pants	\$8.11	\$5.54	\$3.92	Y	Y	Y
600420	Hunting and fishing equipment	\$7.96	\$4.59	\$4.57	Y	Y	N
200900	Alcoholic beverages purchased on trips	\$7.88	\$6.28	\$5.58	Y	Y	N
390210	Girls' shirts, blouses, sweaters	\$7.79	\$5.39	\$4.10	Y	Y	Y
380420	Women's undergarments	\$7.64	\$5.27	\$4.69	Y	Y	N
370312	Boys' pants	\$7.43	\$5.62	\$3.49	Y	Y	Y
320521	Small electric kitchen appliances	\$7.27	\$5.06	\$4.68	Y	Y	N
380510	Women's suits	\$7.22	\$6.76	\$4.30	N	Y	Y
320111	Floor coverings, nonpermanent	\$7.12	\$6.32	\$4.72	N	Y	N
280210	Curtains and draperies	\$6.89	\$5.46	\$3.83	N	Y	N
690112	Computer software and accessories for	\$6.83	\$5.53	\$4.94	N	Y	N
610900	Recreation expenses, out-of-town trips	\$6.70	\$5.75	\$4.40	Y	Y	Y
620903	Other entertainment services, out-of-town trips	\$6.70	\$5.75	\$4.40	Y	Y	Y
320420	Power tools	\$6.53	\$4.80	\$4.57	Y	Y	N
400210	Boys' footwear	\$6.36	\$3.90	\$3.59	Y	Y	N
430110	Watches	\$6.19	\$4.12	\$3.26	Y	Y	N
400220	Girls' footwear	\$6.05	\$3.82	\$3.12	Y	Y	Y
360210	Men's coats and jackets	\$5.76	\$5.38	\$4.48	N	Y	Y
620122	Participant sports, out-of-town trips	\$5.57	\$4.78	\$3.08	N	Y	Y
370130	Boys' shirts	\$5.51	\$3.58	\$2.44	Y	Y	Y
850300	Other vehicle finance charges	\$5.36	\$5.37	\$5.26	N	N	N
320232	Telephones and accessories	\$5.18	\$4.04	\$3.79	Y	Y	N
320220	Lamps and lighting fixtures	\$4.87	\$3.60	\$2.99	Y	Y	N
380332	Women's shorts, shorts sets	\$4.87	\$2.79	\$2.27	Y	Y	N
240112	Paints, wallpaper and supplies	\$4.84	\$4.09	\$2.27	Y	Y	Y
380320	Women's skirts	\$4.69	\$2.78	\$2.60	Y	Y	N
320370	Nonelectric cookware	\$4.59	\$3.12	\$2.25	Y	Y	N
280230	Sewing materials for slipcovers, curtains,	\$4.45	\$3.90	\$2.39	N	Y	Y
380901	Women's accessories	\$4.32	\$3.21	\$2.16	Y	Y	Y
620222	Admission to sports events, out-of-town trips	\$4.31	\$4.10	\$2.87	N	Y	Y
340620	Appliance repair, including service center	\$4.22	\$2.61	\$3.42	Y	Y	Y

280110	Bathroom linens	\$4.06	\$3.55	\$2.70	Y	Y	Y
340914	Service for termite/pest control	\$4.03	\$4.32	\$4.40	N	N	N
360340	Men"s sweaters and vests	\$4.01	\$3.10	\$2.55	Y	Y	N
320902	Hand tools	\$3.75	\$2.28	\$1.82	Y	Y	N
270211	Water/sewer maint. (renter)	\$3.74	\$3.15	\$3.19	N	N	N
520410	Vehicle inspection	\$3.74	\$2.83	\$2.21	Y	Y	Y
320320	China and other dinnerware	\$3.47	\$2.92	\$2.30	N	Y	N
380430	Women"s hosiery	\$3.39	\$2.45	\$1.97	Y	Y	Y
390222	Girls" shorts, shorts sets	\$3.19	\$1.39	\$1.33	Y	Y	N
360512	Men"s shorts, shorts sets	\$3.15	\$2.23	\$1.51	Y	Y	Y
380410	Women"s sleepwear	\$3.01	\$2.42	\$2.03	Y	Y	N
390120	Girls" dresses, suits	\$2.95	\$1.68	\$1.69	Y	Y	N
360311	Men"s underwear	\$2.92	\$1.96	\$1.29	Y	Y	Y
370313	Boys" shorts, shorts sets	\$2.87	\$1.61	\$1.17	Y	Y	Y
380340	Women"s active sportswear	\$2.66	\$2.10	\$2.22	Y	N	N
440130	Alteration, repair and tailoring of apparel	\$2.44	\$1.71	\$1.65	Y	Y	N
520310	Drivers" license	\$2.28	\$1.76	\$1.80	Y	Y	N
410901	Infant accessories	\$2.20	\$1.37	\$1.33	Y	Y	N
360330	Men"s accessories	\$2.18	\$1.57	\$1.32	Y	Y	N
390310	Girls" underwear and sleepwear	\$2.17	\$1.51	\$1.21	Y	Y	Y
440150	Watch and jewelry repair	\$2.11	\$1.57	\$1.80	N	N	N
470211	Motor oil	\$2.01	\$1.32	\$1.00	Y	Y	Y
260113	Electricity (owned vacation)	\$2.00	\$1.64	\$1.64	N	N	N
640420	Electric personal care appliances	\$1.98	\$1.55	\$1.31	Y	Y	N
520532	Parking fees, out-of-town trips	\$1.84	\$1.54	\$1.42	Y	Y	N
360312	Men"s hosiery	\$1.70	\$1.13	\$0.83	Y	Y	Y
320340	Glassware	\$1.57	\$1.05	\$1.15	Y	Y	N
270411	Trash/garb. coll. (renter)	\$1.47	\$1.28	\$1.23	N	N	N
520542	Tolls on out-of-town trips	\$1.40	\$1.05	\$0.97	Y	Y	N
370211	Boys" underwear	\$1.23	\$0.80	\$0.63	Y	Y	N
390321	Girls" hosiery	\$0.80	\$0.40	\$0.30	Y	Y	N
370213	Boys" hosiery	\$0.75	\$0.38	\$0.28	Y	Y	N
240122	Tools and equipment for painting and	\$0.52	\$0.44	\$0.24	Y	Y	Y
420120	Sewing patterns and notions	\$0.52	\$0.60	\$0.40	N	N	N
470212	Motor oil on out-of-town trips	\$0.34	\$0.27	\$0.23	Y	Y	Y