

The Consumer Expenditure Survey in Comparison: Focus on Personal Consumption Expenditures

by

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I. Introduction

Historically, Consumer Expenditure Survey (CE) data have been compared with corresponding expenditure data and estimates from other sources to evaluate the soundness of the CE estimates at any point in time and the consistency of the estimates over time. The primary role of post-survey evaluation, including data comparisons, is to assess the cumulative effects of non-sampling errors on the quality of the data obtained from the CE, and to help in developing methodological studies to improve data quality.¹ Since the start of the ongoing CE in 1980, such comparisons have been a regular part of the CE program. Gieseman (1987), the first within the BLS to conduct this work, stated the aim of these comparisons: “What was expected from these comparisons was a sense of degree and direction of possible survey errors, rather than an exact measure of bias, because the specific estimates from other sources are not necessarily the ‘true’ values” (p. 9).

Comparisons have been conducted using data from several data sources. These comparative measures are published biennially with the CE data² and are available in other formats as well, including the *Monthly Labor Review*.³ When comparing CE data with data from these other sources it is important to remember that the CE and these sources construct their series for different purposes, and use different definitions and estimation procedures. As a result it is difficult to reconcile these before comparisons are conducted. However, attempts are made to reconcile these differences as much as possible before making the comparisons.

The primary source of independent data for comparison over time has been the Personal Consumption Expenditures (PCE) of the National Income and Products Accounts; these data are the focus of this study. The CE has a primary interest in the PCE as comparisons are produced in biennial publications, the PCE is used for source selection (either the Interview or the Diary) for integrated data, and the PCE is used to assess the quality of the CE data in general.

¹ Early work includes the use of a Diary supplement administered to respondents and interviewers to measure attitudes and behaviors associated with keeping the Diary, and the use of different formats for the Diary instrument. More recent work includes the testing of Computer Assisted Personal Interviewing (CAPI) for the collection of Interview data. This study is complete and a CAPI instrument will be used to collect data beginning April 1, 2003.

² For recent published comparisons, see Bureau of Labor Statistics, 1995, 1997b, 1999, 2001a. Source data to which the CE have been compared include, for example, the National Health Expenditures from the Health Care Financing Administration, expenditures from the Residential Energy Consumption Survey and Residential Transportation Energy Consumption Survey from the Department of Energy, *Progressive Grocer* and *Supermarket Business* food expenditures, and Personal Consumption Expenditures (PCE) of the National Income and Product Accounts from the Bureau of Economic Analysis. Periodic comparisons have also been conducted. For example, health insurance expenditures from the CE were compared to those from the Medical Expenditure Panel Survey supplied by Health Care Quality and Research, U.S. Department of Health and Human Services. (A description of the primary data sources are presented in Appendix A.)

³ See Gieseman (1987) for comparisons for 1980 through 1984 of Interview data to the PCE for select goods and services, and Diary food expenditures from *Supermarket Business* and *Progressive Grocer*. See Branch (1987) for a comparison of CE and HCFA medical care expenditure data for 1980 to 1984. Branch (1994) provides comparisons of CE expenditures to those of the PCE, Residential Energy Consumption Survey and the American Housing Survey using integrated Diary and Interview data (the earlier studies had relied on the Diary or Interview separately for comparison). See Garner and Passero (2001) for a comparison of private health insurance expenditures from CE and MEPS for 1996.

The PCE, as other sources of data, including the CE, has strengths and weaknesses. The strength of the PCE is that estimates of aggregate expenditures for an extensive list of commodities are available. However, no source is without error. As the CE expenditures are subject to errors inherent to household surveys, the PCE data are subject to their own measurement errors and to judgment errors in the estimation and allocation of sales to the personal sector and other sectors of the accounts. For non-benchmark years, the PCE also reflects many of the same measurement errors as other surveys, in that the monthly Retail Trade Survey has been identified as the single most important source of data for the PCE (Wilcox 1992). Triplett (1997) stated that the reporting biases and non-sampling errors in surveys, such as the Retail Trade Survey, “are probably not documented as thoroughly as have been those of the CE” (p. 16). Errors imbedded in the CE and PCE are not quantified easily. Each year, PCE aggregate expenditure estimates are subject to revision which results in substantial differences in expenditure estimates over time. This alone supports the proposition that there is no “true” value for consumer expenditure estimates

Recent work by a team of researchers within the BLS⁴ suggests that earlier comparison methods need to be reevaluated. The purpose of this study is to provide a quantitative comparison of the CE and PCE, and to quality why differences exist between the two. Significant detail is provided, particularly for one group of commodities, apparel. Some of the research is summarized in the main text with the details relegated to appendices.⁵

II. Outline and Summary of Findings

In the next section of the paper, highlights from previous research in which the CE and PCE have been compared are presented. These are followed by a description of CE and PCE methods including purposes, populations covered, definitions of expenditures, and data collection for the CE and source data for the PCE. Next the current comparison methodology developed and used by the CE, based on type of expenditure (e.g., food, housing, transportation), is presented along with ratios of CE to PCE aggregate expenditures from 1992 through 2000. The year 1992 was selected as the starting year as this is the last year for which the team had access to PCE benchmark estimates at the time of this writing. These results reveal that for all but rented dwellings and vehicle purchases, CE expenditure aggregates are lower than those of the PCE, and that the ratios for other expenditure types have been decreasing over time.

To evaluate the CE and PCE for the purposes of this study, a different aggregate scheme was followed than what has been used in the past, one based on allocating detailed CE data (based on UCCs) to PCE categories by major type of product (i.e., durables, non-durables, services). This classification was applied since CE data are being used to study consumption growth. For consumption comparisons, researchers focus mostly on non-durables and/or services (e.g., Fernandez-Villaverde and Krueger, 2002, use CE data; Parker and Julliard, 2003, used per capita PCE nondurable expenditures) as no adjustment to the data are needed. Estimates from the

⁴ In April 2000 a team of researchers in the Divisions of Price and Index Number Research, and Consumer Expenditure Surveys was convened to compare CE to other data sources, the primary source being the PCE. The first team report provides a description of the team charter, plans for data comparison, and results from comparing CE and PCE footwear aggregate expenditures (see Passero et al. 2001).

⁵ Interim findings were presented at the NBER Conference on Research in Income and Wealth “Consumer Expenditure Survey Research summer workshop (2002).

flow of services from durables would be necessary for a full consumption measure. (See Slesnick, 1992 and 1998, for studies in which such adjustments are made to PCE and CE expenditures to make the data from the two sources more comparable in an effort to estimate consumption.)

Based on comparison of comparable items in the CE and PCE, CE aggregate expenditures are 89 percent of PCE aggregate expenditures in 1992. However, by the years 1997 and 2000, the ratio of CE to PCE aggregates of comparables falls to 80 percent. When all items are used for the comparison, CE aggregate expenditures are 66 percent of PCE in 1992. This ratio using all items falls two percentage points by 1997 and four more by the year 2000. The CE to PCE ratios would be expected to be higher, however, if aggregates were adjusted for population differences, for example the ratio of comparables are estimated to be approximately 91 percent for 1992.⁶ Other differences in the CE and PCE were identified for which no adjustments could be made. For example, since the CE data are collected and coded by types of expenditure rather than by major type of product, it was not always possible to allocate items to a major product type.

An exhaustive analysis of CE and PCE estimates of apparel in 1992, the last benchmark year available at the time of the study, are presented next. This analysis reveals that CE apparel estimates are approximately two-thirds the magnitude of PCE estimates. An evaluation of the quality of the estimates focuses on three elements: measures of statistical reliability, expert judgment, and differences in definition of component categories. Standard errors are computed and confidence intervals are constructed for the CE estimates; such measures cannot be calculated for the PCE estimates, but a subjective quality indicator is available from BEA for components of the estimate. The effect of expert judgment applied by economists and statisticians at BLS and BEA to adjust for inconsistencies, misreporting, and other problems with source data is identified and estimated. Differences in the content of component categories of apparel are also identified, though their effect could not always be estimated. Taking these elements into account does not have a major impact in reconciling the difference between the CE and PCE apparel estimates. It is posited that proxy response in the CE might be a significant factor in accounting for the difference and research by the CE in this area might be fruitful.

In the final section of the paper, questions are raised regarding how important comparisons such as between the CE and PCE are and what would need to be done to reach greater comparability. Of primary concern is whether a product by type classification scheme, as used in the PCE, is preferred for the CE over the type by expenditure classification currently used by the CE and CPI. Such a scheme would have major implications for data collection and processing as now CE data cannot fully be allocated into durable, non-durable, and services categories. Another question is how to obtain quantitative information concerning the quality of PCE data and the impact of interpolation, imputation, and expert judgment. How does the PCE determine the share of certain expenditures for household, rather than business or government use? For example, are the PCE aggregates too high for home computers? How does the PCE determine what percentage of home computer purchases are for business versus personal

⁶ At the NBER (2002) workshop on Consumer Expenditure Surveys, Garner reported that to adjust PCE estimates so that they refer to the same population as the CE (i.e., non-institutional, not living on a military base, not living overseas), the PCE aggregates would need to be multiplied by 0.979004346 for 1992.

household use? Would it be desirable and feasible for CE estimates to be augmented with data from other sources? Is the PCE the best source or are others better, for example, scanner data? What is the quality of the alternative sources?

III. Previous Research on Comparing CE and PCE

Comparisons of CE and PCE data have also been conducted by researchers outside the BLS.⁷ Some of the research from the last 10 years has focused on the CE as a source of data along with the PCE to assess economic growth in personal consumption and related issues^{8,9} (e.g., Slesnick 1992, 1998; Triplett 1997). The most recent has focused on the CE and its role in the production of the CPI¹⁰ (e.g., Fixler and Jaditz 2002¹¹; Johnson and Greenlees 2003; Lebow and Rudd 2003; National Research Council 2002).

Slesnick (1992) used CE data from 1960/61, 1972, 1973, 1980, 1981, and 1984-89 and compared consumption expenditures to PCE estimates. After making adjustments for differences in definition,¹² Slesnick concluded that approximately one-half of the difference between aggregate expenditures reported in the CE and PCE could be accounted for through definitional differences. He went on to note that the sources of the remaining differences “is a mystery that can only be resolved by future investigation” (p. 594). Slesnick listed several reasons why the differences might still remain, some due to household survey reporting and others due to PCE estimation procedures, the same conclusion of Gieseman (1987). Regarding the magnitude of the adjustments made to the PCE during revisions, Slesnick states that, “The magnitude of these adjustments suggest caution is in order before one assigns full blame for the differences in the estimated levels of aggregate expenditure to underreporting in the CEX surveys” (p. 594).

The General Accounting Office (GAO 1996) reported that BEA had conducted a comparison of the differences in CE and PCE consumer expenditures for 1992. BEA concluded that more than half of the difference in the aggregate expenditures from the two was traceable to coverage and definitional differences, with the remainder due to statistical differences.¹³

⁷One of the earlier references is Houthakker and Taylor (1970) in which 1960/61 CE data were compared to PCE aggregate expenditures (cited in Slesnick 1992).

⁸Bosworth, Burtless, and Sabelhaus (1991) examined CE and PCE data with regard to the decline in savings.

⁹Comparisons of household expenditure and national accounts personal consumption expenditure data from developing countries are also being conducted, with results similar to those reported for the U.S. For example, Ravallion (2001) compares levels and economic growth rates from the personal consumption expenditure data with household consumption and income surveys in developing countries to determine how closely the two sources of data on aggregate welfare agree. He reports that the recent data from India indicates that about 60 percent of private consumption, based on national accounts data, is from household surveys. Ravallion notes that the ratio of household expenditures to national accounts personal consumption expenditures has been declining over time.

¹⁰Triplett 1997 also examined the relationship between the PCE deflator and the CPI.

¹¹Fixler and Jaditz (2002) treated “overlap in category definition across indexes” (p. 3) for the CPI weights based on the CE with the PCE as differences in weights rather than deal with the fact that the underlying operational concepts differ. For example, for physician services, the CPI focuses on out of pocket expenditures of households while the PCE in addition includes third party payers (private and public).

¹²Slesnick (1992) refers to this exercise as a “crude attempt at reconciling the two series” (p. 593).

¹³The reference in the GAO report is: “Reconciliation of PCE and Consumer Expenditure Survey Estimates of Consumer Spending,” Preliminary Draft, Bureau of Economic Analysis, September 7, 1994. A copy of the Draft could not be supplied to the current authors at the time of this writing.

One of the differences in estimates is due to the inclusion, in the PCE and not CE, of expenditures by non-profits serving households¹⁴. Slesnick (1998) pointed out the importance of removing from PCE expenditures those for non-profit institutions serving households when comparing the data to the CE. The commodity classifications most affected are medical care, personal business, recreation, private education and research, and religious and welfare activities. He reported that by 1993, these represented about 10.6 percent of PCE, 18.6 percent of total services, and 12.1 percent of non-durables and services (p. 54). Mead (2002), in a study to separate nonprofits from households in the PCE, reported even more categories of expenditures are affected.¹⁵ The magnitude of separating the PCE into nonprofits and households has not been determined by the BEA as yet. However, he did report that about 65 percent of nonprofit institution consumption expenditures are for medical care and about 25 percent for religious and welfare activities.

Also focusing on measuring consumption over time, Triplett (1997) examined CE data as a way to evaluate PCE expenditures. Unlike Slesnick, Triplett did not use the micro-level CE data, but published selected aggregates presented in Branch (1994). In discussing strengths and weaknesses of the CE and PCE, Triplett states that the PCE I-O format is better for higher levels of aggregation rather than for lower ones: “The finer the level of detail, the more likely that the long chain of computation necessary to reach the PCE’s indirect estimate of consumer spending will have cumulative errors that affect the totals” (p. 16). He goes on to say, “The individual components of PCE and CE have been studied too little to permit conclusions about which is better and what can be learned from comparing the two” (p. 16).

In contrast, Lebow and Rudd (2003), in their evaluation of the CE versus the PCE as the primary source of data for weights for the CPI, conclude that, “Neither measure of weights is perfect, but we see advantages to the PCE data on balance.” (p. 168). They emphasize the advantage of the PCE that is derived primarily from businesses’ responses to economic censuses. However, they also state that, “The main difficulty with the PCE data in this context lies in the need to subtract the purchases of businesses and governments from total expenditure data in order to obtain spending by households and non-profit institutions” (p.168). Lebow and Rudd state that CE data rely largely on respondents’ memory of their own expenditures as well as those of others, which is actually incorrect as a sizable proportion of CE respondents use records, such as checkbooks, bills, and receipts when participating in the survey.

The National Research Council (2002) was not consistent in their evaluation of the CE as compared to the PCE as the basis of the weights in the CPI.

¹⁴ Non-profit institutions serving households included in the PCE consist of trade unions, professional associations, clubs and fraternal organizations, educational institutions, foundations for education and research, and religious and welfare organizations (Mead 2002).

¹⁵ See Mead (2002), Table 1. North American Classification System (NAICS) Industries with Nonprofit Activity in Personal Consumption Expenditures. The industries listed include: broadcasting and telecommunications, information and data processing services, professional, scientific and technical services, education services, ambulatory health care services, hospitals, nursing and residential care facilities, social assistance, performing arts, spectator sports, and related industries, museums, historical sites and similar institutions, amusement, gambling, and recreation industries, accommodations, and religious, grant-making, civic, professional, and similar organizations.

On the basis of available evidence, it is unclear whether the PCE or CEX weights are superior. What is clear, though, is that for some components the two systems produce very different results. The major hurdle inhibiting comparison among indexes weighted using alternative source data is the lack of uniformity in the scope and definition of goods and services covered. It is an open question as to how accurately expenditure categories can be mapped from the PCE to the CEX. We are not in a position to advocate one set of weights over the other, but the question certainly warrants further investigation... (p. 250)

In the conclusion to the chapter the following statement is presented: “The panel concluded that it is likely that the CEX estimates of consumer expenditure shares are biased, perhaps seriously” (p. 274). The panel recommended that the CE should be carefully evaluated, and that the net advantages of using the PCE to produce upper-level weights for the CPI should be included in the evaluation (Recommendation 9.1).¹⁶ No direct evaluation of the PCE was recommended however. In Recommendation 9.2,¹⁷ the panel stated that if the categories in the CE and PCE can be reasonably match so that comparable item strata indexes can be created, a program should be set up to produce CPIs based on PCE weights.

In addition to the studies cited, over the years other users familiar with the CE and PCE have also raised concerns about differences in aggregate estimates between the CE and these other sources and the different trend of the CE as compared to the PCE.¹⁸ As reflected in the early work on Gieseman (1987) and Branch (1994), and discussions with users and through workshops and conferences, the BLS has worked to produce the best comparisons of CE and PCE aggregate expenditures possible.

IV. Focus on Consumer Expenditure Survey Expenditures and Personal Consumption Expenditures¹⁹

The CE and PCE were designed to represent a similar concept of total consumption expenditures; however, different methods of measurement are used. The CE collects its data through surveys and aggregates to the population and the PCE makes estimates based on industry

¹⁶ Recommendation 9-1: Before additional resources are directed toward increasing its sample size (beyond the current plan), the accuracy of the CEX should be carefully evaluated. Assessing the net advantages of using the BEA’s PCE to produce the upper-level weights for the national CPI should be part of this evaluation (National Research Council, 2002, p. 274).

¹⁷ Recommendation 9-2: If categories can be reasonably well matched between the CPI and PCE, so that comparable item strata indexes can be created, a program should be set up to produce an experimental CPI that uses PCE-generated weights at the upper (218 item) level but that is otherwise no different from the CPI (National Research Council, 2002, p. 274).

¹⁸ For example, in an email communication, David Lebow (2000) the Federal Reserve Board expressed concerned about the difference in magnitude of the CE weights used for the CPI relative to those used in the production of the PCE. Concerns were also expressed by attendees at the Princeton University (1998) Conference on “Current and Future Developments in the Consumer Expenditure Survey,” May 19-20, 1998. Consumer Expenditure Surveys (1998), the Council of Professional Associations of Federal Statistics (November 2000). Landefeld (2000), Parker (2000), and others attending the U.S. Bureau of Labor Statistics (2000b), “Issues in Measuring Price Change and Consumption Conference,” June 5-8.

¹⁹ Descriptions of the CE and PCE are based on various publications (e.g., BEA 1990, BLS 1997a, Carson 1987).

production. There are several distinct differences in the expenditures that the CE and the PCE collect and the population and data sources used by each.

The CE collects data relating to family expenditures for goods and services used in day-to-day living. This would be all that consumers spend defined as transaction costs. This figure includes all excise and sales taxes. The CE is made up of two components to collect this data, a diary survey and an interview survey. The Diary portion is intended to capture everyday purchases such as groceries and small-cost items such as laundry detergent. For the Interview survey, respondents report data to an interviewer. Each sample household is interviewed once per quarter, for five consecutive quarters. This survey is designed to collect data on major items of expense, such as property purchases or vehicle purchases, and those that occur on a regular basis, such as rent or utility payments. Respondents tend to recall these types of expenditures for 3 months or longer. The publications integrate both the diary and interview survey based on which source provides the most statistically reliable information. The Consumer expenditure Survey includes all transactions paid for by the consumer, included person to person transactions.

The expenditures that PCE collects include all that consumers spend excluding consumer-to-consumer transactions. Additionally the PCE collects data on expenditures made on behalf of the consumer. This includes expenditures financed under government programs, such as Medicare and Medicaid. The PCE also includes all excise and sales tax.

The populations covered by CE and PCE are defined somewhat differently. The CE collects data from consumer units who are representative of the civilian noninstitutional population residing in the continental United States, Alaska, and Hawaii.

The PCE includes all "Persons resident" in the United States, including the nonprofit institutions that serve them. Person's resident includes persons who are physically located in the U.S., employees of U.S. businesses working abroad for one year or less, and U.S. government civilian and military personnel stationed abroad, regardless of the duration of their assignments. The nonprofit institutions considered for the PCE are tax-exempt, non-business-like not for profit organizations. These include public charities, domestic fraternal societies, labor organizations, political organizations, and social and recreation clubs, along with some professional organizations. Their output is measured as operating expenses which are included in the PCE. Operating expenses serve as a proxy for the value of services provided by nonprofits. Some output that is considered secondary to nonprofits, such as cafeteria receipts at a hospital, is moved to categories where it is considered primary. This decreases the value of output attributed to nonprofit institutions. Those operating expenses would be expenditures less the receipts from the sales of goods and services.

Consumer Expenditure data from the CE is collected through the diary and interview surveys administered by the Census Bureau and comes directly from the consumers.

Data for the PCE is collected from numerous surveys and censuses. Most items of the PCE use a residual approach. In general, the BEA uses the Census of Manufactures (CM) and Annual Survey of Manufactures (ASM) to obtain the basic value of shipments, the Census of

Wholesale Trade (CWT) and Annual Wholesale Trade Survey (AWTS) to derive wholesale trade margins and taxes, the Census of Retail Trade (CRT) and Annual Retail Trade Survey (ARTS) to obtain retail trade margins and taxes, and the Census of Service Industries (CSI) and Service Annual Surveys. The BEA also adds transportation costs using data from the Interstate Commerce Commission, the Department of Transportation, and the Census Bureau's Census of Transportation, Communications, and Utilities, to arrive at the final purchasers' value. The data sources and methodologies differ slightly between benchmark years (years ending in "2" or "7") and non-benchmark years (years between the benchmark years). The economic censuses are used in the benchmark estimates, while the annual survey data are used in extrapolations to estimate PCE for the non-benchmark years.

These basic differences within the CE and PCE explain some of the difference between the two estimates. Taking these differences into account still yields varied estimates between the CE and PCE aggregates. A comparison method was developed to present the numerical difference between the CE and PCE.

A. Development of CE to PCE Comparison Methodology

Comparisons of CE estimates to PCE estimates have been made since the early 1980's, and in this section ensues a summary of the process by which this has been accomplished.²⁰ The first step to accomplishing the comparison is the selection of item categories for comparison. The initial framework on which to produce matching CE to PCE estimates came from the detailed item categories in the CE bulletin.

It was not possible to create conceptually similar CE to PCE categories in every case. In some cases, item categories were combined to achieve comparability. For example, rent, utilities, and public services were combined because the CE does not separate utility charges that are included in contract rent. In other cases, adjustments were made to publish CE categories in order to produce categories comparable to PCE. The value of disposed vehicles and trade-in allowances for new and used vehicles, neither of which are included in estimates of vehicle purchases in CE published tables, were included with net payments for vehicles to derive an estimate similar to that of the measures in PCE. Irreconcilable conceptual differences were present for categories such as homeowner shelter, capital improvements to property, health care, insurance, and finance charges and were excluded from CE to PCE comparisons.

Having determined comparable CE to PCE item categories, the basic CE and PCE expenditure data had to be processed and formatted to calculate annual estimates. A number of steps were required to obtain the proper CE estimates. Because the CE Interview and Diary components collect expenditure data for many of the same items and the CE does not employ composite estimation to produce estimates, one of the two survey components has to be chosen as the data source for the estimate. The CE has to address this issue in producing publication tables and has developed an integration methodology to determine which survey source is superior for each item each year. For any year's CE to PCE comparison, the source survey for each item in the CE estimate is the one chosen for the publication tables produced for that year.

²⁰ A comprehensive description of the procedural steps followed by the BLS to produce CE to PCE comparisons is provided by Pollard (2000) in an internal BLS document.

To calculate an annual estimate for a CE item category requires mathematical manipulation of the data since neither the Diary Survey nor the Interview Survey use an annual reporting period in their data collection. Data from the Diary Survey sample are organized as weekly reports on the CE data files, while Interview Survey data are formatted as quarterly reports. A special adjustment has to be made for certain items that are only collected from a fourth of the sample during any one quarter in the Interview Survey.

Estimates of PCE are generated by BEA and published in tables organized by type of product and type of expenditure in the Survey of Current Business. BEA supplies BLS each year with a table of annual estimates by type of product containing underlying unpublished category detail. An adjustment is made to the estimate of rental value of farm dwellings in the PCE to reconcile it to the CE method for collecting this data. The level of precision in the PCE estimates is adjusted to match the level of the CE estimates.

For the item categories for which comparisons between the CE and the PCE can be made, a concordance is established that identifies which detailed CE and PCE items should be included to construct the category. Annual aggregate estimates for these items are summed for the CE and PCE, and ratios of these aggregates are calculated.

Since the development of this comparisons method, certain trends have developed in the calculated ratios. An overview of these trends is presented in the next section.

