

## The CE and the PCE: a comparison

*An analysis of a decline in the ratios of aggregate spending for various categories of expenditures from the BLS Consumer Expenditure Survey and the BEA's Personal Consumption Expenditures over an 11-year period employs a new methodology that takes into account the degree of comparability of those categories*

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Since the start of the ongoing Consumer Expenditure Survey (CE) in 1980, expenditure estimates from CE data have been compared regularly with corresponding expenditure estimates from other data sources to evaluate both the soundness of the CE estimates at any point in time and the consistency of the estimates over time. In 1987, Raymond Gieseman, the first within the Bureau of Labor Statistics (the Bureau, BLS) to use continuing survey data to conduct this work, stated the aim of the 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."<sup>1</sup> In conjunction with other evaluation tools, data comparisons are employed to assess the cumulative effects of nonsampling errors on the quality of data obtained from the CE and to develop methodological studies to improve that quality.<sup>2</sup>

In addition to these internal uses, data comparisons have appeared regularly in CE publications. The major biennial releases of the CE program include tables comparing its data estimates with those from other sources. Articles on these comparative measures also have been published in the *Monthly Labor Review*.<sup>3</sup>

The primary source of independent data for comparison over the years has been the Personal Consumption Expenditures (PCE) of the

National Income and Product Accounts, produced by the Bureau of Economic Analysis (BEA); these data are the focus of this study. The PCE affords comprehensive coverage of item categories similar to those of the CE and, in fact, is used as a tool in the process of producing tables for CE publications.

Like all data sources, the CE and the PCE have their strengths and weaknesses. The strength of the CE is that an extensive accounting of expenditures made by consumer units<sup>4</sup> is collected through personal interviews and paper-and-pencil diaries. Separate samples of consumer units participate in the Diary survey and the quarterly Interview survey. A weakness is that the data are collected from samples and thus are subject to sampling errors. Nonsampling errors also may be introduced, in processing the data for final use. The strength of the PCE is that it provides estimates of aggregate expenditures for an extensive list of commodities purchased for consumption by and on behalf of households. However, PCE data are subject to (1) measurement errors in the censuses and sampling and nonsampling errors in surveys that provide source data to the BEA and (2) classification errors by the BEA in its estimation and allocation of production or output to the personal sector and other sectors in constructing the national accounts. Each year, previously released PCE aggregate expenditure estimates are subject to revision, which can result in meaningful differences over time. This alone supports the proposition that

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there is no “true” value for consumer expenditure estimates, as suggested by Gieseeman.<sup>5</sup>

Work by a team of researchers within the Bureau<sup>6</sup> suggested that earlier methods comparing CE data with PCE data needed to be reevaluated. As a part of the reevaluation, the team kept in mind that the CE and alternative data sources were designed to serve different purposes; thus, comparisons of estimates may be affected by differences in scope, definition, and estimation procedure. The team attempted to reconcile these differences as much as possible to construct compatible estimates. The purpose of the current article is to highlight recent work of this team. A quantitative comparison of CE and PCE expenditure estimates is presented, followed by a discussion of differences between the estimates and possible reasons for them.

## Outline and summary of findings

The next section highlights previous research comparing the CE and the PCE. Following that, the foundations of the CE and the PCE are presented, including the purposes of the two surveys, the populations they cover, definitions of expenditures, and data collection methods. Then the historical comparison methodology developed and used by the CE is described.<sup>7</sup> Finally, ratios of CE-to-PCE aggregate expendi-

tures from 1984 through 2002 are calculated and shown for categories of expenditures. PCE expenditure estimates are based on 1997 benchmark data, updated to their current levels by periodic revisions that have occurred through 2005.

Exhibit 1 summarizes the trends in the CE-to-PCE ratios over the 1984–2002 period at a disaggregated level. For most categories of spending, the ratios have been decreasing. Appendix table C-1 shows that for two categories of expenditures—clothing for children less than 2 years of age and purchases of vehicles—CE aggregate expenditures are greater than PCE aggregates for earlier periods, but drop to or below PCE estimates in later years. Overall, however, the historical comparison methodology suggests that CE and PCE aggregate estimates are becoming more disparate with time.