B. Trends in CE and PCE Estimates

In this section, we examine trends in the aggregate estimates for “comparable” item categories in the CE and PCE and trends in the ratio of CE estimates to PCE estimates. “Comparables” in this section are based on the methodology that is currently being used for published CE to PCE comparisons. The primary time period of interest is 1992-2000 (a summary of the trends is presented in Table 1). The PCE estimates are benchmarked to 1992. Only those commodities that have been considered comparable in the past are examined. Several categories of expenditures are excluded from these and previous CE to PCE comparisons. First is the exclusion of owner occupied shelter costs that in the CE are defined to include mortgage interest and charges, property taxes, and maintenance, repairs, insurance and other related costs. The PCE values non-farm owner occupied shelter using a proxy for space rent. Space rent is defined to exclude charges for utilities, major appliances, furniture, and furnishings. Estimates for farm dwellings are provided by the U.S. Department of Agriculture and are updated over time. Although in the CE data are available to produce an owner occupied housing rent comparison, this variable, reported rental equivalence, has not been used in previously published comparisons (see Appendix for CE to PCE rental equivalence comparison for 1992-2000). Also not included among the comparable commodities are health care, education, cash contributions, and personal insurance and pensions. The PCE includes the expenditures made by non-profit institutions serving households for health care and education in their estimates. Given this difference in population difference, these are considered to be out of scope for the CE to PCE comparison. In the past cash contributions were considered to be so differently defined that the comparison would not be useful. Personal insurance and pensions are out of scope for the PCE.

Aggregate expenditure ratios are presented in the following table. On average the ratios at the level of aggregation represented in the table show fairly consistent trends over the time periods 1984 to 2000 and 1992 to 2000. For all but “rent, utilities and other related goods and services” the average ratios decrease with time. The CE and PCE produce similar aggregates for (1) rent, utilities, and other related goods and services, (2) transportation, and (3) total food. CE aggregate expenditures are relatively lower for (1) personal care, (2) apparel and services, (3) entertainment, and (4) household operations. PCE aggregate expenditures are substantially larger than CE estimates resulting in quite low ratios of between 0.21 and 0.25.

**Table 1. Ratios of CE to PCE Using Current Comparison Methodology:
Averages for 1984-2000 and 1992-2000**

Publication Title	1984 to 2000	1992 to 2000
Total food	.74	.72
Rent, utilities, and other related goods and service	.98	.99
Household operations	.57	.53
Apparel and services	.63	.57
Transportation	.88	.86
Entertainment	.61	.56
Personal care	.68	.65
Miscellaneous	.25	.21

See Appendix Table B1 and Charts B1 for details.

More detailed results reveal differences within commodity group that help in identifying areas for possible concern. A summary of trends, defined in terms of stable, decreasing, and increasing, based on detailed results presented in the Appendix Table B1, is presented in Table 2. Vehicle purchase aggregate expenditures based on CE data are consistently higher than those for the PCE. This is not surprising as the CE includes sales of used vehicles from person to person while the PCE does not. Also the PCE estimates the value of used vehicles to be the retail margin plus a value for scrap metal.²¹ The CE does not collect data on these and thus the proxy that is used for the comparison could result in a higher estimate than is warranted.

²¹ PCE includes sales of used vehicles through wholesalers and retailers, which are primarily trade-ins. In these cases, PCE assigns a negative value for the sale of the used vehicle to the dealer, and then a positive value for the purchase of the used vehicle from the dealer. Generally, these pre-sale positive and negative values net to zero, so the value added to PCE comes from dealers’ margins and taxes. There is no netting for used cars sold to dealers by businesses. PCE excludes person-to-person sales altogether.

Table 2. Trends by Groups Using Data from 1984-2000

Stable	Decreasing	Increasing
<i>High</i>	<i>Moderately Lower</i>	<i>High</i>
Rented dwellings	Food away from home	Footwear
Vehicle purchases	Household operations	<i>Moderately Lower</i>
	Children under 2	Vehicle rental and other charges
<i>Moderately Lower</i>	Transportation	
Rent, utilities, public services	Gasoline and motor oil	
Utilities, fuels, public services	<i>Even Lower</i>	
	Food, total	
	Alcoholic beverages	
<i>Even Lower</i>	Telephone services	
Food at home	Housekeeping supplies	
Other vehicle expenses	Household furnishings and equipment	
Public transportation	Apparel and services	
	Men and boys	
	Women and girls	
	Other apparel products and services	
	Maintenance and repairs	
	Entertainment	
	Fees and admissions	
	Televisions, radio, sound equipment	
	Pets, toys, and playground equipment	
	Other entertainment supplies and equipment	
	Personal care products and services	
	Reading	
	Tobacco products and smoking supplies	
	Miscellaneous	

Changes from 1999 to 2000 show a slightly different pattern. For example, the ratio of CE to PCE expenditures for children under 2 increased over this time period, although the drop in the ratio since 1984 has been dramatic. The last two year trends are presented in Table 3.

Table 3. Trends by Groups for 1999 to 2000

Stable	Decreasing	Increasing
High	Food, total	Alcoholic beverages
Rented dwellings, total	Food away from home	Household operations
		Apparel and services
	Telephone services	Men and boys
		Women and girls
	Housekeeping supplies	Children under 2
	Household furnishings and equipment	Footwear
		Fees and admissions
		Personal care products and services
	Other apparel products and services	Vehicle rental and charges
	Transportation	
	Gasoline and motor oil	
	Maintenance and repairs	
	Entertainment	
	Televisions, radio, sound equipment	
	Pets, toys, and playground equipment	
	Other entertainment supplies and equipment	
	Reading	
	Tobacco products and smoking supplies	
	Miscellaneous	

If one would compare the ratios presented above and in the more detailed ratios in the Appendix table with earlier published estimates, one would find aggregate estimates and resulting ratios for the same year differing over time (results not shown). While CE aggregates for a particular year occasionally change due to a previously undiscovered data error, it is more likely that the trend line in CE aggregates exhibits spikes or disjoint shifts over time. These coincide with changes in sample design, data collection methods, and data processing in the CE. On the other hand, changes in PCE aggregates are retrospective. When a new year's PCE aggregates are produced, the aggregates for previous years are often revised, due to updated

source data that BEA has received in the interim or to the culmination of the benchmarking process.

C. Re-examination and Evaluation

As the ratios and trends suggest, gaps between the CE and PCE are widening for most commodity groups, making studying the underlying reasons a more pressing issue. While some of the reasons for differences, such as definition, coverage, and methodology between the CE and other sources, have been recognized and documented in the past when these comparative estimates have been presented, a more formal, comprehensive examination had never been conducted. For this reason, CE management convened a team of staff members from the Division of Consumer Expenditure Surveys (DCES) and the Division of Price and Index Number Research to investigate issues relating to the differences between CE and PCE.

Objectives of this team include:

- addressing inquiries about differences in estimates between the CE and other sources,
- assessing the efficacy of the current CE collection methodology,
- suggesting possible revisions to improve CE data quality, and
- suggesting possible revisions to improve the quality of other expenditure estimates.

To begin it is necessary to examine the factors that may contribute to differences in CE and PCE aggregates. Then a general assessment of the current comparison methodology is provided. A detailed examination of apparel expenditures is presented as an example of how one might go about assessing differences between the CE and PCE. A summary of this examination is presented with the details included in an appendix.

1. Possible Reasons for Differences

The CE and PCE each provide a measure of household expenditures, but these measures are derived from different types of data. The PCE is based on sales or residuals related to sales, while the CE is based on purchases. Another important distinction between the two measures is that the PCE includes the expenditures of nonprofit institutions. In theory, if all sales and purchases are recorded accurately and expenditures of nonprofit organizations are excluded from the PCE, the CE and PCE estimates should be the same. In practice, however, these estimates are disparate because of differences in concepts, data sources, and data collection methods.

The two major reasons for the differences between CE and PCE are scope (in terms of whose expenditures are being measured) and methodology. PCE covers the expenditures of nonprofit institutions, military personnel, and others whose expenditures are not covered in the CE. In addition, certain commodities are out of scope because the BEA uses the CE as the primary source for the PCE estimates. For example, the BEA uses CE data directly or through extrapolation for motor vehicle leasing (cars and trucks), motor vehicle rental, taxis, nursery schools, and child care (McCully 2000). The BEA has also used the CE estimates for medical and hospitalization insurance premiums in the PCE. Beginning with the 2000 annual revision of

the PCE, however, BEA adopted the Medical Expenditure Panel Survey (MEPS) as the primary data source for the medical care and hospitalization insurance component of PCE.²²

a. PCE specific

Wholesale and retail trade margins can account for a large proportion of the final purchasers' value assigned to PCE. These margins are applied to durable and non-durable goods. The algorithm by which margins are calculated can be summarized simply as total receipts from sales less total costs for the purchase of merchandise adjusted by changes in the value of inventories over the year. Since the source data are not specifically designed to produce trade margins, a series of adjustments and reallocations are made.

Data limitations also affect the computation of retail trade margins. Data are available to calculate overall retail trade margins by type of outlet, such as hardware stores, grocery stores, and auto dealers, but not by merchandise lines, such as footwear, within each outlet. As a result, the BEA staff applies many of the same procedures used to calculate wholesale trade margins to obtain retail trade margin for goods. The BEA staff uses available retail trade data to compute this margin rate.

Commodity and wholesale taxes, which take the form of sales taxes, must also be added in to the purchasers' value. Based on data from the Annual Trade Survey (ATS), Census Bureau analysts determine a tax rate for sales by merchant wholesalers and apply that rate to sales receipts of merchant wholesalers and manufacturers' sales branches.

The process of moving products from producer to wholesaler to retailer imposes transportation costs that augment the total output value. Data on air transit costs come from the Department of Transportation's Air Carrier Financial Statistics publication. The Census Bureau conducts the Census of Transportation, Communications, and Utilities which serves as the source for shipping charges by truck. The now-defunct Interstate Commerce Commission provided data on freight costs charged by railroads.

Retail sales taxes are the final item going into the total value of the product. The process to determine these taxes mirrors the procedure to obtain retail trade margin, simply substituting tax rate for margin rate. The Census Bureau provides sales tax rates, that is, sales taxes as a percentage of sales, to the BEA staff by type of business from the Annual Retail Trade Survey (ARTS). As with the computation of wholesale trade margin, misreporting adjustments are made by the BEA staff (expert judgment).

b. CE specific

The expenditures of some consumer items included in the CE, such as alcoholic beverages and tobacco products, could possibly be under-reported by respondents because of the sensitive nature of these products.

²² The BEA plans to continue monitoring expenditures on private health insurance in the CE on an annual basis as a cross-check on their estimates (Wilcox, 2000).

In the CE, proxy reporting is one of the reasons for the lower estimates of out-of-pocket health insurance premiums as compared with MEPS and the source of some mis-reporting in that the respondent might not have had perfect knowledge of the paying arrangements and out-of-pocket premiums for insurance policies held by other CU members. Some CU respondents may have claimed that policy premiums were paid entirely by an employer or union, when in reality the CU actually paid some or all of the policy premiums.

Some of the questions in the CE interview and diary surveys could be too global in nature to capture all expenditures or the correct expenditures in the intended category. Take for example, ATM expenditures. ATM expenditures would be captured in the interview survey through the question (section 20 part B question 8a and 8b) that ask "Do you (or any members of your CU) have any expenses for checking accounts or other bank services". Because of the global nature of this question it is possible that respondents may not record ATM expenses or all expenditures related to the use of ATMs.

Trends in the relationship between CE and PCE estimates can also be affected by periodic changes made to the Interview and Diary survey instruments. Revised procedures applied in the processing of data collected in the instruments may also have an impact. Extensive work has been done to catalog these changes (details available from the authors upon request) and their influence on estimates for specific categories is an area for further work.

c. General

The following are additional reasons for these differences between CE and PCE.

In PCE but out of scope for CE: Employees of U.S. businesses working abroad for one year or less; U.S. government civilian and military personnel stationed abroad, regardless of duration of their assignments; military living on-base in the U.S.; all persons in institutions or homeless for whom expenditures are made; non-profit institutions serving households; value of home production for own consumption on farms; standard clothing issued to military; and services furnished without payment by financial intermediaries except life insurance.

In CE but out of scope for PCE: Transaction from household to household (includes used vehicles purchases from another CU), here subtracting all person to person sales of used cars from CE.

Partly out of scope for CE (non-profit institutions serving housings and employer payments), and part defined quite differently: CE medical care out-of-pocket; PCE medical care expenditures made by households, insurance companies, employers, and non-profits; CE cash contributions; and PCE religious and welfare not including child care.

Defined quite differently: CE education out-of-pocket; PCE education and research expenditures made by households and for profit and non-profit institutions serving households; CE published expenditures for owner occupied housing (interest and charges, property taxes, maintenance and repairs, and other expenses); imputed space rent; CE premiums and contributions including to Social Security; and PCE expanses of handling life insurance and pensions plans.

Operationally quite differently defined: CE reported rental equivalence while PCE imputed space rent.

2. Overall Examination of CE and PCE

In order to understand better the differences in the CE and PCE, the team stepped back from the earlier methodology used (e.g., Branch 1994) and regrouped the CE items by UCC into PCE detailed categories using the PCE 1992 Bridge Table. The Bridge Table provided by the BEA (Key 2003) provides the most detailed information available regarding what is included in each commodity aggregate. CE expenditure items are grouped by UCC into PCE categories. For many cases there is not a one-to-one match between the two, even when concepts are generally the same. These are discussed in the section below in which we review each aggregation. The detailed concordance of PCE categories and CE UCC items, used for this exercise, is available from the authors upon request. In a later section, apparel is examined in detail. The overall examination based on the concordance has not gone through the same level of scrutiny.

The CE and PCE are compared using the following major aggregations: durable goods, non-durables, and services. Within each of these, expenditure aggregates are presented using subgroup aggregations. First aggregates for both the CE and PCE are presented regardless of comparability. Then, for those items deemed most comparable by the team, additional aggregates are shown. Brief descriptions are provided to explain why we suspect differences result and thus do not consider the CE and PCE items comparable. As will be seen, there are many fewer items that are considered comparable than in past comparisons. The aggregation for 1992, the most recent benchmark year for which PCE estimates are available, is presented below. Aggregations for 1997 and 2000 are in an Appendix.

All UCCs that are within scope are included in the comparison. In some cases, for example, health care, the category is in scope for both the CE and PCE but the operational definitions are sufficiently different to result in estimates that are not comparable. For the PCE the full costs of health care are included but for the CE only the expenditures made by consumer units, net of health insurance reimbursements are included. Another example is used cars. The PCE includes the sales margin and a value for scrap metal. The CE does not have estimates for either of these. Also, in earlier comparisons, person-to-person sales (intra-household sector transactions) were included in the CE but are out of scope for the PCE. Thus, the used car comparisons produced with the earlier methodology were very rough proxies and are now deemed to be not comparable.

For this comparison, rental equivalence of owner occupied housing has been included, unlike for earlier comparisons. CE reported rental equivalence is used for owner occupied housing while the expenditures associated with owning are not included. For example, property taxes are not included and neither are capital improvements for owned housing. Such expenditures are considered out of scope for the PCE. In the national accounts, the homeowner is treated as a small business that owns the home and rents it out. Taxes and many of the expenses related to the upkeep of the home are considered part of the “owner-occupied housing” industry, rather than PCE.

Table 4. Comparison of 1992 Aggregate Consumer Expenditures vs. Personal Consumption Expenditures Based on 1992 PCE Benchmark (\$ millions)
 * indicates "comparable" CE and PCE items

PCE Categories	Raw Aggregates		ratio
	PCE	CE	
Total Durables, Nondurables, and Services	4209653	2787852	0.66
Durable Goods	470778	430076	0.91
Motor vehicles and parts	200238	250555	1.25
* new autos	78016	88202	1.13
net purchases of used autos	31176	63907	2.05
other motor vehicles	60523	82115	1.36
trucks, new and net used	54069	73243	1.35
recreational vehicles	6454	8872	1.37
tires, tubes, accessories and other parts	30523	16331	0.54
Furniture and household equipment	178654	128748	0.72
* furniture, including mattresses and bedsprings	38957	31922	0.82
* kitchen and other household appliances	24287	23204	0.96
china, glassware, tableware, and utensils	19577	6122	0.31
video and audio good, including musical instruments, and			
* computer goods	57040	33148	0.58
video and audio goods, including			
* musical instruments	44964	26168	0.58
* computers, peripherals, and software	12076	6980	0.58
other durable house furnishings (i.e., floor coverings, clocks, lamps, and furnishings, blinds, rods, and other, writing equipment, hand tools, tools, hardware, and supplies)	38793	34352	0.89
Other Durable Goods	91886	46805	0.51
ophthalmic products and orthopedic appliances	13001	7100	0.55
wheel goods (including bicycles and motorcycles), sports (also includes guns) and photographic equipment, boats, and			
* pleasure aircraft	30092	21641	0.72
jewelry and watches	31645	13120	0.41
books and maps	17148	8912	0.52

Table 4 (continued). Comparison of 1992 Aggregate CE and PCE Expenditures (\$ millions): Nondurable Goods
*** indicates "comparable" CE and PCE items**

Nondurable Goods		1322946	866976	0.66
Food		669332	481347	0.72
	* food purchased for off-premise consumption	366840	299635	0.82
	* alcoholic beverages purchased for off-premise consumption	48853	16388	0.34
	* purchased meals and beverages	212269	179103	0.84
	* alcoholic beverages in purchased meals	33694	13801	0.41
	food supplied to civilians	6573	2609	0.40
	food supplied to military	513		
	food produced and consumed on farms	590		
Clothing and shoes		221851	146050	0.66
	* shoes	32903	23124	0.70
	women's and children's clothing and accessories except shoes (also includes clothing for infants)	115710	75828	0.66
	* men's and boys' clothing and accessories except shoes	63650	45018	0.71
	standard clothing issued to military personnel	267		0.00
	sewing good for males and females	5680	1399	0.25
	luggage for males and females	3650	681	0.19
* Gasoline, fuel oil, and other energy goods		117073	107384	0.92
Other nondurable goods		314690	132195	0.42
	* tobacco products	48008	27266	0.57
	* toilet articles and preparations	37903	21268	0.56
	semi durable house furnishings	25572	12021	0.47
	cleaning and polishing preparations, and miscellaneous household supplies and paper products	41060	26071	0.63
	drug preparations and sundries	75894	30377	0.40
	nondurable toys and sport supplies	36523	13568	0.37
	stationery and writing supplies	14850	13989	0.94
	net foreign remittances	960		
	magazines, newspapers, and sheet music	21959	10782	0.49
	flowers, seeds, and potted plants	11961	5425	0.45

Table 4 (continued). Comparison of 1992 Aggregate CE and PCE Expenditures (\$ millions): Services
*** indicates "comparable" CE and PCE items**

Services		2415929	1490800	0.62
* Housing		641305	695822	1.09
	owner and tenant occupied dwellings	617012	673165	1.09
		452317		
	owner occupied nonfarm dwellings	159346		
	tenant occupied nonfarm dwellings	5349		
	rental value of farm dwellings	24293	22657	0.93
* Household operations	other lodging	248309	232083	0.93
	electricity	79337	78681	0.99
	gas	29537	25240	0.85
	water and other sanitary services	30294	16217	0.54
	telephone and telegraph	70669	62266	0.88
	domestic service	11356	7937	0.70
	other household operations (i.e., moving and storage, household insurance, rug and furniture cleaning, electrical repair, reupholstery and furniture, postage, household operation services not elsewhere classified)	27116	34940	1.29
* Transportation		155024	158353	1.02
	repair, greasing, washing, parking storage, rental, and leasing	90293	63365	0.70
	bridge, tunnel, ferry tolls	2839	1472	0.52
	insurance	25728	62916	2.45
	mass transit systems	6463	6341	0.98
	taxicab	2586	1848	0.71
	railway	647	1702	2.63
	bus	1595	1142	0.72
	airline	21281	18143	0.85
	other (i.e., including water passenger, passenger transportation arrangement, limousine service, other local transportation, part of Amtrak passenger, trucking and courier services-except air)	3592	1424	0.40
Medical care		652630	126920	0.19
	physicians	167267	16729	0.10
	dentists	37636	17373	0.46
	other professional services	85216	10215	0.12
	hospitals	269020	7808	0.03
	nursing homes	50222	1300	0.03
	health insurance	43269		
	medical care and hospitalization			
	health insurance	37566	73495	1.96
	income loss insurance	2102		
	workers' compensation	3601		

Table 4 (continued). Comparison of 1992 Aggregate CE and PCE Expenditures (\$ millions): Services continued
*** indicates "comparable" CE and PCE items**

Recreation			139119	78716	0.57
	* admissions to all events		16107	12658	0.79
		motion picture theaters, theatre, opera, and entertainment	10976	9360	0.85
		spectator sports	5131	3298	0.64
	* radio and television repair		3438	1092	0.32
	clubs and fraternal organizations		10200	8643	0.85
	commercial participant amusements		29885	64	0.00
	pari-mutual net receipts		3366	5399	1.60
	other (i.e., including pets and pet services excluding vets, veterinarians, cable TV, film developing, photo studios, sporting and recreational camps, high school recreation, lotteries, video cassette rental, commercial amusements not elsewhere classified)		76123	37362	0.49
Personal Care			47472	38340	0.81
	cleaning, storage, and repair of clothing and shoes		11365	12722	1.12
	barbershops, beauty parlors, and health clubs		20065	24671	1.23
	other (i.e., including watch, clock, and jewelry repair, miscellaneous personal services)		16042	947	0.06
Personal Business			342606	28676	0.08
	brokerage charges and investment counseling		28797		
	bank service charges, trust services, and safe deposit box rental		30934	3825	0.12
	services furnished without payment by financial intermediaries except life insurance carriers		141498		
	expense of handling life insurance and pension plans		66935		
	legal services		44859	9180	0.20
	funeral and burial expenses		10969	6711	0.61
	other personal business (i.e., including labor union expenses, professional association expenses, employment agency expenses, money orders, classified ads, tax return preparation services, personal business services not elsewhere classified)		18614	8957	0.48
Education and research			95977	46244	0.48
	higher education		52221	25789	0.49
	nursery, elementary, and secondary schools		23052	18685	0.81
		elementary and secondary schools	18765	7117	0.38
		nursery schools	4287	11568	2.70
	other education and research		20704	1770	0.09
		commercial and vocational schools	13162		
		foundations and nonprofit research	7542		

Table 4 (continued). Comparison of 1992 Aggregate CE and PCE Expenditures (\$ millions): Services continued
*** indicates "comparable" CE and PCE items**

Religious and welfare activities		112413	85646	0.76
all contributions including religion (CE)		7937	72986	9.20
	political organizations	2757		
	museums and libraries	3554		
	foundations to religion and welfare	1626		
social welfare		73121	12660	0.17
	child care	13089	8320	0.64
	social welfare (i.e., including membership organizations, job training and vocational rehabilitation services, residential care, individual and family services, social services not elsewhere classified, civic-social-fraternal associations, religious organizations)	60032	4340	0.07
		31355		
Net foreign travel		-18927		

See Appendix Table C1 for the 1997 comparison and Table C2 for the 2000 comparison.

As seen in Table 4, the ratio of CE to PCE total goods and services is 0.66. CE aggregate durable goods expenditures are 91 percent of those for the PCE. CE nondurable goods account for 66 percent of the PCE value, while the services CE to PCE ratio is 0.62. These ratios are not adjusted to account for the differences in population represented by the CE and PCE. As noted earlier, PCE expenditures represent those made by a larger population than the CE population. For most commodities that are fairly comparable, the CE and PCE result in similar estimates. When concepts differ, or the categories vary in composition beyond that which we can control, aggregate expenditures diverge, and diverge substantially in some cases.

a. Durables

Durables include motor vehicles and parts, furniture and household equipment, and other durable goods. Among durable goods expenditures, those most comparable for the CE and PCE are new automobiles and kitchen and other household appliances.

CE aggregate expenditures for motor vehicles and parts are higher than those reported for the PCE (the ratio is 1.25). The new automobiles CE to PCE ratio is 1.13. As noted earlier, the CE expenditure for the net purchase of used automobiles is an approximation that is perhaps not as comparable to the PCE as we had originally thought. The earlier comparison included the trade-in value for new vehicles in the purchase of used vehicles. Since this trade-in is counted in new automobiles, it was not added again for the CE in this comparison. However, the PCE counts the value of these in both new automobiles and used automobiles. Also as noted earlier, the CE does not provide adequate information to produce an estimate of the retail sales margin appropriately, nor to provide an estimate for scrap metal. Person-to-person sales (within-in the household sector) are included in the CE for used vehicles but not the PCE. Thus, not surprisingly, the CE aggregate expenditure is higher (CE to PCE ratio is 2.05).

The comparable items in other motor vehicles in the CE and PCE include trucks, new and used, and recreational vehicles. Trucks are treated in the same way as are automobiles, new and used. The used truck portion is likely not as comparable as is desirable for CE and PCE comparisons. In the PCE other motor vehicles include truck tractors, bus chassis, and combat vehicles. These items are likely not being included in the CE but their values are likely to be small (e.g., the combat vehicle estimate is about 0.9 percent of the aggregate estimate for this group in 1992). Recreational vehicles appear to be fairly comparable.

Tires, tubes, accessories, and other parts appear to be the same items in the CE and PCE. However differences in the estimates are likely related to reimbursements for these items in the CE; the full purchase price is assumed for the PCE. CE estimates for specific items will be higher than those from the PCE since labor is not separated from parts (e.g., in some cases the purchase of tires includes the labor to install them). However, when the majority of the expenditure was for a service, for this exercise, the item in question is included in services.

Furniture and household equipment includes a broad set of items as noted in the table. The CE to PCE ratio for this group is 0.72. From among the overall set of items, durable goods that appear to be most similar conceptually and operationally are furniture (including mattresses and bedsprings), and kitchen and other household appliances. The ratios for these are 0.82 and

0.96. The china, glassware, tableware, and utensils, video and audio goods including musical instruments and computer goods ratio is only 0.31. This group includes a large mix of items, but the overlap in the CE and PCE of the items varies. Computers, peripherals, and software expenditures from the CE are only 58 percent of those reported for the PCE. The CE estimate is for non-business only. The difference could result from the way the CE and PCE determine non-business use.

The final sub-grouping in furniture and household equipment is for other durable house furnishings grouping. This is another instance where the items included in the CE and PCE are not exactly the same. The PCE appears to be more comprehensive than the CE. Another source of difference is in the treatment of items like installed carpet for owners. For this item the service charge for the installation can be included in the CE estimate but would not be in the PCE estimate.

Aggregate expenditures for other durable goods are lower in the CE than in the PCE (ratio is 0.51). This is in part due to the reimbursements for ophthalmic products and orthopedic appliances in the CE and not in the PCE. CE aggregate expenditures for this grouping are 55 percent of the PCE amount. CE expenditures for wheel goods, sports and photographic equipment, boats, and pleasure aircraft are 72 percent of PCE expenditures. The categories are not defined exactly alike but they are quite similar. The PCE grouping of items included with jewelry and watches is much more comprehensive than that for the CE. The ratio of expenditures reflects this at 0.41. The PCE books and maps category is also more comprehensive. The PCE includes not only books but expenditures for publishing as well. Consumers report expenditures for books but not publishing. Art reproductions and prints and maps are included along with other household decorative items in that category for the CE.

b. Non-Durables

For this analysis, non-durables are grouped into four major categories: food, clothing and shoes, gasoline, fuel oil, and other energy goods, and other nondurable goods. Food and the energy groups appear to be the most alike of the set when comparing the CE and PCE. The ratio for the energy items is quite high at 0.92. The ratio for food is lower at 0.72.

CE expenditures for food purchased for off-premise consumption is 82 percent of the value for the PCE. Included in PCE but not the CE are additions to certain food groupings for the Women's, Infants', and Children's program (WIC). CE purchase meals and beverages are 84 percent of those of the PCE. The detail provided in the PCE is greater than that in the CE. This alone may contribute to the difference in the two aggregates. PCE food furnished to employees is more comprehensive than the category used to produce the CE aggregate. The CE only includes the value of meals as pay, while the PCE includes the value of food provided to civilians and the military. If meals are provided in addition to pay, no amount is collected in the CE. Also, no value is collected for military personnel living on base as these people are not included in the CE population.

CE clothing and shoes expenditures are 66 percent of those reported in for the PCE. The ratio for shoes is somewhat higher at 0.70. The CE includes some athletic shoes in the recreation

section while the PCE includes all shoes here. The only other major item difference that appears for clothing and accessories is that standard clothing issued to military personnel is included in the PCE and not the CE.

The CE and PCE appear to define durable energy goods the same conceptually. This is reflected in the result that aggregate expenditures for these are almost the same. The CE to PCE ratio is 0.92.

Other nondurable goods include a mix of items, for example, tobacco products, toilet articles and preparations, as well as flower, seeds, and potted plants. Given this mix it is not surprising that the ratio is only 0.42 for the group. CE and PCE tobacco aggregate expenditures result in a ratio of 0.57. Toilet articles and preparations also have a relatively low ratio, 0.57.

With the exception of tobacco products and toilet articles and preparations, the sub-groupings within other nondurables are not as similar in the CE and PCE as one might like. However, the items are often included in other sub-groupings with the overall other nondurable goods category. For example, PCE includes fertilizers under cleaning preparations while the CE includes these with flower, seeds, and potted plants. CE expenditures for drug preparations and sundries are only 40 percent of those reported by the PCE. As for other medical related goods and services, this is not surprising as this group of items is likely subject to reimbursements thus lower the CE value. Nondurable toys and sport supplies is much more comprehensive for the PCE than for the CE as much of what is included in sport supplies by the PCE is included in other durable goods (e.g., golf clubs and fishing tackle and equipment). The CE to PCE ratio for this sub-grouping is only 0.37. The CE UCC coding system does not provide the detail to match the PCE is the detail that is represented in the 1992 PCE Bridge Table. Although the ratio is high (0.94), the CE estimate also includes some school books that were grouped with other school supplies for all but college. This grouping was used as school supplies are expected to represent the largest share in the CE UCC. Sheet music is included along with magazines and newspaper in the PCE nondurable category but is included with musical instruments and accessories in durable in the CE.

c. Services

Services include housing, household operations, transportation, medical care, recreation, personal care, personal business, education and research, religious and welfare activities, and a PCE adjustment for net foreign travel. Based on our analysis, we consider only five of these comparable conceptually: housing, household operations, transportation, recreation, and personal care. Within these major groupings, differences in coverage sometimes exist.

Housing services include those for owner occupied housing, tenant occupied housing, and other lodging. The aggregate expenditure ratio for housing services for owners and renters combined is 1.09. The ratio for other lodging is 0.93.

The CE and PCE disaggregate owner and renter housing differently but in total they represent the same items and concepts with a few adjustments. The PCE distinguishes farm and non-farm dwellings. All farm dwellings, whether owner occupied or tenant occupied, are

combined in the PCE. Expenditures for non-farm dwellings are available for owner occupants and tenants. The CE aggregate for rental equivalence is for all owned dwelling and rents are for all tenants. For the comparison, farm and non-farm expenditures are aggregated for the two series. Details for owner occupied non-farm dwelling are presented in the Appendix.

The estimates for owner occupied and tenant housing services are higher in the CE than the PCE. This is part is due to the fact that certain adjustments are not made for the CE that are made in the PCE, but also, we suspect, because of the mechanism used by the PCE to impute owner occupied housing services. In the CE aggregate for owner occupied housing no adjustment is made to subtract the value of the flow of services from appliances already in the house. Also, CE tenant rents differ from those in the PCE as CE rents that include costs of utilities has not been adjusted; PCE rents do not include the value of utilities. Another reason for the differences is likely due to the BEA method for imputing rents that is based on rent-to-value ratios from rental housing. This approach may underestimate the value of owner occupied housing. More on this is presented in the Appendix.

Household operations include utilities, domestic services, and a mix of other household operations services. Expenditures for electricity are approximately the same for the CE and PCE, 0.99, while the ratio falls slightly for gas and telephone and telegraph (0.85 and 0.88 respectively). CE expenditures for other household operations are substantially higher than PCE expenditures. This is in part due to differences in concept and differences in how the CE and PCE classify services. For example, household insurance is defined as premiums net of reimbursements for the PCE but as premiums only for the CE. The PCE estimate is negative (-\$0.24 million) while the CE estimate is positive (\$18.7 million).

Transportation includes a broad range of services from repairs to passenger fares. All the CE to PCE ratios, but the one for bridge, tunnel, and ferry tolls, are quite high with some greater than one. As for other types of insurance, the treatment of insurance in the CE and PCE is different. Vehicle insurance is premiums net of reimbursements in the PCE and only the premiums in the CE, again resulting in a higher aggregate for the CE and higher ratio (2.45). Expenditures for mass transit systems are almost the same for the two series of data. Expenditures for taxicabs, buses, and airlines are slightly lower in the CE relative to the PCE. Railway transportation is quite high in the CE; the ratio to PCE is 2.63. The source of the PCE data is Amtrak revenues. CE expenditures could cover more than Amtrak in the U.S. and travel abroad. If an all inclusive travel package was provided by the train, the full value of the travel would be included in the CE but not the PCE.

Medical care includes expenditures provided by health care providers, health care facilities, and insurance. The CE to PCE ratios are quite low with the exception of medical care and hospitalization health insurance which has a ratio of 1.96. One of the reasons is that the expenditures of non-profits serving households are also included in the PCE estimate and not the CE aggregates. Another is that CE expenditures are after reimbursements by insurance companies and other third party payers. Those for the PCE represent the full costs of the care. The CE does not directly collect data on income loss insurance purchased by consumers nor does it consider workers' compensation as a consumer expenditure.

Recreation includes various activities. The largest CE to PCE ratio in this group is for pari-mutuel receipts (1.6). The CE category includes few more items that do not appear to be in the PCE category such as license for pets, fishing, and guns. The very low ratio for commercial participant amusements is disturbing but perhaps not surprising since some of the costs of these (e.g., sightseeing) in the CE would be included in transportation travel when a package vacation included these. The low ratio for radio and television repair is rather puzzling.

Overall CE personal care expenditures are about 81 percent of those reported by the PCE. The category for which the CE is low is for watches, clocks, and jewelry repair, and miscellaneous personal services. The CE and PCE produce similar estimates for all but miscellaneous personal services. The PCE aggregate for this subcategory is about 94 percent of the total for the group. The BEA refers to this aggregate as a misreporting adjustment.

Personal business includes a broad set of services, some CE and PCE comparable and others not. Conceptually funeral and burial expenses appear to be comparable but the ratio is only 0.61. Many of the other services included in the PCE are not ones for which consumers make payments. These are often included in the expenditure paid by the consumer for a particular service. For example, the expense of handling life insurance and pension plans would be included in the price of the product and would be included elsewhere in the accounts, not in PCE.

Education is similar to medical care in that the expenditures of non-profits serving households are included also with those of consumers themselves. For most education, consumers do not pay the full costs. The exception is likely nursery schools. The CE category includes not only nursery schools but also day-care centers and preschools. The ratio for nursery schools is 2.70.

Religious and welfare activities expenditures for the PCE include those for non-profits serving households, not just those for households. The ratio for the entire category is 0.72. Child care is considered comparable in the CE and PCE, however, the estimates still differ; the ratio of CE to PCE is only 64 percent. As the BEA uses the CE as the source of these data (McCully 2000), these results suggests that operating costs are in addition being included in the PCE estimates.

d. Summary of Comparable CE to PCE Estimates

By refining the CE and PCE estimates to only those items in the CE and PCE that are comparable to each other, the ratio of CE to PCE moves closer to one (Table 5). In 1992, the ratio increases from 0.66 to 0.89. This ratio takes into account only the comparability of the items, without adjustment for population differences between the CE and PCE

In 1997 and 2000, the ratio also show improved with the comparability adjustment, although not as much as in 1992. In 1997, including only comparable items brings the CE to 80 percent of the PCE comparable aggregate. For 2000, the ratio of CE to PCE increases from 0.60 to 0.80.

For nondurable goods and services in 1992, the ratios of CE to PCE both increased by taking out non-comparable items. The ratio for durable goods decreased slightly from 0.91 to 0.87 in 1992. This is due to the fact that net purchases of used autos as well as aggregates for other vehicles are not comparable in CE and PCE and both items had a ratio of CE to PCE well over one.

One factor contributing to the improvements in ratio is the number of items that must be taken out of the PCE to provide comparability with the CE. Over all years, the highest percent of comparable items for the PCE out of all items was 56%. For the CE, however, the percent of comparable items of total CE was above 70 percent.

By taking non-comparable items out of the comparison, the ratio of the items remaining were mostly the "good ratios" that were close to one. However, for some items, though they are comparable, the ratio is still low. This is the case for radio and television repair and alcoholic beverages purchased for off-premise consumption and in purchased meal, which in 1992 had ratios of 0.32, 0.34, and 0.41, respectively. The alcohol purchases are not surprisingly low ratios, despite the comparability of these items. The CE is known to have underreporting in sensitive items, such as alcohol. This also explains the relatively low ratio for tobacco products (0.57). The low ratio for radio and television repair cannot be as easily explained.

Table 5. Summary Comparison of Aggregate Consumer Expenditures vs. Personal Consumption Expenditures Based for 1992, 1997, & 2000 (\$ millions)
Restricted to Most Comparable Based on Concepts and Comprehensiveness

	1992			1997			2000		
	PCE	CE	ratio	PCE	CE	ratio	PCE	CE	ratio
Total Durables, Nondurables, and Services	2369478	2106940	0.89	3117032	2489754	0.80	3723413	2982437	0.80
all items	4209653	2787852	0.66	5529283	3552836	0.64	6728414	4019950	0.60
% of all	0.56	0.76		0.56	0.70		0.55	0.74	
Durable Goods									
* New autos	78016	88202	1.13	82462	84636	1.03	104988	116014	1.11
* Furniture, including mattresses and bedsprings	38957	31922	0.82	53757	42012	0.78	64102	44217	0.69
* Kitchen and other household appliances	24287	23204	0.96	30755	28391	0.92	36323	32065	0.88
* Video and audio good, including musical instruments, and computer goods	57040	33148	0.58	83749	50427	0.60	106942	48259	0.45
* Wheel goods (including bicycles and motorcycles), sports (also includes guns) and photographic equipment, boats, and pleasure aircraft	30092	21641	0.72	42809	33842	0.79	58295	30155	0.52
total comparable	228392	198117	0.87	293532	239308	0.82	370650	270710	0.73
all durables	470778	430076	0.91	642532	594933	0.93	819647	648152	0.79
% of all	0.49	0.46		0.46	0.40		0.45	0.42	
Nondurable Goods									
* Food purchased for off-premise consumption	366840	299635	0.82	486509	204684	0.42	569561	372523	0.65
* Alcoholic beverages purchased for off-premise consumption	48853	16388	0.34	58087	18972	0.33	71169	24781	0.35
* Purchased meals and beverages	212269	179103	0.84	316631	218288	0.69	378008	245959	0.65
* Alcoholic beverages in purchased meals	33694	13801	0.41	43223	13604	0.31	52053	15761	0.30
* Shoes	32903	23124	0.70	40083	33126	0.83	46815	37399	0.80
* Women's and children's clothing and accessories except shoes (also includes clothing for infants)	115710	75828	0.66	148000	79388	0.54	175117	88031	0.50
* Men's and boys' clothing and accessories except shoes	63650	45018	0.71	83299	42883	0.51	96898	48017	0.50
* Gasoline, fuel oil, and other energy goods	117073	107384	0.92	143215	127847	0.89	183217	152310	0.83
* Tobacco products	48008	27266	0.57	49807	24565	0.49	72069	34624	0.48
* Toilet articles and preparations	37903	21268	0.56	50627	25749	0.51	58516	28160	0.48
total comparable	1076903	808815	0.75	1419481	789106	0.56	1703423	1047565	0.61
all nondurables	1322946	866976	0.66	1641551	1025729	0.62	1989598	1158007	0.58
% of all	0.81	0.93		0.86	0.77		0.86	0.90	
Services									
* Housing	641305	695822	1.09	810502	920315	1.14	958762	1082441	1.13
* Household operations	248309	232083	0.93	333039	295944	0.89	385671	321163	0.83
* Transportation	155024	158353	1.02	234398	225711	0.96	272753	239924	0.88
* Admissions to all events	16107	12658	0.79	22075	18595	0.79	27260	20168	0.79
* Radio and television repair	3438	1092	0.32	4005	775	0.32	4894	466	0.32
total comparable	1064183	1100008	1.03	1404019	1461340	1.04	1649340	1664162	1.01
all services	2415929	1490800	0.62	3245200	1932174	0.60	3919169	2213791	0.56
% of all	0.44	0.74		0.43	0.76		0.42	0.75	

3. Apparel Report

In 1992, the CE to PCE ratio for aggregate apparel expenditures was about 67.8 percent. Table 6 shows the major components of footwear for the CE and PCE.

Table 6. Comparison of Expenditures for Total Apparel Major Components Between CE and PCE, 1992

Category	Annual Expenditures (millions of dollars)	
Consumer Expenditure Survey		
Total	143,970	
Men's Apparel		45,018
Women's Apparel		68,056
Infants Apparel		7,772
Footwear		23,124
Personal Consumption Expenditures		
Total	212,259	
Men's Apparel		63,645
Women's Apparel		107,474
Infants Apparel		8,237
Footwear		32,903

a. Derivation of CE Estimates

Apparel expenditures in the CE are collected in Section 9, Part A of the Interview Survey questionnaire and Part 4 of the Diary Survey questionnaire. The CE disaggregates apparel into men and boy's, women and girl's apparel, children under 2, and footwear.

The CE estimates can occur in three ways. An expenditure can be directly reported, allocated, or imputed. If it is directly reported, the respondent writes the expenditure directly in the diary instrument or reports it to an interviewer during an interview. If expenditure is combined in a group that cannot be separated, then allocation is done during processing. For example, if a respondent were to say they spent \$500 on "clothing" and did not specify what type of clothing, this \$500 would be divided among different sections of Apparel. When there is a missing value for an expenditure that is expected, imputation is done during processing. This will occur when the respondent says that they do have an expense for something, but then when asked what the expense is, there is no answer. For the Apparel section, the CE uses Hot Deck Imputation (Method 1). (More details on CE allocation and imputation methods available from authors upon request.)

Table 7 details the percent of total expenditures in each category that have had some type of data adjustment made to them. It is important to note that the codes of allocation or

imputation are given at the UCC level. For this reason, grouping these UCCs into categories may return a higher rate of adjustment for that category than it should. For example, one may say that one paid X amount of money on utilities. This X amount would then be allocated to the different areas of utilities based on the CE's weighting class distribution, so each of these individual UCCs for which the allocation are being made would get a flag indicating that allocation. Then, when these UCCs are regrouped under the utilities category, they would each carry the allocation flag with them. The total number of allocations in the utilities category would then include these expenditures (the original amount X), even though this X was directly reported as utilities. The total allocated expenditures for utilities would therefore appear to be higher than they actually are. This problem could occur in all categories where respondents are likely to group items together. Therefore, the estimates of allocated expenditures will be higher than actual allocated expenditures at the higher levels of aggregation.

Table 7. Data adjustments for Apparel and Services, 1992

	Total Expenditures (in millions)	Imputations	Allocations	Imputations and Allocations	Directly Reported
Apparel	143,970	0.1	14.6	0.1	85.3
Men's and Boys'	45,018	0.1	17.6	0.1	82.3
Women's and Girls'	68,056	0.1	13.8	0.1	86.0
Children Under 2	7,772	0.1	14.1	0.1	85.8
Footwear	23,124	0.0	11.3	0.0	88.7

The published estimates are an integrated form of the diary and interview data. About 63 percent of all items come from the diary survey, with the remaining 37 percent from the interview survey. The percentage of total expenditures coming from the diary survey was larger with about 83 percent (\$119,470 million) coming from the diary survey and 17 percent (\$24,501 million) coming from the interview survey.

In summary, deriving the CE estimates starts collection of data through the Interview and Diary Surveys. The data is then processed in which imputations and allocations are done when necessary. Integrating the two surveys to provide one set of annual estimates is the last step. The PCE process of producing estimates is very different.

The source data from which the apparel portion of the PCE estimates are derived issue from just two sources. The Census of Manufactures provides the base product data for domestic apparel output, while merchandise trade data collected by the Bureau of the Census for balance of payments computations supplies imports of apparel. The Census of Service Industries provides the gross receipts data for establishments providing apparel services. Data for the computation of wholesale trade margins come from the 1992 Census of Wholesale Trade and the 1992 Annual Trade Survey. The calculation of retail trade margins employs data from the 1992 Census of Retail Trade and the 1992 Annual Retail Trade Survey.

b. Derivation of PCE Estimates

The following section traces the process by which the PCE estimates for apparel are derived. It should be viewed in the context of BEA's objectives of showing the production and use of goods and services by industry and detailing the composition of gross domestic product.

The process can be viewed simply in the following way. The BEA calculates the benchmark value of the domestic production of the apparel industry and imports of apparel and then allocates that supply among various intermediate and end users, including consumers (PCE).²³ Total output, which BEA terms "purchasers' value," can be decomposed into six components, each of which is determined independently. The first piece termed "basic value" represents the value of shipments of apparel produced by domestic manufacturers plus the value of apparel imported from foreign countries. The second element is transportation costs that cover the conveyance charges from both manufacturer to wholesaler and from wholesaler to retailer. The next piece is wholesale trade margin. This reflects the value added by wholesalers for the warehousing and distribution of apparel to retail outlets. Next there are commodity and wholesale taxes. These are excise and sales taxes imposed on producers and wholesalers. The fifth element is retail trade margin, which encompasses the value added by retail outlets for selling apparel to consumers. The final piece of purchasers' value consists of retail taxes, which are commonly sales taxes charged by government authorities on the purchase of consumer goods. The apparel components and their levels for 1992 are listed in Table 8 below. Following the table is a detailed description for each of these components for apparel expenditures.

Table 8. Amount of Value Added to Total Apparel Output by Component, 1992

Component	Millions of 1992 dollars	
Total	\$238,843	
Basic value		\$119,114
Wholesale margin		21,286
Transportation cost		3,369
Wholesale taxes		163
Retail margin		84,860
Retail taxes		10,051

The domestic portion of the basic value of apparel production is found in two publications from the 1992 Census of Manufactures (CM). The value of product shipments for items of men's, women's, boys', girls', and infants' apparel and footwear is found in a number of reports from the 1992 Census of Manufactures – Industry Series. The total value of these shipments was \$65,605 million in 1992.

The BEA staff adjusts this value to account for three types of discrepancies. The first is a secondary production adjustment that essentially corrects rounding errors and vintage problems in product shipment and industry shipment data BEA uses in producing input-output accounts.

²³ For the benchmark years, PCE estimates are based on the BEA's benchmark input-output accounts, which are computed by the Industry Economics Division of the BEA. The PCE estimates for the inter-benchmark years are computed by another division.

This had a modest impact, adding \$103 million to the total value of apparel shipments for 1992. The next adjustment is for nonemployer receipts. Depending on the particular item, the apparel shipment data in the CM comes from firms with a minimum number of employees, so the Census Bureau uses IRS tax data to estimate receipts for apparel produced by establishments with fewer employees. Another \$394 million was added to total shipments. A further adjustment corrects for misreporting of shipment value. The BEA staff assumes, for instance, that there is some underreporting of production in the tax data. Corrections for misreporting added another \$103 million to shipments. Finally, the values of two types of handling charges are allocated to PCE apparel. The first was handling charges and other miscellaneous nonmerchandise receipts for catalog and mail order houses. The second was handling charges for the mailing of gifts by children's and infants' wear stores. Together these charges totaled \$174 million, bringing the total adjusted value of domestically produced apparel shipments to \$66,739 million.

Imports include not just the value of the products shipped, but also the charges for transporting the items to the United States and any customs duties placed on their entry. The basic value of imported apparel originates from internal merchandise trade data from the Census Bureau provided to BEA's Balance of Payments Division. Apparel imports in 1992 were valued at \$52,735 million. This brings the basic value of both domestically produced and imported apparel to \$119,114 million.

Wholesale and retail trade margins can account for a large proportion of the final purchasers' value assigned to PCE. The algorithm by which margins are calculated can be summarized simply as total receipts from sales less total costs for the purchase of merchandise adjusted by changes in the value of inventories over the year. Since the source data are not specifically designed to produce trade margins, a series of adjustments and reallocations are made.

The estimation procedure for wholesale trade margins starts by examining the operations of wholesalers whose primary business is apparel. Total purchases of apparel by these wholesalers are published in the 1992 Census of Wholesale Trade – Subject Series – Miscellaneous Subjects – WC92-S-4 (CWT) and amounted to \$37,325 million. The BEA then refines receipts through a series of what are collectively termed misreporting adjustments. Based on IRS and other data, these adjustments added \$965 million for a total cost of \$38,290 million for goods sold. Wholesalers reported sales receipts of \$51,713 million. A similar set of misreporting adjustments based on IRS and other data added \$1,362 million for total receipts of \$53,075 million. This yields a trade margin of \$15,750 million. Expenses for the operation of manufacturers' sales branches also published from the 1992 CWT increases the trade margin by \$850 million to \$16,600 million.

The wholesale trade margin is also based on the inventory change for three types of operations in the wholesale trade arena – merchant wholesalers, manufacturers' sales branches and offices (MSO&B), and agents, brokers and commission merchants (A&B). Inventories of apparel held by merchant wholesalers are approximately 10 times larger than the inventories held by the other two operations combined. Inventory values for the beginning and end of 1992 for

MSO&B and A&B are also published in the 1992 CWT – Miscellaneous Subjects publication. A slight increase of \$70 million was registered for these operations.

Changes in inventory values for merchant wholesalers are calculated somewhat differently. Beginning- and end-of year inventory values for the broader category of apparel, piece goods, and notions, of which apparel is a component, are obtained from the 1992 Annual Trade Survey (ATS). These values are considered more conceptually accurate than the inventory values in the CWT because they include inventory housed in auxiliary storage facilities. The ATS, however, does not disaggregate the apparel category to the apparel component level as is done in the CWT. The BEA staff computes the percentages that apparel inventories made up of apparel, piece goods, and notions inventories at the beginning and end of 1992 in the CWT and applies those percentages to the ATS inventory estimates. Calculating the change in merchant wholesaler inventories with these values yields an increase of \$875 million. The change in the value of inventories for all kinds of wholesale operations combined comes to an increase of \$945 million, bringing the wholesale trade margin to \$17,545 million. The BEA staff then accounts for value created in the wholesale apparel sector that properly belongs in the services sector. Rental and leasing receipts and labor charges for repair work comprise these services, which total about \$204 million and result in an apparel trade margin of \$17,341 million.