After reviewing the historical comparison methodology, the BLS team decided that revisions were in order. Accordingly, this article describes the development of a new comparison methodology based on (1) knowledge gained from the results of earlier comparisons, (2) a deeper institutional understanding of the CE and the PCE gained from working with these data over time, and (3) recent work presented in the economics literature. The new methodology uses a different item classification scheme, reallocating detailed CE data to PCE categories by major type of product (that is, durables, nondurables, or services) instead of by type of expenditure (for example, food, trans-

### Exhibit 1. Trends in CE-to-PCE ratios, by expenditure groups, 1984–2002

#### Decreasing

1984–2002 ratio  $\geq 0.8$ :

- Food away from home
- Rented dwellings
- Telephone services
- Children under 2 years
- Transportation
- Vehicle purchases
- Utilities, fuels, and public services

1984–2002 ratio = 0.6–0.8:

- Food, total
- Household operations
- Household furnishings and equipment
- Men’s and boys’ apparel
- Women’s and girls’ apparel
- Televisions, radio, and sound equipment
- Personal care products and services

1984–2002 ratio = 0.4–0.6:

- Housekeeping supplies
- Apparel and services
- Maintenance and repairs
- Other vehicle expenses
- Entertainment
- Fees and admissions

#### Decreasing (continued)

1984–2002 ratio = 0.4–0.6:

- Pets, toys, and playground equipment
- Other entertainment supplies and equipment
- Reading
- Tobacco products and smoking supplies

1984–2002 Ratio < 0.4:

- Alcoholic beverages
- Other apparel products and services
- Miscellaneous

#### Stable

1984–2002 ratio  $\geq 0.8$ :

- Rent, utilities, and public services
- Utilities, fuels, and public services

1984–2002 ratio = 0.6–0.8:

- Food at home

1984–2002 ratio = 0.4–0.6:

- Public transportation

#### Increasing

1984–2002 ratio = 0.6–0.8:

- Footwear
- Vehicle rental and other charges

portation, or medical care). A more detailed description of the categories of items from the CE and the PCE is utilized than was used when the historical comparison methodology was developed. Consequently, more comparable product categories are constructed and are included in the final aggregates and ratios used in the newer comparison of the two sets of estimates.

The new framework should provide more usable, accurate comparisons for researchers examining consumption growth and changes in the inequality of consumption over time. For comparisons of consumption, researchers have most often focused on nondurables or services;<sup>8</sup> the new methodology will facilitate this work.

Using the new methodology on data for categories that are comparable between the CE and the PCE reveals that CE aggregate expenditures are 86 percent of PCE aggregate expenditures for 1992, drop to 85 percent in 1997, and fall further to 81 percent in 2002. When all categories of items, both comparable and noncomparable, are included, CE aggregate expenditures are 67 percent of PCE aggregates in 1992, 65 percent in 1997, and 60 percent in 2002.

When PCE aggregates are adjusted to reflect differences in population coverage between the CE and the PCE, the ratios are higher. For example, the ratio for comparable categories rises to about 88 percent for 1997 and 84 percent for 2002 when the population adjustment is made.<sup>9</sup>

Other differences between the CE and the PCE were identified for which no adjustments can be made. For example, because CE data are collected and coded by type of expenditure rather than by type of product, it is not always possible to assign items directly to a major type of product.

### Previous research comparing CE and PCE data

Comparisons of CE and PCE data have been conducted by researchers both inside and outside the Bureau.<sup>10</sup> Research over the last 20 years has used the CE and the PCE to assess economic growth and other economic trends.<sup>11</sup> Other research has focused on the quality of CE data, compared with PCE data, as the former affects the Consumer Price Index (CPI).<sup>12</sup> A brief review of several studies follows.

Daniel T. Slesnick used CE data from 1960–61, 1972–73, 1980–81, and 1984–89 to compare CE consumption expenditures with PCE estimates.<sup>13</sup> After making adjustments for differences in definition,<sup>14</sup> he concluded that approximately one-half of the difference between aggregate expenditures reported in the CE and the PCE could be accounted for by these definitional differences. He went on to note that the source of the remaining difference in expenditures “is a mystery that can only be resolved by future investigation.”<sup>15</sup> Slesnick posited reporting errors by households in the CE and PCE estimation procedures as possible reasons for the remaining disparity. Raymond Gieseman came to basically

the same conclusion.<sup>16</sup> Slesnick noted, “The magnitude of these adjustments [those made to the PCE during revisions] suggests [that] caution is in order before one assigns full blame for the differences in the estimated levels of aggregate expenditure to underreporting in the CEX [Consumer Expenditure] surveys.”<sup>17</sup>

In a report on alternative poverty measures, the General Accounting Office cited a 1994 BEA study that compared differences in CE and PCE estimates of expenditures for 1992.<sup>18</sup> The BEA concluded that more than half of the difference in aggregate expenditures was traceable to coverage and definitional differences, with the remainder due to statistical factors.<sup>19</sup>