This intermediate estimate of wholesale trade margin needs to be adjusted since the initial data BEA receives is by kind of business, while the margins BEA requires for the national accounts is by product. The trade data by kind of business is inadequate because of two factors. First, wholesalers whose primary business is apparel may trade in other businesses as well as apparel and the data do not distinguish between apparel and non-apparel operations. Second, by the same token, wholesalers whose primary business is not apparel may also have apparel operations. Thus trade margins calculated for wholesalers in businesses such as sporting goods may include apparel.

Since it is not possible to isolate wholesale trade margins attributable to apparel for each group of wholesalers from the data, the BEA staff uses an allocation procedure based on sales receipt data. These data are published in 1992 Census of Wholesale Trade – Subject Series – Commodity Line Sales – WC92-S-3. Sales receipts for the apparel commodity line are available for each kind of business engaged in the wholesale trade of apparel. Sales data are also available for the commodity lines other than apparel in which apparel wholesalers also trade. Trade margin rates, defined as the ratio of trade margin to sales receipts, can be calculated for apparel and the non-apparel commodity lines in which apparel wholesalers operate.

An initial estimate of the trade margin for apparel is estimated by applying the wholesale margin rate of apparel wholesalers, which includes non-apparel commodities, to the apparel sales receipts of all wholesalers. Similarly, the margin rates for other commodities handled by apparel wholesalers are applied to sales receipts reported by apparel wholesalers. Ideally, the trade margin generated by applying these rates to the commodity lines handled by apparel wholesalers would equal the trade margin estimated by the procedure outlined earlier that evaluated purchases, costs, and inventory adjustments. (In fact this would be the case for all types of wholesalers, not just apparel wholesalers). One could then infer that the apparel trade margin rate could be applied successfully to all sales of apparel, regardless of wholesaler, to obtain the

trade margin for apparel. In practice, the trade margins do not corroborate with each other and the BEA staff adjusts the margin rates for commodity lines and kinds of business until they are harmonized. In the case of apparel, this resulted in an increase of about 22.7 percent in the wholesale trade margin for apparel from \$17,341 million to \$21,286 million.

In the case of apparel, commodity and wholesale taxes take the form of sales taxes. Based on unpublished data from the 1992 ATS, Census Bureau analysts determine a tax rate for sales by merchant wholesalers and apply that rate to sales receipts of merchant wholesalers and manufacturers' sales branches. All told these taxes amounted to \$163 million in 1992.

The process of moving apparel from producer to wholesaler to retailer imposes transportation costs that augment the total output value of apparel. Air, truck, and rail are the three modes of transportation used to convey apparel. Data on air transit costs come from the Department of Transportation's Air Carrier Financial Statistics publication. The Census Bureau conducted the 1992 Census of Transportation, Communications, and Utilities which serves as the source for shipping charges of apparel by truck. The now-defunct Interstate Commerce Commission provided data on freight costs charged by railroads. Total transportation costs for apparel from the three modes came to \$3,369 million.

Data limitations also affect the computation of retail trade margins. Data are available to calculate overall retail trade margins by type of outlet, such as hardware stores, grocery stores, and auto dealers, but not by merchandise lines, such as apparel, within each outlet. As a result, the BEA staff applies many of the same procedures used to calculate wholesale trade margins to obtain retail trade margin for products and services.

While clothing stores do sell other products and services, their main product line is apparel. Thus, the first step the BEA staff takes in estimating the retail trade margin for sales of apparel is to calculate the retail trade margin for sales at clothing stores and derive the margin rate. They divide clothing stores into types: men's and boys' clothing and accessory stores, women's clothing stores, women's accessory and specialty stores, family clothing stores, shoe stores, children's and infants' wear stores, and miscellaneous apparel and accessory stores. The BEA staff uses available retail trade data to compute this margin rate. In addition to clothing stores, other outlets sell apparel, including department stores, warehouse clubs, and sporting goods stores. While retail trade margins cannot be calculated for apparel sold by these outlets, receipts from such sales are available. As in the case of wholesale trade margins, an initial estimate of the retail trade margin for apparel sold at each of these outlets is approximated by applying the shoe store margin rate to each outlet's sales receipts.

Apparel is just one of many merchandise lines sold by department stores, clothing stores, and other apparel sellers. For each of these merchandise lines, trade margins are calculated in a similar manner to apparel. The trade margins for all merchandise lines sold in department stores, clothing stores, and other retail outlets are then combined to get an estimated gross trade margin for each type of outlet. For example, the trade margin for department stores would combine trade margins for merchandise lines like household textiles, appliances, and cosmetics, as well as apparel. A direct estimate of the retail trade margin for these alternative outlets can be computed from the same data that produced the trade margin estimate for clothing stores.

Again, the retail trade margin derived by summing the merchandise line margins theoretically should equal the retail trade margin that is directly estimated. In practice, this does not occur. As a result, the BEA staff adjusts the margins for each merchandise line in an exhaustive iterative process to reconcile with the direct estimate for each type of outlet. The BEA staff tries to insure that the trade margin rates for a product across the types of outlets in which it is sold are reasonable.

The calculation of retail trade margin for apparel begins with the cost of goods purchased by clothing stores. According to the 1992 Annual Retail Trade Survey (ARTS), clothing stores purchased \$61,524 million of apparel. As with the computation of wholesale trade margin, misreporting adjustments are made by the BEA staff, adding \$703 million to the cost of goods, yielding a total of \$62,227 million. Apparel stores reported receipts of \$104,212 million from sales. Another \$1,266 million is added to this amount for misreporting adjustments, so that apparel sales receipts total \$105,478 million. Thus the retail trade margin for apparel stores prior to adjustments for inventory change equals \$43,251 million. The value of apparel inventories in clothing stores rose by \$1,734 million between the beginning and end of 1992, increasing the retail trade margin to \$44,985 million. The BEA staff makes a set of adjustments that allocate a portion of the retail sales receipts to services and other commodities that are provided by apparel outlets. Retail receipts of \$434 million for custom-made garments are distributed among various apparel categories. Labor charges for alterations and garment construction done by apparel stores and other nonmerchandise receipts for services resold by women's accessory and specialty stores are allocated receipts of \$190 million. Rental of formal wear receives \$111 million of retail receipts. \$23 million of is allocated to miscellaneous merchandise and other nonmerchandise receipts of nonmargin trucking and courier services. Shoe repair services are apportioned \$9 million of nonmerchandise receipts. These allocations total \$767 million, dropping the retail margin to \$44,218 million. Finally, an adjustment is made to the cost of goods to account for the cost of custom-made garments sold in apparel stores and the cost of nonmerchandise services received by women's accessory and specialty stores. This adjustment decreases the cost of goods sold by \$249 million and increases the final trade margin to \$44,467 million. Based on the trade margin and applicable sales receipts, the trade margin rate for apparel equals 41.77 percent.

According to the 1992 Census of Retail Trade, apparel sales at clothing and accessory stores represented 50.29 percent of total apparel sales. If the trade margin rate at these outlets were applied to sales at other outlets, the trade margin for these outlets would equal \$39,772 million, yielding a total retail trade margin for apparel of \$84,239 million. The BEA staff reported a final apparel retail trade margin of \$84,860 million for the 1992 benchmark estimate, over 99 percent of the margin calculated by applying the apparel store margin rate to all sales. This implies that the BEA staff revised the margin rate slightly upward for sales at other outlets.

Retail sales taxes are the final item going into the total value of apparel. The process to determine these taxes mirrors the procedure to obtain retail trade margin, simply substituting tax rate for margin rate. The Census Bureau provides sales tax rates, that is, sales taxes as a percentage of sales, to the BEA staff by type of business from unpublished data in the 1993 ARTS. The average sales tax rate for apparel stores is considered the most appropriate rate with

which to begin. Taxes of \$5,033 million are estimated from the \$106,445 million in adjusted sales receipts reported from apparel stores, yielding a tax rate of about 4.7 percent. Applying this rate to retail apparel sales in other outlets would add about \$4,475 million to the retail taxes total. This estimate of \$9,508 million in sales taxes is 5.4 percent lower than the \$10,051 million actually apportioned by the BEA staff to apparel, implying a higher tax rate on sales by other outlets. The grand total for the purchasers' value of all the components of apparel output is \$238,498 million.

Having determined the total value of apparel output in 1992, that output is then distributed among the various intermediate and end uses of apparel. Table 9 identifies these uses and shows the amount of the purchasers' value allocated to each one.

Table 9. Amount of Purchasers' Value Allocated by Group, 1992

Group	Millions of 1992 dollars	
	Total	\$238,844
Exports		\$7,037
Intermediate production		12,557
Government purchases		2,713
Inventory change		4,845
Gross private fixed investment		-126
Unallocated output		345
PCE Clocks, Lamps, & Artwork		46
PCE Sporting Equipment		6
PCE Vehicle Accessories & Parts		-148
PCE Jewelry & Watches		-765
PCE Lighting Supplies		120
PCE Other Personal Hygiene Products		97
PCE Food in Off-Premise Food Purchases		-721
PCE Magazines		-295
PCE Laundry & Garment Repair		571
PCE Semi-durable House furnishings		48
PCE Military Clothing		230
PCE Sewing Goods for Men		25
PCE Apparel		212,259

First, there are exports. Second, there is intermediate production or output that will undergo further processing, or more precisely, will have value added before reaching its final use. Next, there are purchases by government at all levels. Changes in the value of inventories at the intermediate goods, wholesale, and retail stages comprise the next group. Finally, there is personal consumption. Apparel output is distributed to a number of PCE categories other than PCE Apparel. Personal consumption is not directly estimated, but instead represents the residual output after allocations are made to the other groups. These allocations are based on direct estimates of apparel use.

Many of the PCE categories display negative allocations of purchasers' value which would seem to be illogical. They arise because of the way BEA treats an anomalous category of scrap other than ferrous. This category also affects exports and intermediate consumption. The negative allocations represent the value of sales of scrap, such as scrap paper, scrap grease, and scrap cloth, from PCE categories. For example, the PCE Magazines group shows sales of \$295 million, estimating the value of recycled newspapers and magazines from households. (The recycled paper finds its way into the production of paper products, such as cups and greeting cards.) Other non-apparel PCE categories also appear in this table due to another anomalous item – miscellaneous fabricated products, not elsewhere classified, not specified by kind. While most items that contribute to total apparel output are primarily apparel oriented, such as men's finished hosiery and women's, misses' and juniors' dresses, this item encompasses a collection of disparate items, such as toupees, umbrellas, lamp shades, and furs. Only a small portion of its output is allocated to PCE Apparel. A variation of this theme is exemplified by another item contributing to apparel output – alterations and garment construction. While this is clearly an apparel-oriented item, the distinction here is between apparel goods and apparel services. Data for this item comes from the Census of Service Industries, so that most of its output consists of alteration and garment construction services. These establishments do produce some output that is directly allocated to apparel items.

As in the case of apparel imports, the basic value of exported apparel is generated from internal merchandise trade data from the Census Bureau provided to BEA's Balance of Payments Division. This was pegged at \$5,422 million. The wholesale trade margin associated with services supplied by wholesalers in getting apparel from the factory to the point of foreign shipment was valued at \$1,257 million. Last, but not least, the transportation services used to physically move apparel from producer to wholesaler to point of foreign shipment came to \$356 million. Commodity and wholesale taxes of \$2 million were levied on apparel destined for export. Thus, the total allocated to exports was \$7,037 million.

The values of intermediate production and associated costs were concentrated in scrap other than ferrous. The basic value of apparel apportioned to intermediate production equaled \$6,702 million. Wholesale margins and transportation costs associated with the distribution of apparel stock to intermediate producers came to \$5,826 million. A total of \$29 million in commodity and wholesale taxes were also added, bringing the total allocation for intermediate production to \$12,557 million.

Governments at all levels also make purchases of apparel. The BEA staff obtains data from the Government Division at BEA showing aggregate expenditures made by governmental entities, such as correctional facilities and schools, and apportions some of the apparel output to these purchases. Overall, government purchases came to \$2,713 million, which consisted of \$2,232 million in basic value, \$476 million in wholesale margins and transportation costs, and \$5 million in commodity and wholesale taxes.

Some apparel output does not reach its next destination after production and ends up being stored as inventory by intermediate goods producers, wholesalers, and retailers. During the course of the year, some previously-held inventory moves to its next user, so the BEA staff

examines the change in the value of these inventories between the beginning and end of the year. Any net increase in the value of inventories indicates some of the apparel produced during the year is now being stored and should be claimed as use of current output. The increase in the basic value of apparel inventories held totaled \$4,145 million. Wholesale margin attributed to end-of-year inventories was \$619 million higher than beginning-of-year inventories. Transportation costs and commodity and wholesale taxes on year-end inventories were \$73 million and \$8 million higher respectively than inventories at the beginning of 1992. All told, changes in inventories were apportioned \$4,845 million of total apparel output.

Gross private fixed investment also receives a portion of output, solely from the two anomalous categories contributing to total apparel – nonferrous scrap and miscellaneous fabricated products. The basic value is \$-337 million, a reflection of the greater value of reallocated scrap compared to fabricated products. All wholesale trade margin, transportation costs and commodity and wholesale taxes issue from fabricated products and total \$151 million, \$54 million, and \$6 million respectively. This yields a net final purchasers' value of \$-126 million.

There is also a portion of the total output that the BEA staff cannot allocate to a particular user. Because this output has to be considered when constructing the input-output accounts, it is put in what is termed a balancing record. The unallocated output came from boot and shoe cut stock and findings if footwear and apparel belts, not specified by kind in men's and women's clothing. The basic value of this output was \$290 million. Adding a wholesale margin of \$35 million, transportation costs of \$18 million, and commodity and wholesale taxes of \$2 million the total value of unallocated boot and shoe cut stock and findings summed to \$345 million.

The remainder of the purchasers' value of apparel is allocated to PCE. One final set of allocations is made before arriving at the final PCE apparel number that is comparable to CE apparel. The allocations to PCE Sporting Equipment, PCE Lighting Supplies, PCE Other Personal Hygiene Products, and PCE Sewing Goods for Men originate from the miscellaneous fabricated products category. PCE Clocks, Lamps, & Artwork is allocated output from the fabricated products item and from the handling charges and other miscellaneous nonmerchandise receipts for catalog and mail order houses referenced earlier as an adjustment to the value of shipments. Nonferrous scrap accounts for the negative purchasers' values displayed by PCE Vehicle Accessories & Parts, PCE Jewelry & Watches, PCE Food in Off-Premise Food Purchases, and PCE Magazines. The allocation to PCE Laundry & Garment Repair reflects the output from the alterations and garment construction item noted earlier. PCE Semi-durable House furnishings receive output from the miscellaneous fabricated products item and an item for finished straw hats, wool-felt & fur-felt hats and millinery. Finally, the U. S. armed forces purchase apparel, which is captured by the Government Division at BEA in a military clothing allowance. The apparel portion of that allowance was estimated to be \$230 million, consisting of a basic value of \$205 million with an additional wholesale margin of \$25 million. The total value of military apparel was assigned to the PCE category of military clothing.

After making these allocations, the total value of PCE (non-military) apparel can be determined. The residual basic value of apparel came to \$101,570 million. The remaining wholesale margin added another \$14,941million. Transportation costs for PCE-allocated apparel

equaled \$849 million. A significant amount of commodity and wholesale taxes fell to PCE apparel, totaling \$100 million. Because virtually all retail sales are directed to personal consumption, a preponderant amount of retail margin and retail taxes redound to PCE apparel. Together these added \$94,799 million to the total. In sum, PCE apparel was valued at \$212,259 million in 1992.

c. Evaluation of CE and PCE Estimates

Having derived estimates of apparel expenditures from the CE and PCE, it is now appropriate to evaluate the quality of these estimates. A natural approach is to start by calculating standard statistical measures, such as standard errors and 95% confidence intervals, for the estimates.

1) Standard Errors and Confidence Intervals

a) CE Estimates

A pseudo replication technique is chosen to produce variances and standard errors in the CE because it is accurate and simple to understand. Forty four artificial "subsamples" can be created from the original sample data through replicate weight variables such that the variance information of the original data is preserved. These subsamples can be more accurately described as half-samples, since only half of the CU's are assigned to each of the 44 replicates. An estimate for the variance of aggregate expenditures for total apparel (and other component categories of apparel, such as women's and girls' clothing) can be computed by generating 44 separate estimates using the 44 replicate weights and employing the standard formula for computing sample variance. Deriving standard errors and 95% confidence intervals from the variance is straightforward.

Aggregate spending for total apparel for 1992 was estimated at \$143,970 million. Employing the methodology described above, the standard error of this estimate is \$4,598 million. The 95% confidence interval around the estimate can be computed from the standard error. Based on this calculation, one can assume with 95% certainty that the true estimate for total apparel expenditures in the CE is between \$134,958 million and \$152,982 million.

b) PCE Estimates

Because the PCE is compiled from numerous different sources, creating standard errors and confidence intervals is too complicated a process. The BEA has its own system of assigning confidence to the PCE statistics. For each transaction, its basic value is given a Quality ID from 1 (highest quality, most confidence) to 3 by the BEA. In the specific case of apparel, a Quality ID of 1, in general, indicates that the value was taken directly from the data source, often found in a published tabulation in the Census of Manufactures. Adjustments for misreporting and estimates of non-employer receipts from IRS data are examples of apparel transactions assigned a Quality ID of 2. A Quality ID of 3 is received by the values estimated for the secondary production adjustment and for the handling charges and other miscellaneous non-merchandise receipts for catalog and mail order houses. Based on these determinants, the overall quality of

PCE's Apparel numbers was high. Ninety-eight percent of the basic value was derived from transactions with Quality ID 1, 1 percent with Quality ID 2, and 1 percent with Quality ID 3.

2) Expert Judgment

In determining the PCE numbers, the BEA uses a lot of “expert judgment”. The estimation of wholesale and retail trade margins are good examples of the application of expert judgment by BEA. These judgments could affect the PCE aggregate estimates and consequently affect the ratio of CE to PCE estimates. At the same time, the CE’s expert judgment, which comes in the form of allocations and imputations, or a combination of both, could affect the accuracy of the CE numbers, further contributing to the differences between the CE and PCE estimates.

Some of the expert judgment involved in allocation and imputation concerns the choice of methods used by the CE to do each. For allocation in the apparel section, the CE uses both allocation using fixed ratios (used primarily for infants clothing and for items taken from the diary) and allocation using probability distribution ratios (used for men’s and women’s apparel and footwear). The allocations are based on weighted expenditure. For allocation (using the probability distribution method), the process takes a combined expenditure (for instance, “clothing”), the combined expenditure then get dispersed among a smaller subgroup of items (for instance: shirts, pants, jackets) selected based on the probability of those items being purchased. One assumption made is that the expenditures collected will accurately represent the distribution of the population. Part of the expert judgment is also to base allocations on weighted expenditures as opposed to weighted items.

Though one might infer that allocation procedures could have a significant influence on aggregate apparel since over 14 percent of the apparel estimate is a product of allocation, their actual influence is probably much less. Because this comparison is done at the major category of apparel, any allocations involving specific combinations or generic categories of apparel will not affect the aggregate value of total apparel in the CE. Regardless of the method employed, allocation of a reported expenditure for ‘shirt and pants’ or for ‘clothing’ will result in expenditures for items that properly belong in the apparel category anyway. The only instances where allocation might have an impact on the apparel estimate is where the combined expense includes both apparel and non-apparel items, for example, ‘shirt and toaster’ or ‘clothing and food’. Typically, combined expenses subject to allocation to apparel items consist only of apparel items, thus the impact of allocation on CE apparel estimates is quite small.

For imputation of missing apparel expenditures, the CE uses the hot-deck imputation method. Basically, for hot deck imputation, if a value is missing that should be there for a CU (CU 1), then another CU (CU 2) is chosen based on a list of demographic characteristics that match the first CU. The value that is missing for CU 1 is then copied from CU 2. Many assumptions go into this method, which the CE accepts as part of their expert judgment. First, the assumption is made that the matching variables will identify a CU that will be a good proxy for CU 1. Just because many of the characteristics between CUs are the same, does it mean that they will actually spend the same way? Assuming that by choosing similar characteristics, a good estimate of consumer expenditure follows, the next assumption is that the variables chosen to match the Cus are the appropriate ones. Perhaps other variables would be a better indicator of

the types of expenditures that Cus make. Another consideration that is made by the CE is that often times there are not enough observations when the chosen characteristics are matched. In this situation, one of the variables used to match the Cus is dropped to find an observation that matches best. The CE assumes that this method will still provide the best estimate for the missing expenditure.

In the case of apparel, imputation procedures have virtually no impact on the CE estimate as only 0.2% of the aggregate is a result of imputation. Imputation procedures would have to be off by a factor of 50 just to effect a 10 percent change in the estimate, and it's unlikely that the imputation methodology would yield results that far off.

3) Difference in Content of Component Categories

Another potential source for the difference in CE and PCE apparel estimates is the existence of differences in the content of component categories that comprise apparel. Among the reasons apparel was chosen as the first category for which we would conduct a comprehensive analysis was the relative homogeneity of the component items in apparel. Shirts, coats, and nightwear are items that appear to be conceptually similar for the CE and PCE. Appendix __ presents detailed definitions of the component items that comprise the CE and PCE apparel universes. A high percentage of the CE and PCE estimates are based on comparably defined apparel items.

The analysis did uncover some component items whose content differed between the CE and PCE. Athletic footwear for sports-related use, such as football and soccer cleats, is included in footwear in the PCE, while the CE assigns such footwear to recreation. It is not possible to isolate these expenditures in either the CE or PCE to adjust aggregate apparel expenditures.

Another example of apparently different definitions is the category of umbrellas, parasols, and canes. It appears from the Census of Manufactures that this includes all types of umbrellas. Purchasers' value apportioned to PCE is assigned to either men's and boys' clothing or women's and girls' clothing. In the CE, however, umbrella expenditures can be assigned to two and possibly three categories. If the expenditure is reported as a clothing accessory, it will be counted with apparel. If it is a patio umbrella, it will be classified as outdoor equipment and assigned to a category in durables. If a golf umbrella is purchased, potentially it can be reported as either a clothing accessory or as general sports equipment with golf clubs and golf balls. In the former instance, the expenditure would be assigned to apparel; in the latter, it would go to recreation.

As a final example, PCE includes in footwear a portion of the purchasers' value for boot and shoe cut stock and findings. This category consists of materials for making shoes. The purchasers' value allocated to PCE probably represents materials used for repairing shoes and other footwear. The CE does not include such a category in footwear and it is likely that respondents include such expenditures in reports of purchasing shoe repair services.

4) Proxy Response

Aggregate CE apparel estimates are about 2/3 of PCE apparel estimates in 1992 – a differential of over \$68 billion. Differences in the definition of component categories of apparel between the CE and PCE are relatively inconsequential in accounting for the difference. CE expert judgment reflected by allocation and imputation procedures also has little impact on the difference. If the true CE estimate was at the upper end of the confidence interval, the gap between the CE and PCE would narrow by about \$9 billion. If the true wholesale and retail trade margins calculated by BEA were actually the lower of the ones mentioned above – \$17.34 billion for wholesale trade and \$84.24 billion for retail trade – the differential between CE and PCE would be reduced by another \$4.5 billion. This would still leave a difference of over \$55 billion between the CE and PCE apparel estimates.

One potential reason for the lower CE estimates is proxy response. Data are collected from typically one, but sometimes more than one, individual for the entire CU. This respondent can mis-report in a number of ways. The respondent may be unaware of all the apparel items purchased by other CU members. The respondent may under-report the actual amount paid for apparel items for personal reasons or due to recall or other errors. This may apply to both apparel items purchased by the respondent personally and apparel items purchased by other CU members. Examining the impact of proxy response and determining ways to remedy it may be a fruitful area for research in the CE.

V. Ongoing Research

A number of research projects are underway to improve the quality of the expenditure estimates from the CE. These projects focus on alternative methods of data collection that show promise in obtaining more accurate data from respondents. A major initiative about to be introduced next month is the replacement of paper-and-pencil data collection in the Interview Survey with a CAPI system. Research has begun to determine whether expenditure estimates based on responses to global questions for categories such as food at home are superior to those based on the sum of responses to detailed questions for the component items of those categories. One project being conducted examines expenditure data collected by electronic scanner from A.C. Nielsen to determine their potential use in improving data processing procedures and in supplementing data collected in the Diary survey. Another project involves redesigning the Diary Survey collection instrument to produce a more user-friendly diary that will elicit better recordkeeping by respondents. The efficacy of parents as proxy reporters of their children's expenditures is the subject of a research contract with the Joint Program in Survey Methodology of the University of Michigan, the University of Maryland, and Westat. Finally, the National Opinion Research Corporation has been contracted to investigate the feasibility of fielding multiple member diaries instead of the single diary currently employed.

VI. Summary, Recommendations, and Questions

The CE and PCE provide estimates of personal consumption expenditures. However differences (e.g., populations, concepts, operational approach) in the two result in the production of different estimates of aggregate expenditures. The CE directly collects expenditures from households and covers the non-institutional population, while the PCE is an indirect measure of

consumption expenditures for a larger population, with expenditure “accuracy depending on the expert handling of every piece”²⁴ of the PCE. As noted by Key (2003), “the internal consistency enforced by the accounting framework [in the National Accounts] limits inaccuracy.”²⁵ While some CE estimates are likely to suffer from proxy reporting (e.g., suspected for apparel and private health insurance) and occasional lying about certain products (e.g., tobacco and alcohol), many estimates are considered to be of quite high quality (e.g., new automobiles, housing dwelling services, gasoline). A sizable proportion of households participating in the CE use records. PCE aggregates are expected to be better for some items than others. For benchmark year estimates, the majority of estimates for the PCE are based on the commodity flow method with expenditures for households the residual after expenditures for businesses and government are determined. Between benchmark years, estimates depend heavily on methods of interpolation, extrapolation, and expert judgment. Unlike for the CE for which standard errors of estimates can be derived, currently there is no way to quantitatively assess the quality of the PCE benchmark data. We were not able to obtain standard errors for the Retail Trade Survey data from the BEA either as a way to determine the quality of the between benchmark year PCE estimates. We were also not able to determine, with a degree of significant accuracy, the impact of aggregate expenditures being based on a larger population in the PCE as compared to the CE. For example, the military personnel living on base and overseas as are employees of U.S. companies and government personnel are included in the PCE population and not the CE

Even after controlling for as many differences in the two data sources as possible, differences remain. For example, the ratio of CE to PCE aggregate expenditures in 1992 was 0.89. By the year 2000, the ratio dropped to 0.80. Whether the drop in ratio is based on PCE inappropriately allocating too much to households is a question and whether retail sales figures, a major source of data for the PCE, do not capture growth.²⁶ However, without continued examination of both the CE and PCE data, the puzzle of why differences in the CE and PCE exist and why the trend is decreasing over time will remain. We recommend that the schematic presented for the years 1997 and 2000 be reproduced using the 1997 benchmark expenditures to in part determine if between year benchmark years contribute substantially to the quantitative differences in the CE and PCE.

Part of the challenge in conducting the comparison was trying to fit the CE data into the PCE product-by-type classification scheme, rather than fitting PCE data into the scheme used by the CE. If the PCE product-by-type classification scheme is a desirable one to be applied to the CE, such a scheme would have major implications for data collection and processing as now CE data cannot fully be allocated into durable, non-durable, and services categories. If such a scheme is preferred, new UCCs would be needed. Also various questions in the CE instruments would need to be asked differently to elicit responses distinguishing services from durables (e.g., what part of carpet installation is for labor and which for the carpet itself). The fact that the CE items cannot readily be allocated to durables, non-durables, and services has plagued users of

²⁴ Email communication from Key (2003) from the BEA.

²⁵ *Ibid.*

²⁶ Comment from attendees at the Princeton University conference on consumer expenditure surveys (1998).

these data, especially when making comparisons to PCE estimates. This is a problem noted by Slesnick (1992, 1998) and Triplett (1997) among other researchers.²⁷

This report is the result of cooperation between the BEA and BLS; however, further cooperation is needed in order to understand remaining differences in the PCE and CE. Major reasons for differences in expenditures include population coverage differences, and in methods used to determine household expenditures. We recommend that a detailed examination of the PCE be conducted to identify PCE estimates expenditures made by households, separating out those made on behalf of households (e.g., as those made by third party payers and non-profits serving households). Particular attention should be given to how the BEA allocates the share of household purchased items that are used for personal business (e.g., personal computers and software). At the same time, the BLS will continue to engage in data collection efforts to improve data quality, and will conduct comparisons with data from other sources.

Questions for BEA to address are presented below.

1. How can the impact of interpolation, imputation, and expert judgment in the PCE be assessed for their impact on expenditure levels and data quality in general for benchmark and between benchmark years?
2. What is the degree of difference in benchmark and between benchmark year estimates due to interpolation, imputation, and expert judgment?
3. How does the PCE determine the share of certain expenditures for households, rather than business or government use? Does the procedure result in PCE aggregates that are too high for home computers? How does the PCE determine what percentage of home computer purchases are for business versus personal household use? Is the BEA allocating too little to business for computers so the household sector is allocated too much?
4. How can the accuracy of the BEA method for estimating owner's equivalent rent be assessed?
5. What is the quantitative impact on PCE aggregate expenditure of including non-profits serving households, military personnel living on based and overseas, and other people living overseas while working for U.S. government and businesses in the PCE population?
6. How are the expenditures made by foreign tourists determined in the PCE?

²⁷ Many other individuals have also expressed this concern, for example, attendees at consumer expenditures survey workshops and seminars such as the NBER workshop (2002) and the Princeton University conference (1998). The National Research Council (2002) stated that the "imperfectly matched expenditures classification creates a major hurdle to producing a PCE-weighted CPI..." which is based on the CE (p. 156). Attendees at the Princeton conference and Parker (2000), during the BLS CE-CPI conference, noted that the CE, CPI, and PCE all use difference classification schemes, none of which conform to international standards. Many recommended following international standards for classification.

In conclusion, several questions are posed to Federal Economic Statistics Advisory Committee (FESAC).

1. Many of the issues in comparing the CE and PCE data arose because of the different classification schemes used. Is one classification scheme more effective than the other?
2. Are there suggestions for ways to quantify the level of measurement error in the PCE and to determine whether differences in PCE and CE expenditures are statistically significant?
3. How would we decide whether the CE estimates should be augmented with data from other sources, such as scanner data,²⁸ or the PCE?²⁹

²⁸ Preliminary examination of AC Nielsen household scanner data for purchases of alcohol for off-premises consumption and for tobacco and accessories are substantially lower than those from the CE. Using AC Nielsen household scanner data from the year 2000, Keil (2003) reports aggregate alcoholic beverage expenditures to be \$11.5 billion and tobacco and accessories expenditures to be \$12.9 billion. Comparable figures from the CE are \$24.8 billion for alcohol and \$34.6 for tobacco and accessories. Thus, household scanner data that are currently available are an unlikely alternative to augment CE data.

²⁹ If PCE estimates were substituted for various commodity groups in the CE, it is not clear how PCE expenditure estimates would be allocated across socio-demographic groups in the CE. Use PCE data, rather than CE data for certain items, has important implications for the CPI as well if price indexes for demographic groups are produced (CPIs for elderly consumers are produced using CE data as starting point for CPI weights and population distributions. See Amble and Stewart (1994) and Garner and Stewart (2002) for descriptions and discussions regarding the index for the elderly. Indexes for the elderly have been produced and are available upon request from the BLS. Indexes from December 1982 through January 2003 are available.

References

- Amble, Nathan and Kenneth J. Stewart (1994), "Experimental Price Index for Elderly Consumers," *Monthly Labor Review*, May, pp. 11-16.
- Bosworth, Barry, Gary Burtless, and John Sabelhaus (1991), "The Decline in Saving: Evidence from Household Surveys," *Brookings Papers on Economic Activity*, Vol 1991, Issue 1, pp. 183-241.
- Branch, Raphael (1987), "Comparing Medical Care Expenditures of Two Diverse U.S. Data Sources," *Monthly Labor Review*, March, pp.15-18.
- Branch, Raphael (1994), "The Consumer Expenditure Survey: A Comparative Analysis," *Monthly Labor Review*, December, pp.46-55.
- Bureau of the Census, Economics and Statistics Administration (1994), *1990 Census of Housing Residential Finance*, 1990 CH-4-1, U.S. Department of Commerce, U. S. Government Printing Office, Washington, D.C.
- Bureau of the Census (2001), Residential Finance Survey website, July 31.
- Bureau of Economic Analysis (1990), *Personal Consumption Expenditures*, Methodology Paper Series MP-6: U.S. National Income and Product Accounts, U.S. Department of Commerce, U.S. Government Printing Office, Washington, D.C., June.
- Bureau of Economic Analysis (2002), "NIWD PCE Bridge to 1992 Input-Output Table," unpublished data, sent by Greg Key to William D. Passero of BLS on March 19.
- Bureau of Labor Statistics (1997a), *BLS Handbook of Methods*, Bulletin 2490, U.S. Department of Labor, U.S. Government Printing Office, Washington, D.C., April.
- Bureau of Labor Statistics (1995), *Consumer Expenditure Survey 1992-93*, Bulletin 2462, U.S. Department of Labor, U.S. Government Printing Office, Washington, D.C., September.
- Bureau of Labor Statistics, (1997b), *Consumer Expenditure Survey 1994-95*, Bulletin 2492, U.S. Department of Labor, U.S. Government Printing Office, Washington, D.C., December.
- Bureau of Labor Statistics (1999), *Consumer Expenditure Survey 1996-97*, Report 935, U.S. Department of Labor, U.S. Government Printing Office, Washington, D.C., September.
- Bureau of Labor Statistics (2001a), *Consumer Expenditure Survey 1998-99*, Report 955, U.S. Department of Labor, U.S. Government Printing Office, Washington, D.C., November.
- Bureau of Labor Statistics (2000a), Consumer Price Index, Table 1 (1999-2000 Weights). Relative Importance of Components in the Consumer Price Indexes: U.S. City Average, December 2002. BLS web site, August.

Bureau of Labor Statistics (2000b), Issues in Measuring Price Change and Consumption Conference, Washington, D.C., June 5-8.

Bureau of Labor Statistics (1991), Quarterly Interview Survey 1991 Forms, Consumer Expenditure Survey, CE-300(P91), 4-1-91.

Bureau of Labor Statistics (2001b), Quarterly Interview Survey 2001 Forms, Consumer Expenditure Survey, CE-300/302, 4-1-2001.

Carson, Carol S. (1987), "GNP: An Overview of Source Data and Estimating Methods," *Survey of Current Business*, Vol. 67, pp. 103-127.

Council of Professional Associations on Federal Statistics (2000), Statistical Policy Seminar: "Integrating Federal Statistical Information Processes," Washington, D.C., November.

Fernandez-Villarverde, Jesus and Dirk Krueger (2002), "Consumption over the Life Cycle: Some Facts from Consumer Expenditure Survey Data," NBER Working Paper 9382, December.

Fixler, Dennis and Ted Jaditz (2002), "An Examination of the Difference Between the CPI and the PCE Deflator," Bureau of Labor Statistics Working Paper 361, Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C.

Garner, Thesia I. and Bill Passero (2001), "Out-of-Pocket Expenditures for Private Health Insurance: An Analysis of Consumer Expenditure Survey and Medical Expenditure Panel Survey Data," mimeo, available from the Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C., June 1.

Garner, Thesia I. and Kathleen Short (2001), "Owner-Occupied Shelter in Experimental Poverty Measurement with a 'Look' at Inequality and Poverty Rates," paper presented at the Annual Meeting of the Southern Economics Association, Tampa, Florida, November.

Garner, Thesia I. and Stewart, Kenneth J. (2002), "Consumer Price Index and COLAs" in David J. Ekerdt, ed., *Encyclopedia of Aging*, Macmillan Reference USA, an Imprint of the Gale Group, New York.

General Accounting Office (1996), "Alternative Poverty Measures," GAO/GGD-96-183R, Washington, D.C., Government Printing Office.

Gieseeman, Raymond (1987), "The Consumer Expenditure Survey: Quality Control by Comparative Analysis," *Monthly Labor Review*, March, pp.8-14.

Houthakker, Henrik S., and Lester D. Taylor (1970), *Consumer Demand in the United States: Analyses and Projections*, 2nd edition, Harvard University Press, Cambridge, MA.

Johnson, David S. and John Greenlees (2003), presentation before FESAC on a “Comparison of Movements in the CPI and PCE Price Indexes,” Bureau of Labor Statistics, U.S. Department of Labor, March 21.

Keil, Eric (2003), unpublished aggregate expenditures based on AC Nielsen household scanner data for alcoholic beverages and tobacco and tobacco accessories, Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C., March 11.

Key, Greg (2003), of the Bureau of Economic Analysis, email communication March 5 sent to David S. Johnson of BLS, Washington, D.C.

Landefeld, J. Steven S. (2000), comments during the BLS “Issues in Measuring Price Change and Consumption Conference,” Washington, D.C., June 5-8.

Lebow, David (2000), email communication with John Greenlees, BLS, concerning CPI weights based on the CE, February 8.

Lebow, David E. and Jeremy B. Rudd (2000), “Measurement Error in the Consumer Price Index: Where Do We Stand?” *Journal of Economic Literature*, Vol. XLI, March, pp.159-201.

McCully, Clint (2000) of the Bureau of Economic Analysis, “Presentation on PCE to the CE Staff,” Bureau of Economic Analysis, Washington, D.C., April 19.

Mead, Charles Ian (2002), “Separate Recognition of Income and Outlays of Nonprofit Institutions Serving Households,” mimeo available from the Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C.

National Bureau of Economic Research (2002), Conference on Research in Income and Wealth (CRIW) Consumer Expenditure Survey Research summer workshop, presentations by Thesia I. Garner, David S. Johnson, William D. Passero, and Mary McCarthy, Cambridge, Mass., July 22-23.

Parker, Jonathan A. and Christian Julliard (2003), “Consumption Risk and Cross-Sectional Returns,” mimeo available from Parker and Julliard, Princeton University, Princeton, New Jersey, March.

Parker, Robert (2000), comments presented during the Panel Discussion on “The role of household expenditure surveys in measuring consumption,” during the BLS “Issues in Measuring Price Change and Consumption Conference,” June 5-8.

Pollard, Thomas (2000), “CE to PCE Comparison Methodology,” mimeo available from the Bureau of Labor Statistics, Washington, D.C., July 10.

Princeton University (1998), Current and Future Developments in the Consumer Expenditure Survey Conference, Princeton, New Jersey, May 19-20, 1998.

National Research Council (2002), *At What Price? Conceptualizing and Measuring Cost-of-Living and Price Indexes*, Panel on Conceptual, Measurement, and Other Statistical Issues in Developing Cost-of-Living Indexes, Charles, L. Schultze and Christopher Mackie , editors, Committee on National Statistics, Division of Behavioral and Social Sciences and Education, Washington, D.C., National Academy Press.

Ravallion, Martin (2001), "Measuring Aggregate Welfare in Developing Countries," Policy Research Working Paper 2665, The World Bank Development Research Group, Poverty, August.

Savage, Howard (2003), telephone communication regarding 1991 Residential Finance Survey sample, Bureau of Census, Washington, D.C.

Slesnick, Daniel T. (1992), "Aggregate Consumption and Saving in the Postwar United States," *The Review of Economics and Statistics*, Vol. 74, Issue 4 (Nov.), pp.585-597.

Slesnick, Daniel T. (1998), "Are Our Data Relevant to the Theory? The Case of Aggregate Consumption," *Journal of Business and Economic Statistics*, January, Vol. 16, No. 1, pp. 52-61.

Smith, George, email communication regarding Personal Consumption Expenditure estimates of owners' imputed rent for the National Accounts, July 31-August 14, 2001.

Smith, George, oral communication regarding Personal Consumption Expenditure estimates of owner-occupied non-farm dwellings and the rental value of farm dwellings, February 10, 2003.

Triplett, Jack E. (1997), "Measuring Consumption: The Post-1973 Slowdown and the Research Issues," *Federal Reserve Bank of St. Louis Review*, May/June, 79(3), pp. 9-42.

U.S. Department of Commerce (Commerce) and U.S. Department of Housing and Urban Development (1993), *American Housing Survey for the United States in 1991*, Current Housing Reports, H150/91, Bureau of the Census, U.S. Government Printing Office, Washington, D.C.

Wilcox, David W. (1992), "The Construction of U.S. Consumption Data: Some Facts and Their Implications for Empirical Work," *The American Economic Review*, Vol. 82, Issue 4 (September), pp. 922-941.

Wilcox, Ernie (2000) of the Bureau of Economic Analysis, email communication November 2 with Thesia I. Garner, BLS, Washington, D.C.

Appendix A. Summary of Sources That Are Compared with CE

PCE: The principal source of independent estimates used in conjunction with the CE is the Personal Consumption Expenditures component of the National Income and Product Accounts produced by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. The PCE measures the market value of goods and services purchased by the “personal sector,” one of the four sectors covered in the national accounts. The personal sector consists of “persons resident” in the United States, where persons is defined as individual and the nonprofit institutions that serve them. PCE estimates of aggregate expenditures represent the market value of goods and services purchased by all persons. BEA conducts comprehensive revisions of the NIPA at 5-year intervals, primarily to update the series with new results from the Census Bureau's quinquennial censuses and other sources used in the accounts. These revisions may also include revisions to selected methods of estimation. In addition, BEA conducts annual revisions to PCE that affect earlier data and may also include changes in estimation methods.

HCFA-National Health Expenditures: The Health Care Financing Administration (HCFA), now the Centers for Medicare & Medicaid Services, of the U. S. Department of Health and Human Services publishes annual data on total aggregate health care expenditures of the U.S. Total health care expenditures include expenditures by all sources in the U.S. economy, including public and private sources. This data covers U.S. citizens living abroad, military personnel, and parts of the institutional population (a larger population than is covered by the CE). Specifically, HCFA data covers the nursing home population whereas the CE does not. HCFA reports out-of-pocket health care expenditures which include expenditures for medical care that are not covered by personal health insurance or other sources of payment. To derive out-of-pocket estimates, HCFA uses data from administrative and industry sources, as well as CE data.

Residential Energy Consumption Survey/Residential Transportation Energy Consumption Survey: The U.S. Department of Energy, Energy Information Administration (EIA), administers the Residential Energy Consumption Survey (RECS) which provides information on the use of energy in residential housing units in the United States. The RECS is a national statistical survey that collects energy-related data for occupied primary housing units. Data for the RECS are obtained from three different sources: On-site personal interviews conducted in the housing unit; telephone interviews with the rental agents of rented housing units that have any of their energy use included in their rent; and mail questionnaires mailed to the housing units' energy suppliers asking them to provide the units' actual energy consumption amounts and expenditures. The universe for this sample design includes all housing units occupied as the primary residence in the 50 States and the District of Columbia. The RECS does not cover vacant housing units, seasonal units, or second homes.

Special project-Medical Expenditure Panel Survey (used for out-of-pocket private health insurance premiums): The Medical Expenditure Panel Survey (MEPS) is published by the Agency for Health Care Quality and Research (AHRQ). The MEPS estimate is based on data collected from both the Household Component (HC) and the Insurance Component (IC) of the survey, with MEPS-IC employment-based data augmented with data from the Office of Personnel Management (OPM) for Federal employees. The MEPS-HC collects data on hospitalization and physician coverage only, excluding single purpose coverage. The MEPS-IC

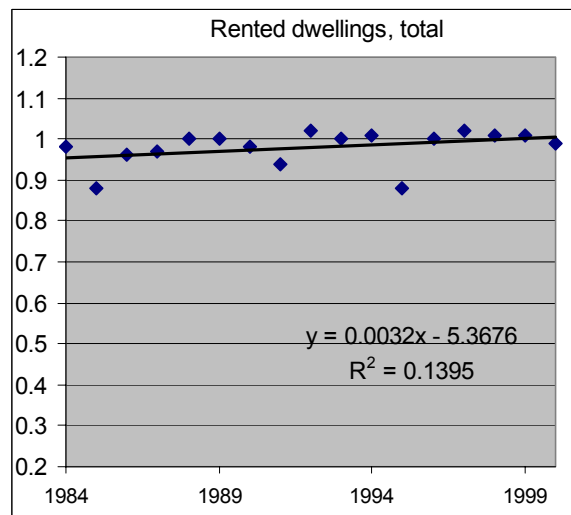
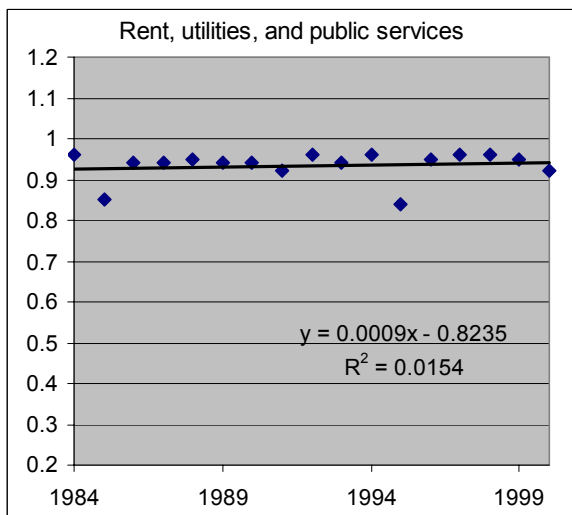
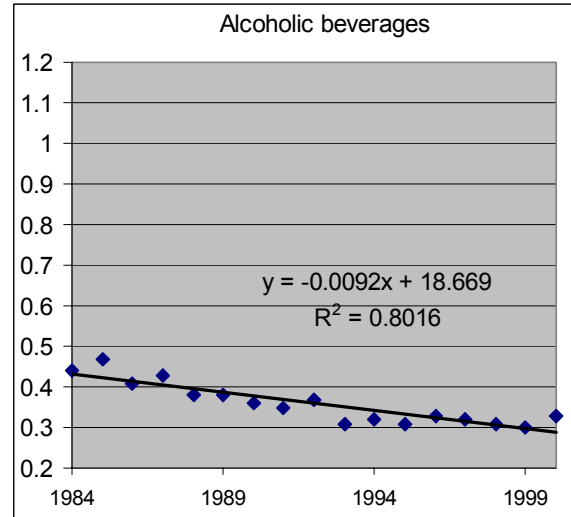
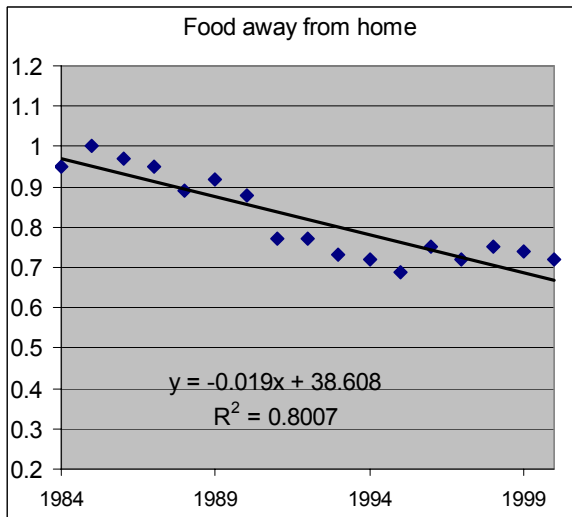
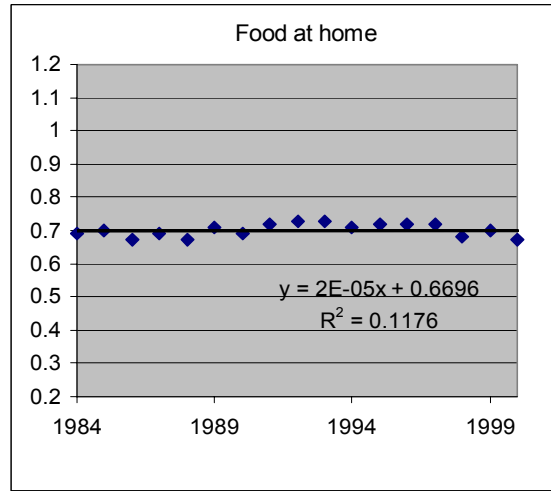
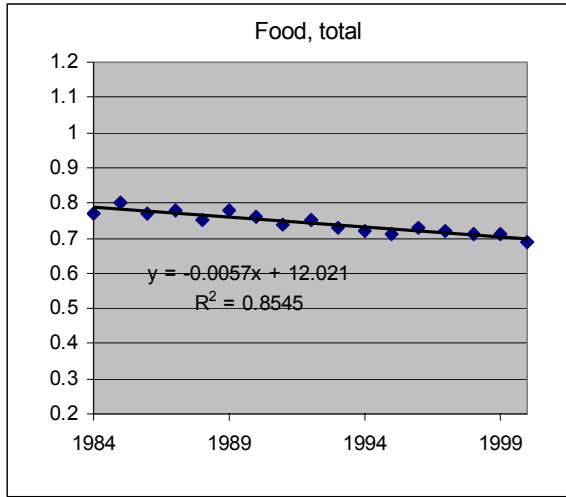
differs from the CE in that it is an establishment survey rather than a household survey and the collection unit is an enrollee rather than a policy. Unlike the MEPS-HC, the MEPS-IC supplies premium data for employer-sponsored coverage (as well as coverage information) thus the data can be compared to the aggregate premiums with the CE. The MEPS-IC collects data on hospitalization and physician coverage only from employers.

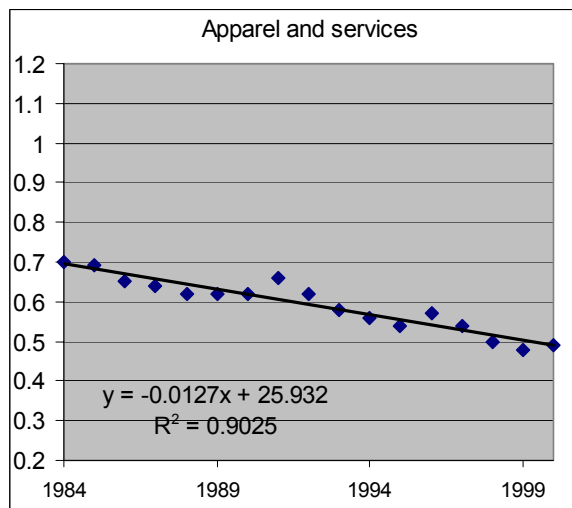
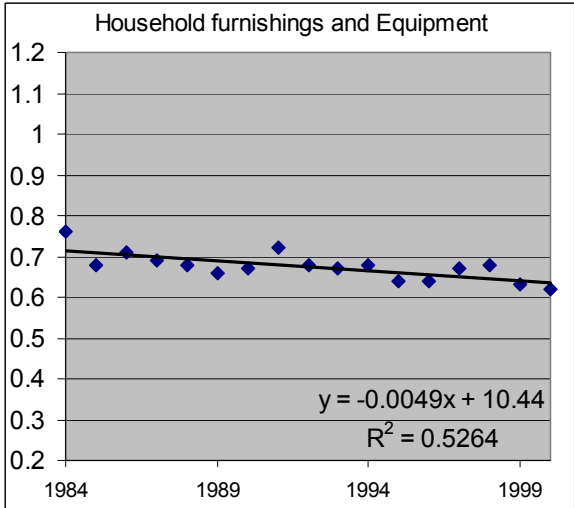
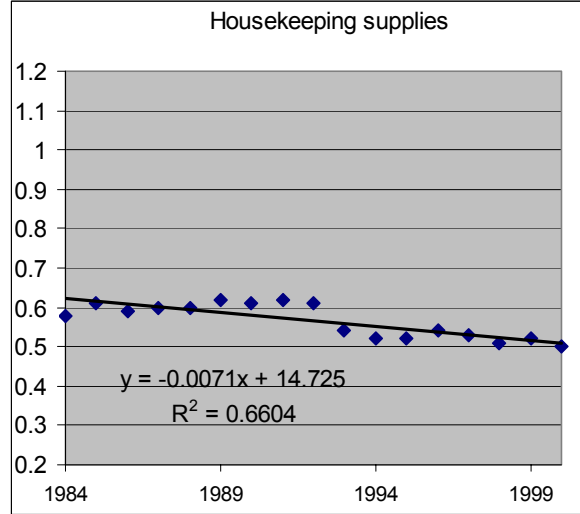
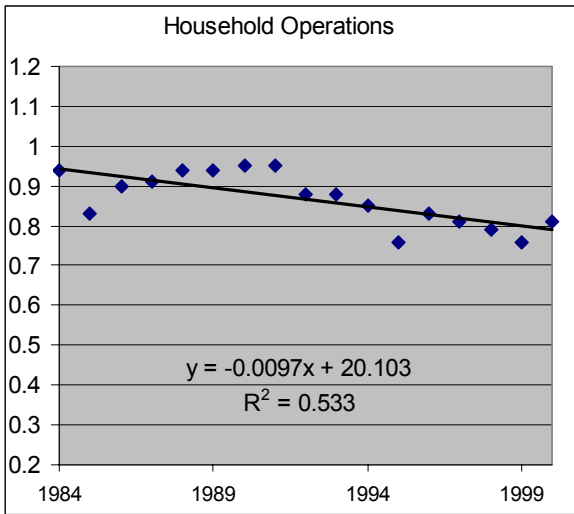
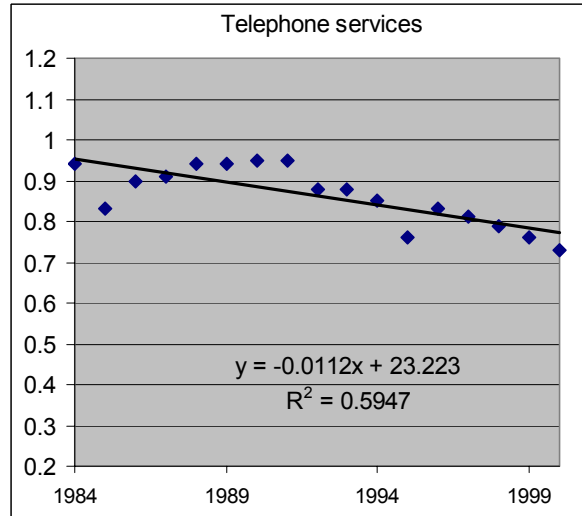
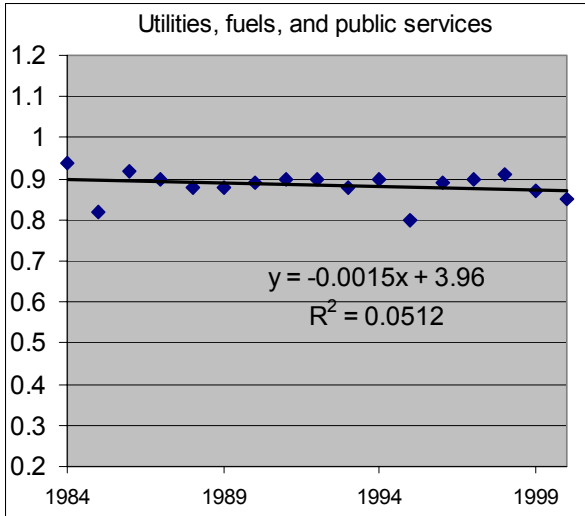
Progressive Grocer/Supermarket Business: Up until the 1998-99 biennial publish report, Supermarket Business Inc. conducted annual mail and telephone surveys of food manufacturers, packers, wholesalers and retailers. These surveys focused on measuring total industry retail sales covering all types of food stores. Progressive Grocer Inc. conducted annual independent studies of supermarket sales focusing on the supermarket (grocery stores with annual food sales of \$2 million or more) performance in relations to other kinds of retail outlets and comparing these sales by product and by category. As of 1998, Progressive Grocer and Supermarket Business Inc. merged and no longer provided supermarket data usable for a comparison with CE.

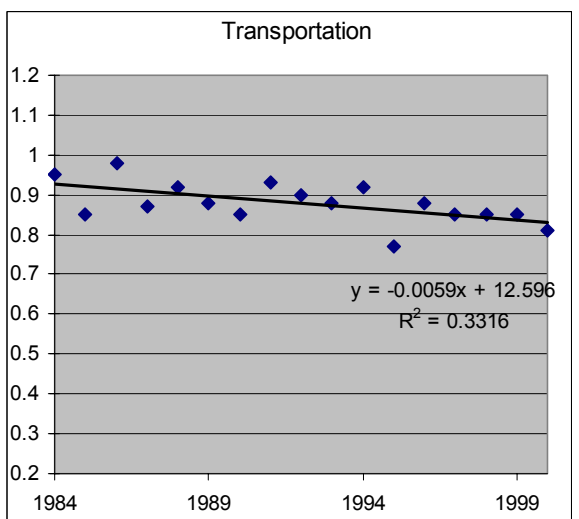
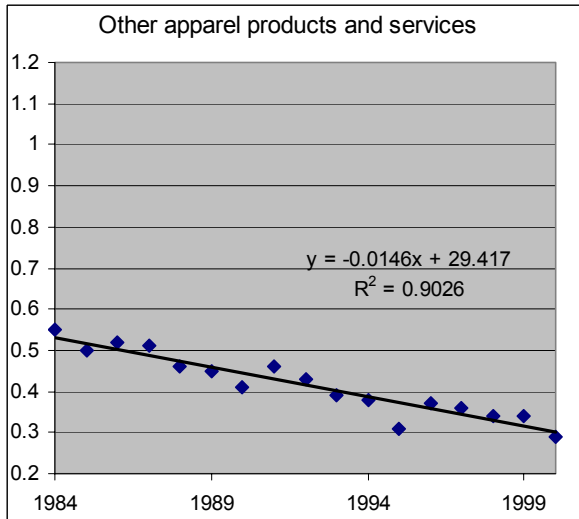
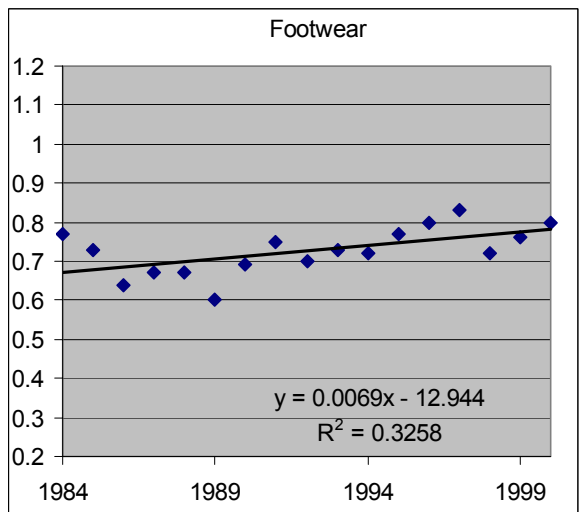
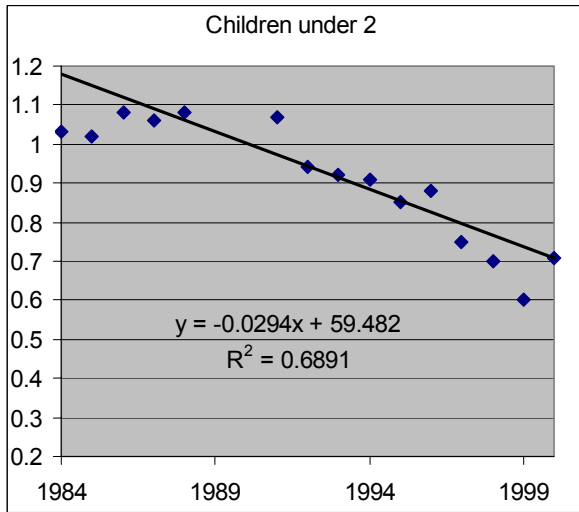
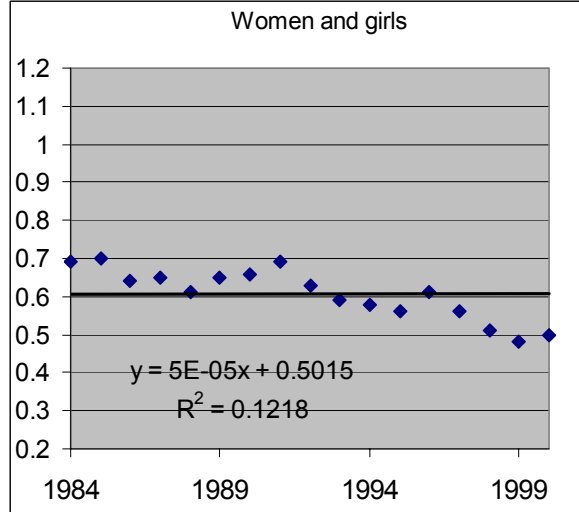
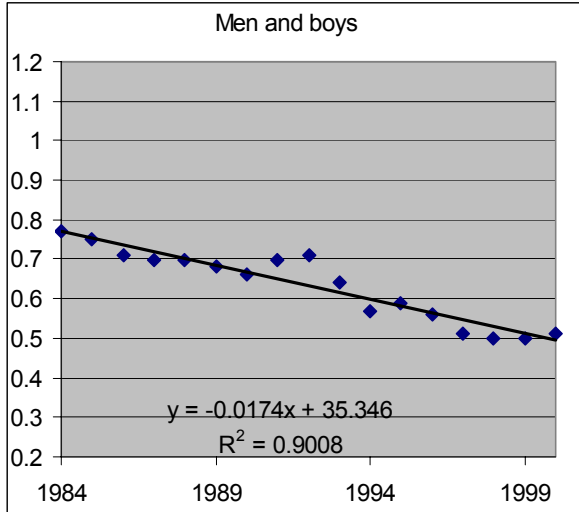
Appendix Table B1. Ratio of CE to PCE, 1984-2000

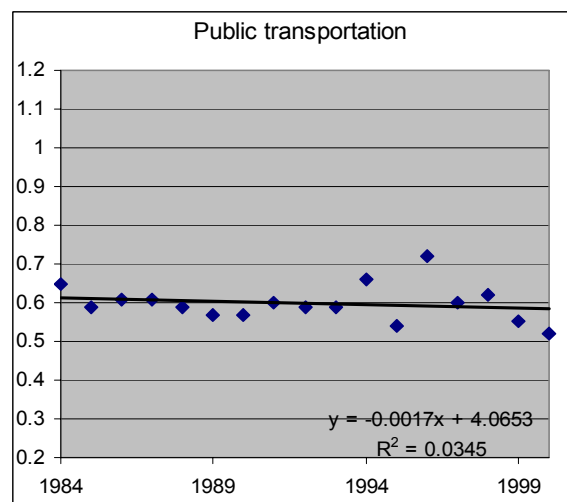
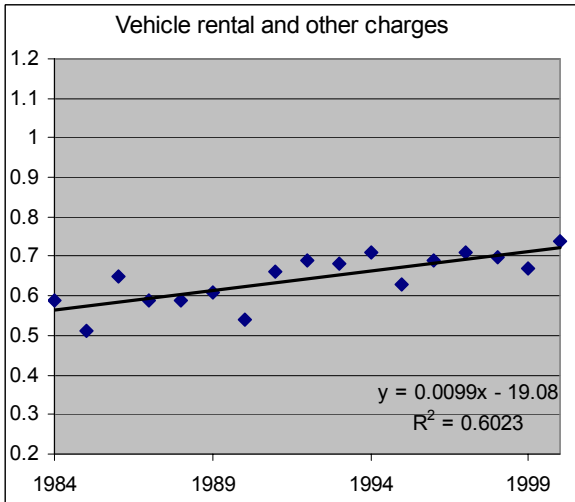
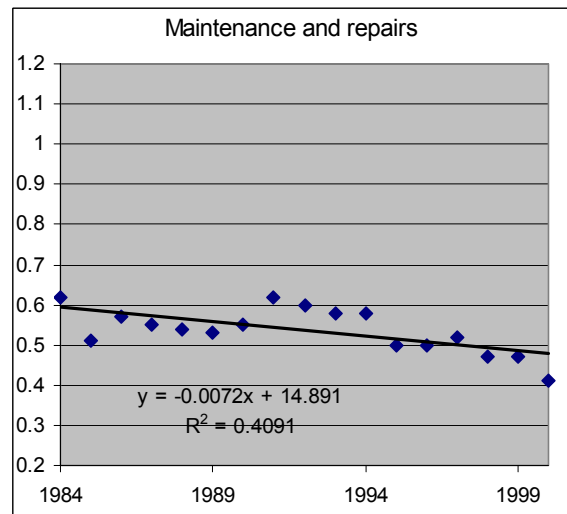
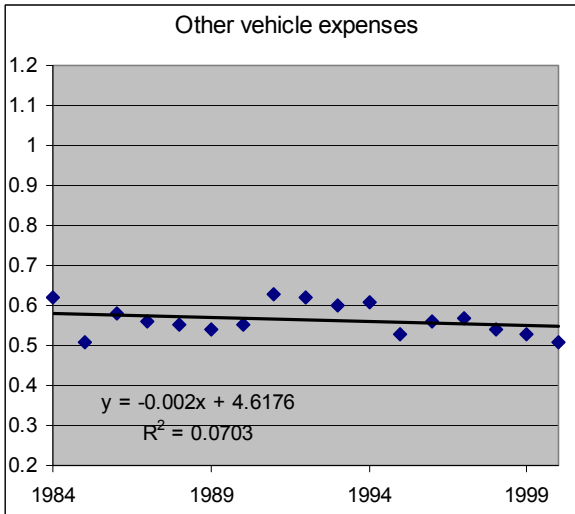
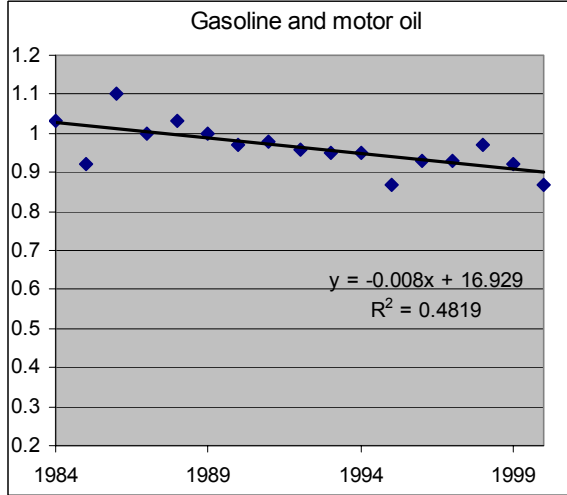
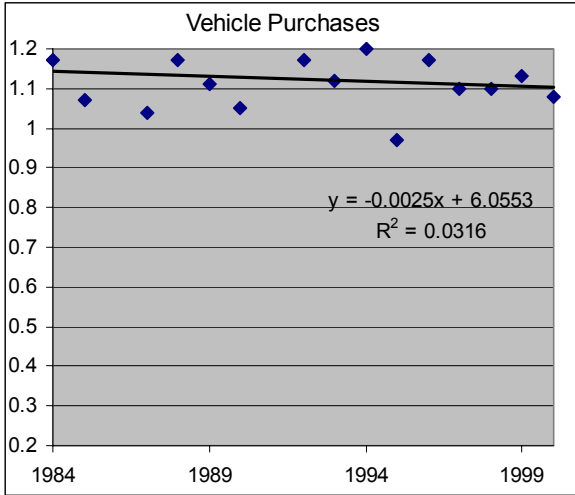
Pubtitle	1992 benchmark																	Average Change	
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	84-00	92-00
Food, total	0.77	0.8	0.77	0.78	0.75	0.78	0.76	0.74	0.75	0.73	0.72	0.71	0.73	0.72	0.71	0.71	0.69	0.74	0.72
Food at home	0.69	0.7	0.67	0.69	0.67	0.71	0.69	0.72	0.73	0.73	0.71	0.72	0.72	0.72	0.68	0.7	0.67	0.70	0.71
Food away from home	0.95	1	0.97	0.95	0.89	0.92	0.88	0.77	0.77	0.73	0.72	0.69	0.75	0.72	0.75	0.74	0.72	0.82	0.73
Alcoholic beverages	0.44	0.47	0.41	0.43	0.38	0.38	0.36	0.35	0.37	0.31	0.32	0.31	0.33	0.32	0.31	0.3	0.33	0.36	0.32
Rent, utilities, and pu	0.96	0.85	0.94	0.94	0.95	0.94	0.94	0.92	0.96	0.94	0.96	0.84	0.95	0.96	0.96	0.95	0.92	0.93	0.94
Rented dwellings, tot	0.98	0.88	0.96	0.97	1	1	0.98	0.94	1.02	1	1.01	0.88	1	1.02	1.01	1.01	0.99	0.98	0.99
Utilities, fuels, and	0.94	0.82	0.92	0.9	0.88	0.88	0.89	0.9	0.9	0.88	0.9	0.8	0.89	0.9	0.91	0.87	0.85	0.88	0.88
Telephone services	0.94	0.83	0.9	0.91	0.94	0.94	0.95	0.95	0.88	0.88	0.85	0.76	0.83	0.81	0.79	0.76	0.73	0.86	0.81
Household operations	0.89	0.79	0.8	0.85	0.9	0.88	0.78	0.83	0.8	0.77	0.79	0.66	0.73	0.74	0.69	0.79	0.81	0.79	0.75
Housekeeping supplies	0.58	0.61	0.59	0.6	0.6	0.62	0.61	0.62	0.61	0.54	0.52	0.52	0.54	0.53	0.51	0.52	0.5	0.57	0.53
Household furnishings,etc.	0.76	0.68	0.71	0.69	0.68	0.66	0.67	0.72	0.68	0.67	0.68	0.64	0.64	0.67	0.68	0.63	0.62	0.68	0.66
Apparel and services	0.7	0.69	0.65	0.64	0.62	0.62	0.62	0.66	0.62	0.58	0.56	0.54	0.57	0.54	0.5	0.48	0.49	0.59	0.54
Men and boys	0.77	0.75	0.71	0.7	0.7	0.68	0.66	0.7	0.71	0.64	0.57	0.59	0.56	0.51	0.5	0.5	0.51	0.63	0.57
Women and girls	0.69	0.7	0.64	0.65	0.61	0.65	0.66	0.69	0.63	0.59	0.58	0.56	0.61	0.56	0.51	0.48	0.5	0.61	0.56
Children under 2	1.03	1.02	1.08	1.06	1.08	1.22	1.21	1.07	0.94	0.92	0.91	0.85	0.88	0.75	0.7	0.6	0.71	0.94	0.81
Footwear	0.77	0.73	0.64	0.67	0.67	0.6	0.69	0.75	0.7	0.73	0.72	0.77	0.8	0.83	0.72	0.76	0.8	0.73	0.76
Other apparel	0.55	0.5	0.52	0.51	0.46	0.45	0.41	0.46	0.43	0.39	0.38	0.31	0.37	0.36	0.34	0.34	0.29	0.42	0.36
Transportation	0.95	0.85	0.98	0.87	0.92	0.88	0.85	0.93	0.9	0.88	0.92	0.77	0.88	0.85	0.85	0.85	0.81	0.88	0.86
Vehicle purchases	1.17	1.07	1.23	1.04	1.17	1.11	1.05	1.23	1.17	1.12	1.2	0.97	1.17	1.1	1.1	1.13	1.08	1.12	1.12
Gasoline and motor oil	1.03	0.92	1.1	1	1.03	1	0.97	0.98	0.96	0.95	0.95	0.87	0.93	0.93	0.97	0.92	0.87	0.96	0.93
Other vehicle expenses	0.62	0.51	0.58	0.56	0.55	0.54	0.55	0.63	0.62	0.6	0.61	0.53	0.56	0.57	0.54	0.53	0.51	0.57	0.56
Maintenance and repairs	0.62	0.51	0.57	0.55	0.54	0.53	0.55	0.62	0.6	0.58	0.58	0.5	0.5	0.52	0.47	0.47	0.41	0.54	0.51
Vehicle rental and other	0.59	0.51	0.65	0.59	0.59	0.61	0.54	0.66	0.69	0.68	0.71	0.63	0.69	0.71	0.7	0.67	0.74	0.64	0.69
Public transportation	0.65	0.59	0.61	0.61	0.59	0.57	0.57	0.6	0.59	0.59	0.66	0.54	0.72	0.6	0.62	0.55	0.52	0.60	0.60
Entertainment	0.7	0.65	0.67	0.65	0.67	0.65	0.61	0.63	0.61	0.63	0.59	0.53	0.58	0.57	0.53	0.52	0.5	0.61	0.56
Fees and admissions	0.86	0.74	0.77	0.78	0.77	0.73	0.66	0.65	0.6	0.62	0.65	0.54	0.55	0.53	0.51	0.48	0.51	0.64	0.55
Televisions, radios, etc	0.75	0.67	0.69	0.65	0.67	0.64	0.67	0.69	0.69	0.78	0.69	0.6	0.65	0.64	0.58	0.63	0.56	0.66	0.65
Pets, toys and playground	0.71	0.66	0.7	0.7	0.68	0.66	0.67	0.62	0.6	0.61	0.56	0.54	0.58	0.55	0.52	0.51	0.48	0.61	0.55
Other entertainment suppl.	0.47	0.52	0.51	0.51	0.57	0.57	0.44	0.53	0.52	0.45	0.42	0.39	0.54	0.54	0.49	0.43	0.39	0.49	0.46
Personal care	0.75	0.72	0.71	0.7	0.67	0.7	0.66	0.72	0.68	0.65	0.65	0.61	0.76	0.75	0.54	0.52	0.69	0.68	0.65
Reading	0.59	0.55	0.58	0.55	0.52	0.54	0.51	0.53	0.53	0.52	0.48	0.4	0.43	0.43	0.4	0.37	0.33	0.49	0.43
Tobacco prod. and other	0.7	0.6	0.67	0.63	0.66	0.65	0.65	0.64	0.57	0.6	0.58	0.54	0.55	0.56	0.54	0.49	0.48	0.59	0.55
Miscellaneous	0.31	0.29	0.3	0.29	0.29	0.29	0.26	0.26	0.26	0.23	0.24	0.21	0.22	0.22	0.19	0.18	0.15	0.25	0.21

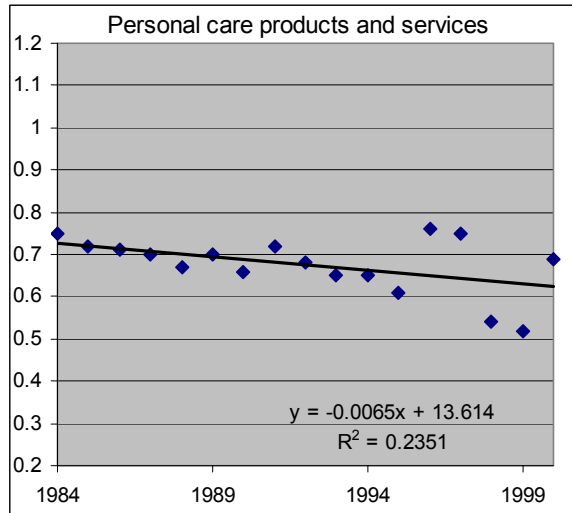
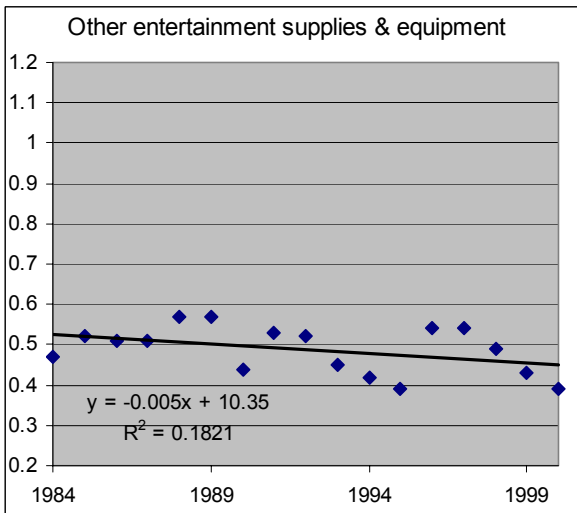
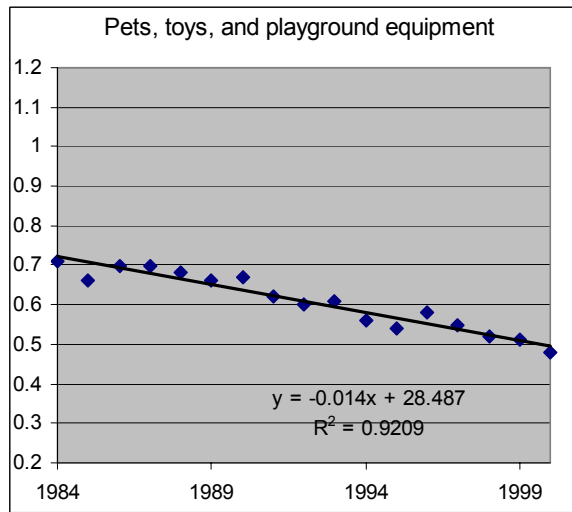
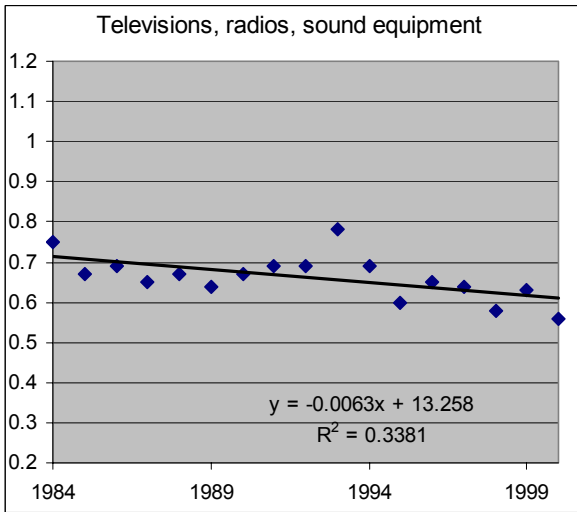
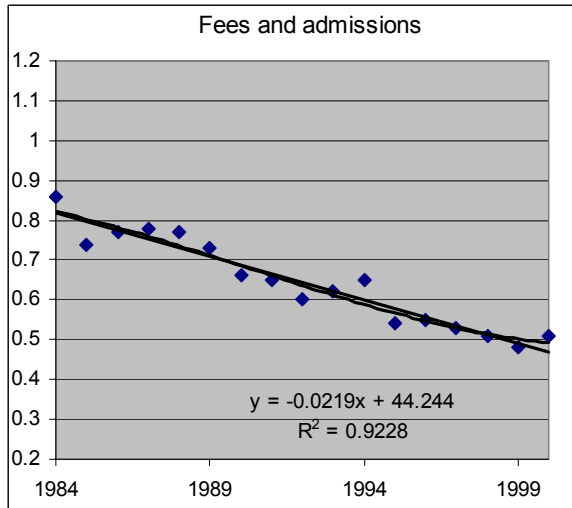
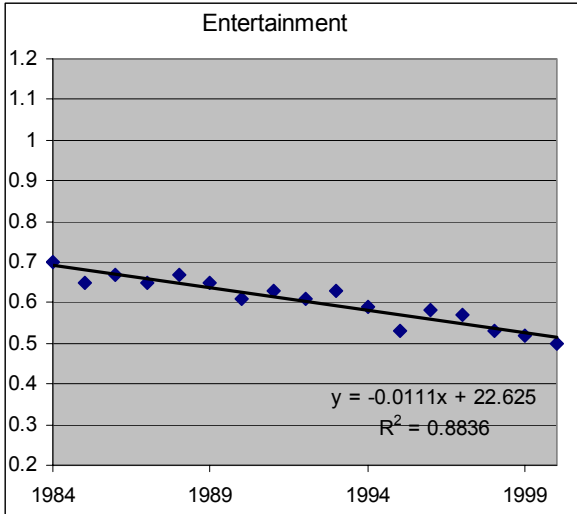
Appendix Charts B1. Trends in CE and PCE Ratios

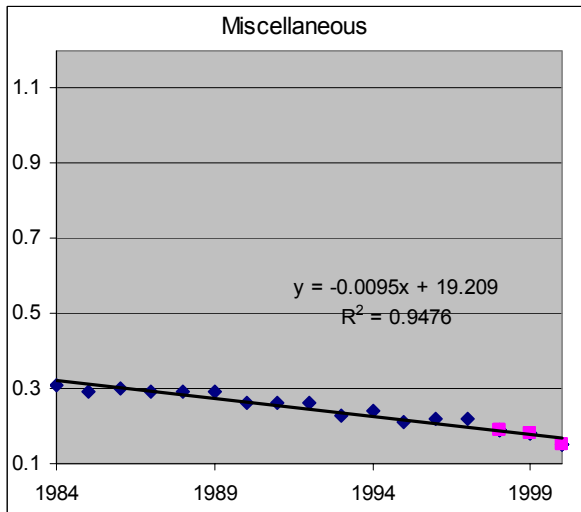
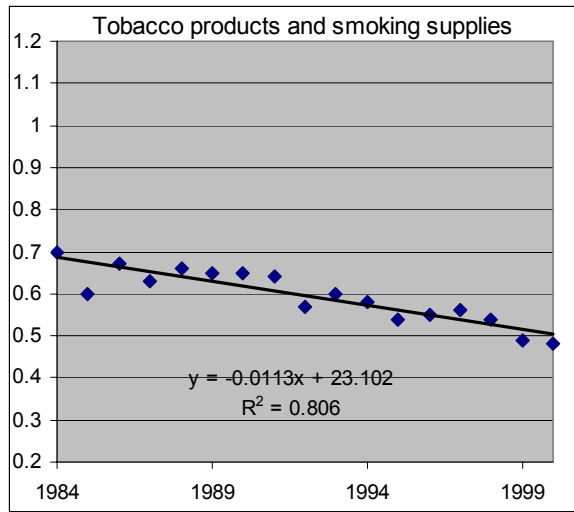
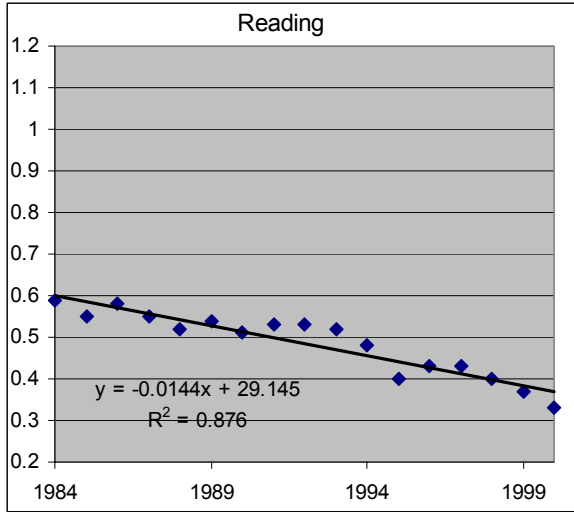












Appendix C.

Table C1. Comparison of 1997 Aggregate Consumer Expenditures vs. Personal Consumption Expenditures Based on 1992 PCE Benchmark (\$ millions)

* indicates "comparable" CE and PCE items

PCE Categories	Raw Aggregates				
	PCE	CE	ratio		
Total Durables, Nondurables, and Services	5529283	3552836	0.64		
Durable Goods	642532	594933	0.93		
Motor vehicles and parts	264150	315177	1.19		
* new autos	82462	84636	1.03		
net purchases of used autos	53070	84917	1.60		
other motor vehicles	88982	129980	1.46		
		trucks, new and net used	79677	121129	1.52
		recreational vehicles	9305	8851	0.95
tires, tubes, accessories and other parts	39636	15644	0.39		
Furniture and household equipment	248939	174753	0.70		
* furniture, including mattresses and bedsprings	53757	42012	0.78		
* kitchen and other household appliances	30755	28391	0.92		
china, glassware, tableware, and utensils	27153	6966	0.26		
video and audio good, including musical instruments, and					
* computer goods	83749	50427	0.60		
		video and audio goods, including			
		* musical instruments	57891	30644	0.53
		* computers, peripherals, and software	25858	19783	0.77
other durable house furnishings (i.e., floor coverings, clocks, lamps, and furnishings, blinds, rods, and other, writing equipment, hand tools, tools, hardware, and supplies)	53524	55517	1.04		
Other Durable Goods	129442	46957	0.36		
ophthalmic products and orthopedic appliances	19147	7789	0.41		
wheel goods (including bicycles and motorcycles), sports (also includes guns) and photographic equipment, boats, and					
* pleasure aircraft	42809	33842	0.79		
jewelry and watches	41228	18086	0.44		
books and maps	26258	11444	0.44		

Table C1 (continued). Comparison of 1997 Aggregate CE and PCE Expenditures (\$ millions): Nondurable Goods

* indicates "comparable" CE and PCE items

Nondurable Goods		1641551	1025729	0.62
Food		812170	559008	0.69
	* food purchased for off-premise consumption	486509	204684	0.42
	* alcoholic beverages purchased for off-premise consumption	58087	18972	0.33
	* purchased meals and beverages	316631	218288	0.69
	* alcoholic beverages in purchased meals	43223	13604	0.31
	food supplied to civilians	7997	3221	0.40
	food supplied to military	526		
	food produced and consumed on farms	507		
Clothing and shoes		271698	157359	0.58
	* shoes	40083	33126	0.83
	women's and children's clothing and accessories except shoes			
	* shoes (also includes clothing for infants)	139369	79388	0.57
	* men's and boys' clothing and accessories except shoes	80907	42883	0.53
	standard clothing issued to military personnel	316		0.00
	sewing good for males and females	5726	936	0.16
	luggage for males and females	5296	1026	0.19
* Gasoline, fuel oil, and other energy goods		143215	127847	0.89
Other nondurable goods		414467	181515	0.44
	* tobacco products	49807	24565	0.49
	* toilet articles and preparations	50627	25749	0.51
	semi durable house furnishings	33056	9069	0.27
	cleaning and polishing preparations, and miscellaneous household supplies and paper products	51440	34339	0.67
	drug preparations and sundries	110588	37231	0.34
	nondurable toys and sport supplies	53202	17568	0.33
	stationery and writing supplies	20011	12985	0.65
	net foreign remittances	1306		
	magazines, newspapers, and sheet music	29123	10881	0.37
	flowers, seeds, and potted plants	15308	6128	0.40

Table C1 (continued). Comparison of 1997 Aggregate CE and PCE Expenditures (\$ millions): Services
*** indicates "comparable" CE and PCE items**

Services		3245200	1932174	0.60
* Housing		810502	920315	1.14
	owner and tenant occupied dwellings	778022	889473	1.14
		585524	681180	
	owner occupied nonfarm dwellings	186088	208293	
	tenant occupied nonfarm dwellings	6410		
	rental value of farm dwellings	32480	30842	0.95
* Household operations	other lodging	333039	295944	0.89
	electricity	93798	95934	1.02
	gas	36566	31774	0.87
	water and other sanitary services	42638	22160	0.52
	telephone and telegraph	104962	85416	0.81
	domestic service	13864	7954	0.57
	other household operations (i.e., moving and storage, household insurance, rug and furniture cleaning, electrical repair, reupholstery and furniture, postage, household operation services not elsewhere classified)	41211	44683	1.08
* Transportation		234398	225711	0.96
	repair, greasing, washing, parking storage, rental, and leasing	146287	101934	0.70
	bridge, tunnel, ferry tolls	3985	1846	0.46
	insurance	36335	79709	2.19
	mass transit systems	7829	7650	0.98
	taxicab	3746	2169	0.58
	railway	684	2237	3.27
	bus	1845	1110	0.60
	airline	28977	26269	0.91
	other (i.e., including water passenger, passenger transportation arrangement, limousine service, other local transportation, part of Amtrak passenger, trucking and courier services-except air)	4710	2787	0.59
Medical care		854641	149348	0.17
	physicians	208753	14104	0.07
	dentists	51859	21491	0.41
	other professional services	125882	10097	0.08
	hospitals	339582	9232	0.03
	nursing homes	69291	1382	0.02
	health insurance	59274		
	medical care and hospitalization	48483	93042	1.92
	health insurance	1172		
	income loss insurance	9619		
	workers' compensation			

Table C1 (continued). Comparison of 1997 Aggregate CE and PCE Expenditures (\$ millions): Services continued

* indicates "comparable" CE and PCE items

Recreation		206157	110190	0.53
* admissions to all events		22075	18595	0.84
	motion picture theaters, theatre, opera, and entertainment	14938	13582	0.91
	spectator sports	7137	5013	0.70
* radio and television repair		4005	775	0.19
clubs and fraternal organizations		14573	7931	0.54
commercial participant amusements		52754	30	0.00
pari-mutual net receipts		3616	5616	1.55
	other (i.e., including pets and pet services excluding vets, veterinarians, cable TV, film developing, photo studios, sporting and recreational camps, high school recreation, lotteries, video cassette rental, commercial amusements not elsewhere classified)	109134	59286	0.54
Personal Care		60631	39079	0.64
	cleaning, storage, and repair of clothing and shoes	13159	7967	0.61
	barbershops, beauty parlors, and health clubs	25514	30147	1.18
	other (i.e., including watch, clock, and jewelry repair, miscellaneous personal services)	21958	965	0.04
Personal Business		488977	36080	0.07
	brokerage charges and investment counseling	50869		
	bank service charges, trust services, and safe deposit box rental	47883	3715	0.08
	services furnished without payment by financial intermediaries except life insurance carriers	204223		
	expense of handling life insurance and pension plans	89280		
	legal services	54975	14336	0.26
	funeral and burial expenses	15190	8731	0.57
	other personal business (i.e., including labor union expenses, professional association expenses, employment agency expenses, money orders, classified ads, tax return preparation services, personal business services not elsewhere classified)	26557	9298	0.35
Education and research		130518	65829	0.50
	higher education	69441	37324	0.54
	nursery, elementary, and secondary schools	29008	26472	0.91
	elementary and secondary schools	23490	9517	0.41
	nursery schools	5518	16955	3.07
	other education and research	32069	2033	0.06
	commercial and vocational schools	21486		
	foundations and nonprofit research	10583		

Table C1 (continued). Comparison of 1997 Aggregate CE and PCE Expenditures (\$ millions): Services continued

* indicates "comparable" CE and PCE items

Religious and welfare activities		149474	89678	0.60
all contributions including religion (CE)			78857	144.69
	political organizations	545		
	museums and libraries	5284		
	foundations to religion and welfare	2552		
social welfare		100321	10821	0.64
	child care	16979	7576	0.09
	social welfare (i.e., including membership organizations, job training and vocational rehabilitation services, residential care, individual and family services, social services not elsewhere classified, civic-social-fraternal associations, religious organizations)	83342	3245	0.08
religion		40772		
Net foreign travel		-23138		

Table C2. Comparison of 2000 Aggregate Consumer Expenditures vs. Personal Consumption Expenditures Based on 1992 PCE Benchmark (\$ millions)

* indicates "comparable" CE and PCE items

PCE Categories	Raw Aggregates				
	PCE	CE	ratio		
Total Durables, Nondurables, and Services	6728414	4019950	0.60		
Durable Goods	819647	648152	0.79		
Motor vehicles and parts	346827	402975	1.16		
* new autos	104988	116014	1.11		
net purchases of used autos	59062	101799	1.72		
other motor vehicles	136456	169612	1.24		
		trucks, new and net used	124575	160207	1.29
		recreational vehicles	11881	9405	0.79
tires, tubes, accessories and other parts	46321	15460	0.33		
Furniture and household equipment	307301	180676	0.59		
* furniture, including mattresses and bedsprings	64102	44217	0.69		
* kitchen and other household appliances	36323	32065	0.88		
china, glassware, tableware, and utensils	33801	7073	0.21		
video and audio good, including musical instruments, and					
* computer goods	106942	48259	0.45		
		video and audio goods, including			
		* musical instruments	72661	25804	0.36
		* computers, peripherals, and software	34281	22455	0.66
other durable house furnishings (i.e., floor coverings, clocks, lamps, and furnishings, blinds, rods, and other, writing equipment, hand tools, tools, hardware, and supplies)	66134			0.00	
Other Durable Goods	165518	64501	0.39		
ophthalmic products and orthopedic appliances	21916	8026	0.37		
wheel goods (including bicycles and motorcycles), sports (also includes guns) and photographic equipment, boats, and					
* pleasure aircraft	58295	30155	0.52		
jewelry and watches	51420	14212	0.28		
books and maps	33888	12108	0.36		

Table C2 (continued). Comparison of 2000 Aggregate CE and PCE Expenditures (\$ millions): Nondurable Goods

* indicates "comparable" CE and PCE items

Nondurable Goods		1989598	1158007	0.58
Food		957471	620557	0.65
	* food purchased for off-premise consumption	569561	372523	0.65
	* alcoholic beverages purchased for off-premise consumption	71169	24781	0.35
	* purchased meals and beverages	378008	245959	0.65
	* alcoholic beverages in purchased meals	52053	15761	0.30
	food supplied to civilians	8857		0.00
	food supplied to military	515		
	food produced and consumed on farms	530		
Clothing and shoes		319135	175387	0.55
	* shoes	46815	37399	0.80
	women's and children's clothing and accessories except shoes			
	* shoes (also includes clothing for infants)	164514	88031	0.54
	* men's and boys' clothing and accessories except shoes	93985	48017	0.51
	standard clothing issued to military personnel	305		0.00
	sewing good for males and females	7094	910	0.13
	luggage for males and females	6422	1030	0.16
* Gasoline, fuel oil, and other energy goods		183217	152310	0.83
Other nondurable goods		529775	209753	0.40
	* tobacco products	72069	34624	0.48
	* toilet articles and preparations	58516	28160	0.48
	semi durable house furnishings	39298	12494	0.32
	cleaning and polishing preparations, and miscellaneous household supplies and paper products	59976	38932	0.65
	drug preparations and sundries	155451	48032	0.31
	nondurable toys and sport supplies	64593	16849	0.26
	stationery and writing supplies	24222	14372	0.59
	net foreign remittances	1316		
	magazines, newspapers, and sheet music	36789	12797	0.35
	flowers, seeds, and potted plants	17546	6620	0.38

Table C2 (continued). Comparison of 2000 Aggregate CE and PCE Expenditures (\$ millions): Services
*** indicates "comparable" CE and PCE items**

Services			3919169	2213791	0.56
* Housing			958762	1082441	1.13
	owner and tenant occupied dwellings		919619	1046358	1.14
		owner occupied nonfarm dwellings	702701	825072	1.17
		tenant occupied nonfarm dwellings	209254	221286	1.06
		rental value of farm dwellings	7664		0.00
	other lodging		39143	36083	0.92
* Household operations			385671	321163	0.83
	electricity		101198	99681	0.99
	gas		40229	33613	0.84
	water and other sanitary services		48309	23479	0.49
	telephone and telegraph		131250	95887	0.73
	domestic service		15993	9640	0.60
	other household operations (i.e., moving and storage, household insurance, rug and furniture cleaning, electrical repair, reupholstery and furniture, postage, household operation services not elsewhere classified)		48693	49923	1.03
* Transportation			272753	239924	0.88
	repair, greasing, washing, parking storage, rental, and leasing		173422	105888	0.61
	bridge, tunnel, ferry tolls		4464	1572	0.35
	insurance		37871	85102	2.25
	mass transit systems		9031	7312	0.81
	taxicab		3934	2009	0.51
	railway		842	2310	2.74
	bus		2193	1761	0.80
	airline		35848	29969	0.84
	other (i.e., including water passenger, passenger transportation arrangement, limousine service, other local transportation, part of Amtrak passenger, trucking and courier services-except air)		5148	4001	0.78
Medical care			996500	169824	0.17
	physicians		245645	14699	0.06
	dentists		62095	24147	0.39
	other professional services		146398	11541	0.08
	hospitals		392692	8430	0.02
	nursing homes		79709	3538	0.04
	health insurance		69961		0.00
		medical care and hospitalization health insurance	61283	107469	1.75
		income loss insurance	1699		0.00
		workers' compensation	6979		0.00
			9619		

Table C2 (continued). Comparison of 2000 Aggregate CE and PCE Expenditures (\$ millions): Services continued
*** indicates "comparable" CE and PCE items**

Religious and welfare activities		190289	110916	0.58
all contributions including religion (CE)			98034	
	political organizations	4628		0.00
	museums and libraries	7146		0.00
	foundations to religion and welfare	3874		0.00
social welfare		126727	12882	0.10
	child care	21552	7088	0.33
	social welfare (i.e., including membership organizations, job training and vocational rehabilitation services, residential care, individual and family services, social services not elsewhere classified, civic-social-fraternal associations, religious organizations)	105175	5794	0.06
religion		47914		0.00
Net foreign travel		-17253		0.00

Appendix D. Rents and Rental Equivalence

The Consumer Expenditure Survey (CE) and Personal Consumption Expenditure (PCE) produce separate expenditures aggregates for tenant occupied dwellings and owner occupied dwellings. Rents for these are described in this section. As the approach to estimate the rental value of owner occupied housing is somewhat more complicated, more details are presented for this component of expenditures. First the CE information is presented followed by an abbreviated description of that used in the derivation of the PCE estimate. A review of how researchers have used the rent-to-value ratio approach developed for the PCE and applied to the CE is also presented.

Consumer Expenditure Survey

Rents

Consumer units who rent are asked two basic questions to determine aggregate rents paid by tenants. The first is about the rent paid and the second about the portion used for business purposes. The rent paid is adjusted to not include the portion of the rental payment that is for business. From the 1992 up to 1999, the primary rental question differed slightly from that used in 1999 forward.

Section 2, Park A, 6a (1992 up to 1999)

What is the rental charge to your CU for this unit? Do not include direct payments by local, state, or federal agencies. \$ _____ .00

6b. *What percent of the rental payment is counted as business expense? _____ . 00 percent.*

Section 2, Park A, 6a (1999 to today)

What is the rental charge to your CU for this unit, including any extra charge for garage or parking facilities? Do not include direct payments by local, state, or federal agencies. \$ _____ .00

5b. *What percent of the rental payment is counted as a business expense? _____ . 00 percent.*

Rental Equivalence and Market Value

Since the beginning of the continuing Consumer Expenditure Survey (CE) in 1979, in the Interview, owner occupants have been asked to report an estimate of what they think their homes would rent for without furniture and without utilities (BLS 1991 and 2001b). Until mid-1993, the question was asked only during the first interview (Section 1, Part B, question 11). Since quarter three of 1993, the question has been asked each quarter (Section 3, Part I, question 13). This change resulted in the rental equivalence values that lagged current rents by seven months as compared to the current question timing.

Prior to mid-1993, the question was asked for all property types. With the 1993 change, the question has only been asked of properties identified as: (1) a home in which you (your CU) currently live(s); (2) a home in which you (your CU) used to live; or (3) a second home, vacation home, or recreational property. The question asked follows:

If someone were to rent your home today, how much do you think it would rent for monthly, unfurnished and without utilities? \$ _____ .00

Unlike for the PCE estimate, no adjustment is made to subtract the implicit rental value of appliances that are currently in the housing units. For CE publication, the average reported rental equivalence for all properties is presented.

The market value of each property owned by the consumer unit is asked about in Section 3, Part B, question 8. The question follows:

*About how much do you think this property would sell for on today's market? \$_____.*⁰⁰

PCE Rental Value of Owner and Tenant Occupied Dwellings³⁰

The BEA estimates values for space rent for owner occupied non-farm dwellings, rents for tenant-occupied non-farm dwellings, and rental value of farm dwellings. All rents are exclusive of the costs of utilities. The estimate of space rent for owner occupied non-farm dwellings is based on an estimate of the space rent of permanent site dwellings and an average rent for mobile homes. Space rent for permanent site dwellings is determined by making an adjustment to estimated contract rents so that the implicit rental value of appliances that are already in the housing unit is not counted. The rent used to estimate the owner occupied value for mobile homes is not adjusted for these appliances. Nor is the rent of farm dwellings exclusive of the implicit rental value of these appliances. In this section is an abbreviated description of the procedures used to value farm and non-farm owner-occupied dwellings. For greater details, see BEA (1990), from where much of the following information is drawn.

Farm Dwellings

The rental value of farm dwellings has two components: space rent for owner occupied farm dwellings and farm rents paid. According to the detailed files provided to the BLS from BEA, space rent for owner occupied dwellings includes the gross rental value of the owner occupied farm dwelling and the rental value of dwellings provided to hired laborers.

The BEA estimates are from USDA. USDA estimates for space rent for farm dwellings by applying benchmark year rent to property market value ratios that BEA estimates for non-farm renter occupied housing. The rent-to-value ratios are based on data from the decennial Census Residential Finance Survey (RFS) and the biennial American Housing Survey (AHS) to the distribution of all (owner and renter occupied) farm dwellings by market value class. (Details regarding how rent-to-value ratios are determined by BEA are presented in the section on the Rental Value of Owner Occupied Dwellings.) USDA updates the market value distribution of all farm dwellings annually, but holds the rent to value ratios constant between the decennial benchmarks. BEA does not use USDA's annual estimates. Instead, BEA has extrapolated USDA's estimate for 1979 (the "legacy benchmark"³¹) which reflected BEA's 1981 RFS benchmark rent to value ratios and USDA's 1979 Farm Finance Survey benchmark market value class distribution of all farm housing. BEA has extrapolated the 1979 USDA benchmark with the percentage change in the current replacement cost of all farm housing as derived from BEA's capital stock estimates.

³⁰ Thanks are extended to George Smith of the BEA for providing details, verbal and written, regarding PCE methods.

³¹ "A legacy benchmark is an estimate from an earlier period in time and has not been updated in a very long time" (Smith 2003).

For farm dwellings no adjustment is made so as not to include the value of appliances already counted in the rental value of owned farm dwellings. Thus, space rent plus the implicit rent of appliances is included in the estimate for owner occupied dwellings, unlike what is indicated in PCE Methods documentation (BEA 1990) and the PCE Bridge to 1992 Input-Output Table (BEA 2002). This results as the implicit rent of appliances is included in the rent to value ratios for non-farm renter occupied housing that are being applied to farm housing, and no adjustment is made to remove implicit rent of appliances.

According to Smith of the BEA (2003), the rental value estimates of farm dwellings are based on legacy benchmarks. The farm dwelling benchmarks are from research conducted by the U.S. Department of Agriculture and provided to the BEA.

Non-farm Dwellings

The PCE includes both monetary rents paid by tenants and an imputed rental value for owner-occupied dwellings. PCE rent for tenant occupied non-farm dwellings is measured as net contract rent plus tenants' un-reimbursed expenditures for major replacements, maintenances, and repairs. Net contract rent is defined as the rent that tenants contract for or agree to pay – including any charges for major appliances and furnishings, utilities, or services – less the charges for utilities. The value of owner occupied non-farm dwellings is defined as “space rent”, which is an imputed value of the rental of the dwelling along, exclusive of any charges for major appliances, utilities, or services (BEA, 1990).

Rental Value of Tenant Occupied Dwellings. Tenant occupied dwelling rents are based on rents for permanent site dwellings and mobile homes.

Rental Value of Tenant Occupied Mobile Homes. For mobile homes, the COH data are used to identify the benchmark number of all (owner and tenant) occupied mobile homes on April 1, 1990. Expert judgment is used to estimate the number of mobile homes that are occupied during the entire year. Interpolation of all occupied mobile homes between benchmarks and extrapolation from the latest Census (1990, until the 1997 benchmark revisions are released) is based on a perpetual inventory calculation using data on new units from the National Conference of States on Building Codes and Standards. This approach has been used since 1991. The number of tenant occupied mobile homes is estimated by multiplying the number of occupied mobile homes times an estimate of the percentage that is tenant occupied. The percentage of all occupied mobile homes that is tenant-occupied is benchmarked to the COH and interpolated and extrapolated judgmentally by BEA. The average gross rent per unit is benchmarked using COH data on tenant-occupied units by gross (of utilities) rent class. Interpolations between benchmarks and extrapolations from the latest Census year are based on the CPI for residential rent. BEA estimates average net rent per unit by subtracting estimated of utilities included in average gross rent per unit. Annual utility charges are benchmarked using data from the Residential Energy Consumption Survey. Contract rent for mobile homes is calculated as the number of units times average net rent per unit.

Rental Value of Tenant Occupied Permanent Site Dwellings. For tenant occupied permanent site dwellings, PCE is the sum of (1) net contract rent per unit multiplied by the number of units and (2) tenants' un-reimbursed expenditures for major replacements, maintenance, and repairs. The number of tenant occupied dwellings is benchmarked to the COH. Biennial AHS data are used to determine the number of units between Census years, augmented with data from the Current Population Survey (CPS) for between AHS years. An additional adjustment is made to add to these housing units a number of vacant reserve housing units intended for rent for a total of all permanent site units.³² The benchmark estimate for net contract rent per unit for tenant dwellings is derived from unpublished data on mean contract rent per unit from the COH, with information on gross rents and utility expenditures from the AHS for between Census year estimates. For the years when the AHS is not available, estimates are based on changes in the CPI for residential rent, adjusted judgmentally for changes in the quality of housing.

Rental Value of Owner Occupied Dwellings. The BEA approach to estimate space rent for owner occupied non-farm dwellings is derived from estimates for permanent site housing and mobile homes.

Rental Value of Owner Occupied Mobile Homes. For mobile homes, the COH data are used to identify the benchmark number of all (owner and tenant) occupied mobile homes on April 1, 1990. Expert judgment is used to estimate the number of mobile homes occupied during the entire year. Interpolation of all occupied mobile homes between benchmarks and extrapolation from the latest Census (1990, until the 1997 benchmark revisions are released) is based on BEA's perpetual inventory of the number of mobile home units as described under tenant occupied mobile homes. The number of owner occupied mobile homes is estimated by multiplying the number of occupied mobile homes times an estimate of the percentage that is owner occupied. The percentage of all occupied mobile homes that is owner-occupied is benchmarked to the COH and interpolated and extrapolated judgmentally by BEA. The average gross rent for owner occupied mobile homes is estimated by dividing the average gross rent for tenant occupied mobile homes times the ratio of rooms per unit for tenant-occupied mobile homes- to- rooms per unit for owner occupied mobile homes. Data on rooms per unit are benchmarked to the COH and interpolated and extrapolated with corresponding data from the AHS. For 1992, the average rent of owner occupied mobile homes used by the BEA was \$4,981. This value is slightly higher than the value used for tenant occupied mobile homes. An estimate of the value of utilities included in this rent is subtracted. No adjustment is made to reduce the estimated rental value of owner-occupied mobile homes for that fact that major appliances are included in the mobile homes. Thus, the mobile home estimate of rent includes more than space rent.

Rental Value of Owner Occupied Permanent Site Dwellings For permanent site owner occupied housing, data from the COH again are used to determine the number of permanent site owner-occupied units on April 1, 1990. These data are adjusted using expert judgment to estimate the number of housing units occupied throughout the year. An additional adjustment is made to add to these housing units a number of vacant reserve housing units

³² PCE for vacant reserve housing units intended for rent equals one-half the net contract rent per unit multiplied by the number of vacant reserve units intended for rent.

intended for owner occupancy for a total of all permanent site units. An imputed average contract rent estimate (described below) is then applied to the total number of housing units to estimate total rent.³³ It is assumed that this imputed average rent includes the implicit rental value of existing appliances in the housing units. Since the goal is to obtain a space rent value, the implicit rental value of these appliances is subtracted. The estimate for the rental use of major appliances is based on a legacy benchmark. The benchmark is extrapolated using the percentage change in the capital consumption allowance, with the capital consumption adjustment on these appliances estimated by the BEA as part of its estimates of capital stock. The proportion of total non-farm permanent site net of utilities contract rent being allocated to the rent of appliances was 0.012357 for the 1992 benchmark.

Although the 1990 PCE Methods documentation (BEA 1990) indicates that an adjustment is also being made for household furnishings, in actuality the only adjustment being made is for major appliances. Smith (2003) notes that “the extrapolator reflects consumption of fixed capital for appliances only; however the legacy benchmark may well include household furnishings.”

Once an imputed average contract rent estimate is obtained, the number of permanent site owner occupied dwellings is multiplied by this value to obtain a benchmark year estimate. For other years, estimates of permanent site dwellings that are owner occupied or vacant but for owner occupancy are interpolations between and extrapolations from the benchmark estimates. These are based primarily on data from the biennial AHS and the CPS. For between benchmark years, estimates of imputed average contract rent are extrapolated from benchmark estimates using the CPI for homeowners’ equivalent rent adjusted judgmentally for changes in the quality of the housing stock.

The latest benchmark for imputed average contract rent is based on data from the decennial RFS for 1991 and the biennial AHS for 1991. The RFS collects data on non-farm properties while the AHS collects data on units. Rent to property value ratios from the RFS from non-farm rental and vacant properties (BEA also excludes cooperative housing units from the set of properties considered in its estimation of contract rent) are used in combination with the distribution of all owner occupied units by owner unit property value from the AHS. Use of the RFS and the AHS by BEA for the contract rent estimation is described below.³⁴

³³ PCE for vacant reserve housing units intended for owner-occupancy equals the full contract rent, net of utilities, per unit multiplied by the number of vacant reserve units intended for owner-occupancy.

³⁴ Thanks are extended to George Smith of BEA for his detailed explanation of the BEA approach, Howard Savage of Census for discussions concerning the Residential Finance Survey, and Sue Lord of Census for discussions regarding the American Housing Survey.

Using the Residential Finance Survey Rent to Property Value Ratios

The purpose of the Residential Finance Survey (RFS) “is to measure the levels of residential mortgage debt and to provide data for assessing the effectiveness of the current residential finance system in promoting the goal of a decent home and suitable living environment for every American” (Census web site 2001). The Residential Finance Survey is conducted once every 10 years by the Census Bureau. It has been conducted the year following the decennial census since the 1950 Census. Sample addresses are selected for inclusion in the sample. Data are collected by mail for homeowners and small rental properties and by Census field staff for larger rental properties.

The RFS data are from the survey of rental properties only and are also for one-unit properties and non-farm properties. Data for both mortgaged and non-mortgaged properties are used for the estimation. The RFS defines property to be real estate: land and anything permanently affixed to the land, such as buildings and those things attached to the buildings, such as light fixtures, plumbing and heating fixtures, or other such items which would be personal property if not attached. A property was classified as a non-farm if it had one to four housing units and was on a place of fewer than 10 acres or if it had five or more units. Only one-unit housing is used for the BEA estimation. One unit housing may be a single-family house (attached or detached), a condominium unit, or single mobile home or trailer. Cooperative apartment buildings or complexes are considered “multiunit” and thus were excluded from the BEA estimation. Other exclusions are listed in the 1990 RFS report. For the RFS, 60,000 addresses were initially in the sample. The final sample of owner occupants was 21,109, and the number of rental and vacant property records was 26,038 (Savage, 2003). The BEA estimates are based 4,458,000 rental and vacant properties (Bureau of Census, 1994).

Data used by the BEA for space rent estimation are from the “Rental and Vacant Property Questionnaire” (form D-2901) of the RFS. Those asked to complete the questionnaire include the property owner, the owner’s agent, or manager. Only the responses referring to residential units are used by the BEA. The question asked is:

17a. *How much were the total actual receipts from rent during the past year from (1) Residential units? \$ _____ .00 per year.*

Not included are receipts for extra services such as fees for parking, telephone use, or maid service. Also asked in the 1991 survey instrument are the following:

11a. *About how much do you think this property would sell for on today’s market?*

If you do not know, give your best estimate. \$ _____ .00

b. *About how much do you think this mobile home or condominium unit would sell for on today’s market:*

If you do not know, give you best estimate. \$ _____ .00

Using responses from these two questions, the Census Bureau produced tables of the number of rental and vacant one-unit properties (mortgaged and non-mortgaged) cross-tabulated by rental receipts as a percentage of the property value and property value for the

BEA. The ratios were only computed if there were rent receipts during the past year. The Census Bureau publishes results for mortgaged and non-mortgaged properties separately (Bureau of Census, 1994, Table 6, page 38 and Table 7, page 4-42). Distributions were presented for eight rental receipt to property value classes and 13 property value classes. Midpoints of rental to property value ratio ranges were used (extreme for the lowest and higher classes) to produce weighted averages of rental receipts to property values for each property value class. For example, for properties valued at less than \$20,000 the rent to value ratio was estimated to be 17.196 percent. For those valued from \$200,000 to \$299,999, the rent to value ratio was only 6.135 percent. Smith (2001) noted that generally the rent to value ratios decline as property values increase. Rather than using the computed ratios for the upper four property classes, the BEA used a constant 6.1 percent return. These ratios, based on one-unit rental and vacant properties, were then used in combination with data from the American Housing Survey to estimate rent for owner occupied housing for the PCE.

The data from the 2001 RFS will be available in print by June 2003 according to the Census web site.

Using the American Housing Survey (AHS) for Imputed Rents for Owner-Occupied Housing

The American Housing Survey collects data on the nation's housing, including apartments, single-family homes, mobile home, vacant housing units, housing characteristics, income, housing and neighborhood quality, housing costs, equipment and fuels, size of housing unit, and rent movers. National data are collected every other year. The national sample covers an average of 55,000 homes in 2003. The survey is conducted by the Census Bureau for the Department of Housing and Urban Development.

Data are collected and presented for housing units. A housing unit is a house, an apartment, a group of rooms, or a single room occupied or intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants do not live and eat with any other persons in the structure and that have direct access from the outside of the building or through a common hall that is used or intended for use by the occupants of another unit or by the general public. The occupants may be single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements (except as described in the section on group quarters). For vacant units, the criteria of separateness and direct access are applied to the intended occupants whenever possible. If the information cannot be obtained, the criteria are applied to the previous occupants. Both occupied and vacant housing units are included in the housing inventory, except that tents, caves, boats, railroad cars and the like, are included only if they are occupied (Commerce, 1993, p.A-3).

Farm - non-farm resident. In rural areas, occupied housing units are subdivided into rural-farm housing (which comprises all rural units on farms) and rural – non-farm housing (which comprises the remaining rural units). Occupied housing units are classified as farm units if the sales of agricultural products amounted to at least \$1,000 during the 12-month

period prior to the interview. Occupied units in rural territories that do not meet the definition for farm housing are classified as non-farm (Commerce, 1993, p. A-1)

The BEA uses data that were collected in 1991 by the Bureau of the Census for the Department of Housing and Urban Development (Commerce, 1993). Property values reported by owner occupants in 1991 were grouped into 15 value classes (Table 3-14, p.120). The BEA collapsed the 15 value classes into 11 and then used the midpoints of the value class range and the number of owner occupants in each value class to estimate total property values for each value class. Then the rent to property value ratios from the RFS were applied to impute estimated aggregate rents for owner occupied housing. An estimate of imputed mean rent of owner-occupied housing units is produced. That value for 1991 was \$7441.75. This average is adjusted to subtract the value for the use of appliances and furnishings and is referred to as space rent as noted above. The resulting space rent value is then multiplied by the number of permanent site non-farm owner occupied housing units in the U.S.

The AHS definition of value is the respondent's estimate of how much the property (house and lot) would sell for if it were for sale. Any nonresidential portions of the property of the property were excluded from the values presented in Table 3-14. The questions asked in the 1991 survey follow:

For one-unit buildings:

84e. *How much do you think the house and lot would sell for on today's market?*

\$ _____

85c. *What is the value of the residential portion of this property?* \$ _____

86c. *How much do you think the house and all the land would sell for on today's market?*

\$ _____

86d. *How much do you think the house and it (lot/yard) would sell for on today's market?*

\$ _____

For condominium or cooperative:

87e. *How much do you think the apartment would sell for on today's market?* \$ _____

For mobile home:

88e. *How much do you think the mobile home would sell for on today's market (Do not include the value of the land.)?* \$ _____

Part B. 8. *About how much do you think this property would see for on today's market?*

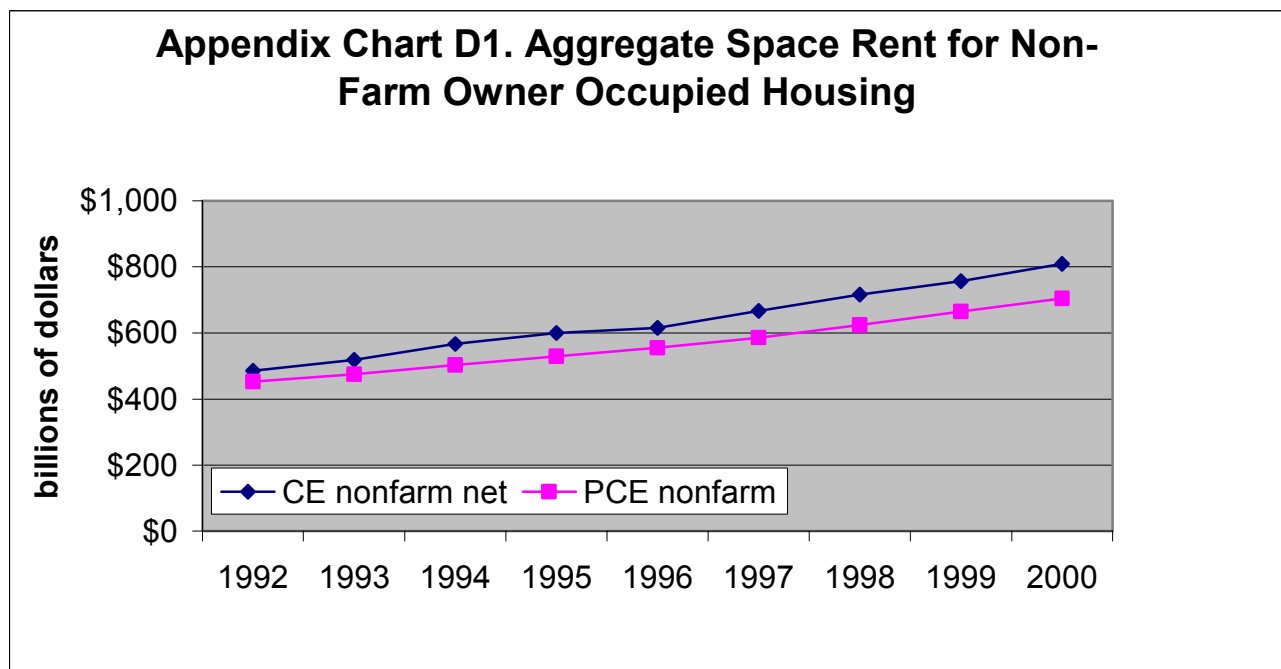
\$ _____ .00

The 2001 AHS are currently available on the web.

Charts Comparing CE and PCE Aggregates: Owner Occupied Non-farm Dwellings

Space rents for owner occupied non-farm dwellings using the CE and PCE are presented in Chart D1 and ratios of CE to PCE aggregates are presented in D2. The comparison is restricted to owner occupied non-farm dwellings for three reasons. First, owner occupied housing accounts for a substantial proportion of the weight in the CPI-U.³⁵ Second, the PCE owner occupied farm dwellings include housing for hired laborers as well as owner occupied housing while for the CE only owner occupied housing is included. And three, without considerable effort we could not produce an estimate for tenants' rents that did not include the costs of utilities.

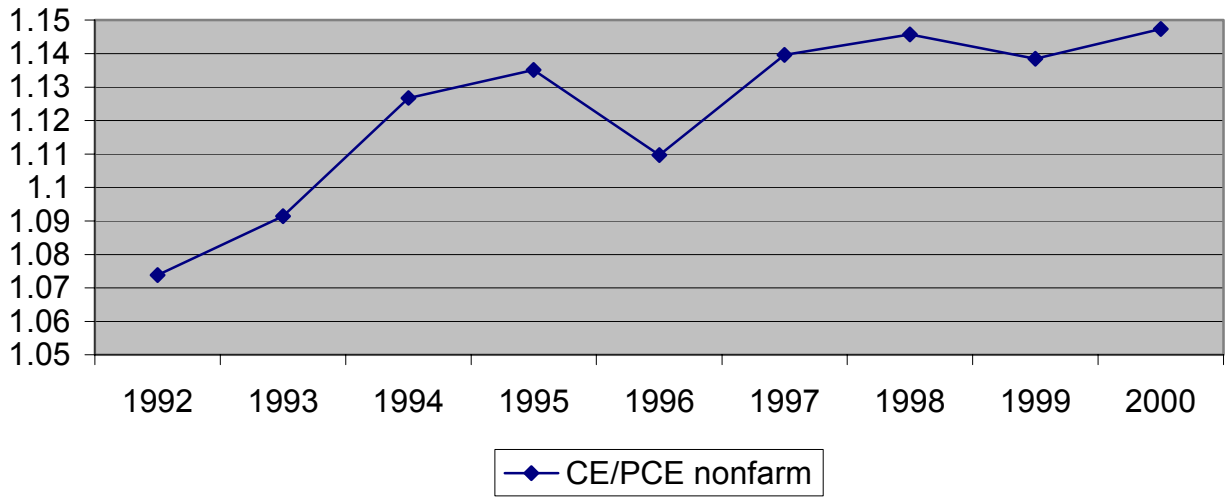
The CE space rent for owner occupied dwellings is estimated by taking the non-farm rental equivalence aggregate and multiplying this for each year by the fraction of net contract rent assumed to be for the rent of appliances in the PCE. The percentage for 1992, 1.236, is used for all years. For this exercise, non-farm is any area not defined as 'rural farm' in the CE (non-farm would be all values of DEG_URBN except for '6' or '9'). This definition of farm is used as it is assumed to be consistent with the Census definition used for the PCE.³⁶



³⁵ For 1999-2000, the weight for owners' equivalent rent of primary residence was 22.243 (BLS web site, 2000a)

³⁶ In contrast to the PCE, the CPI does not use the farm/non-farm distinction, but urban/not urban. The CPI is produced for urban areas only. Non-urban for the purpose of the CPI is defined as a rural farm area inside a MSA, or a rural non-farm or rural farm area outside a MSA. The non-urban designation is the same as DEG_URBN equal '6', '8', or '9' in the CE.

Appendix Chart D2. Ratio of CE to PCE Aggregate Expenditures for Non-Farm Owner Occupied Housing



Application of Rent to Market Value Approach Applied to CE data

Mean rental equivalences restricted by property value classes have been produced using an approach similar to that used by the BEA to estimate contract rents for permanent site dwellings (Garner and Short 2001). Unlike for the RFS, in the CE, market values of rented properties are not collected. Therefore, to estimate the rent to market values Garner and Short (2001) use reported rental equivalence and market value of each primary residence. Following the BEA approach, market values are grouped into 11 property value classes ranging from \$1 to \$20,000 up to greater than or equal to \$300,000. Ratios of the reported rental equivalence to market value are grouped into eight groups. The lowest ratio group is less than 5 percent but greater than 0, and the highest is greater than or equal to 40 percent. Implicit returns from possible renting to investing in owned property are estimated. These are then applied to the midpoints of the property value classes for weighted consumer units in each group to produce an estimated rent for homeowners. This calculation is done for each owner occupant consumer unit in the CE data file. Of all owners, most provided (55,309 of 55,563) reported positive values for both rental equivalence and market value. Only 0.6 did not have values for both. The reported rental equivalence, actual or imputed as described above, are used in the creation of the ratios. Rental equivalence and market values are imputed for cases with missing values using the following variables: primary sampling unit, interview quarter and year, and whether the owned housing was mortgaged or not.

Imputed rents based on the rent to value ratio approach and reported rental equivalence is presented by owned property reported market value in Appendix Table D1. For owned housing valued at less than \$40,000, the average annual rent is higher based on CE rental equivalence alone as compared to the rent to market value approach which is based on reported rental equivalence and market value. Properties in the lowest property class (\$1 to less than \$20,000) are almost as high as those for properties in the \$60,000 to less than \$80,000 range. For properties in all but two of the remaining value classes, the BEA measure produces slightly higher rents. CE reported rental equivalence is higher for market value properties in the \$100,000 to less than \$120,000 and greater than or equal to 300,000 ranges than those based on the BEA approach. Average imputed rents are quite close. These estimates represent rent net of utilities and unfurnished. The implicit value of the rental of appliances is included in the rent however.

Appendix Table D1. Average Annual Imputed Rents by Market Value Class for Owner Occupied Housing Using CE Quarterly Interview Data: 2001 Quarter One				
Market Value		Rent to Market Value Approach		CE Reported
		Imputed Rent		Rental Equivalence
\$1<\$20,000		\$3,975		\$7,632
\$20,000<\$40,000		\$6,504		\$6,737
\$40,000<\$60,000		\$6,697		\$6,579
\$60,000<\$80,000		\$7,865		\$7,852
\$80,000<\$100,000		\$9,351		\$9,285
\$100,000<\$120,000		\$10,082		\$10,092
\$120,000<\$150,000		\$11,845		\$11,839
\$150,000<\$200,000		\$14,130		\$13,858
\$200,000<\$250,000		\$16,608		\$15,669
\$250,000<\$300,000		\$19,010		\$18,503
>=\$300,000		\$21,428		\$24,548
Average imputed rent		\$11,543		\$11,853

Source: Garner and Short (2001).