One source of the difference between the CE and PCE estimates is that the PCE includes expenditures by nonprofit institutions serving households, whereas the CE does not.<sup>20</sup> Slesnick pointed out the necessity for removing such expenditures in comparing PCE with CE data.<sup>21</sup> The commodity groupings most affected are medical care, personal business, recreation, private education and research, and religious and welfare activities. Slesnick reported that in 1993 these categories represented about 10.6 percent of total PCE, 12.1 percent of PCE nondurables and services, and 18.6 percent of PCE services.<sup>22</sup>

In a study aimed at distinguishing the contributions to total PCE of nonprofits serving households, Charles Ian Mead reported that even more categories of expenditures are affected.<sup>23</sup> At the time of Mead’s original research, the amount of PCE attributable to households and to nonprofits serving households had not been determined by the BEA. In a later study, Mead, Clinton P. McCully, and Marshall B. Reinsdorf reported that about 55 percent of the expenditures for nonprofit institutions was directed toward medical care, and about 24 percent toward religious and welfare activities, over the 1992–2001 period.<sup>24</sup>

Also focusing on measuring consumption over time, Jack E. Triplett examined CE data as a way to evaluate PCE estimates.<sup>25</sup> Unlike Slesnick, Triplett did not use unit-level CE data, but chose published aggregates presented by Raphael Branch.<sup>26</sup> In discussing strengths and weaknesses of the two sources of data, Triplett stated that the input-output methodology employed to produce the PCE is qualitatively better at higher levels of aggregation than at 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.”<sup>27</sup> Triplett went 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.”<sup>28</sup>

In contrast, in comparing the CE and the PCE in regard to which would be the better primary source of data for weights for the CPI, David Lebow and Jeremy Rudd con-

cluded, “Neither measure of weights is perfect, but we see advantages to the PCE data on balance.”<sup>29</sup> They emphasized the advantage of the PCE in that its data are derived primarily from businesses’ responses to economic censuses. However, they also stated, “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.”<sup>30</sup> Lebow and Rudd stated that a disadvantage of the CE is that its data rely largely on respondents’ memories of their own expenditures, as well as of those of others in their consumer unit.

A National Research Council panel that examined whether the CE or the PCE would serve as the better basis of the weights in the CPI was not consistent in its evaluation of the CE:

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....<sup>31</sup>

Yet later, “The panel concluded that it is likely that the CEX estimates of consumer expenditure shares are biased, perhaps seriously.”<sup>32</sup> The panel recommended that the CE be carefully evaluated and that the net advantages of using the PCE to produce upper-level weights for the CPI be included in the evaluation (Recommendation 9-1).<sup>33</sup> No direct evaluation of the PCE was recommended. In Recommendation 9-2, the panel recommended that a program be set up to produce an experimental CPI based on PCE weights if the categories in the CE and PCE can be reasonably matched so that comparable item strata indexes can be created.<sup>34</sup>

Other users familiar with the CE and the PCE also have raised concerns about the increasing spread between aggregate expenditures reported in the CE and the corresponding PCE estimates.<sup>35</sup> Drawing on all these discussions and other informal contacts with users concerned with this issue, the Bureau has worked to produce the best comparisons of CE and PCE aggregate expenditures possible.<sup>36</sup>

## Basic concepts and methods

The CE and the PCE are designed to represent a similar concept of total consumption expenditures; however, they follow different paths to obtain their estimates.<sup>37</sup> Simply put, the Bureau of Labor Statistics collects CE expenditure data

through sample surveys and weights the results to obtain population estimates. The Bureau of Economic Analysis, in contrast, calculates PCE estimates on the basis of industry production data collected in economic censuses and through surveys conducted by outside agencies. There are clear differences in the types of expenditure data obtained, dictated by the data collection methods and data sources used by the two Agencies. In addition, the populations covered by the CE and the PCE differ.

The CE program covers consumer-unit purchases of goods and services used in day-to-day living. Data for the CE are reported directly by consumers through two components—the Diary Survey and the quarterly Interview Survey—administered by the Census Bureau. Respondents are instructed to report the out-of-pocket expenditures, including all excise and sales taxes, of all members of the consumer unit. A sample of consumer units separate and independent from the sample participating in the quarterly Interview component of the CE participates in the Diary component.

The Diary Survey is intended to capture everyday purchases, such as groceries, and lower cost items, such as laundry detergent. Respondents to the Diary component list all expenditures made for two consecutive 1-week periods.

The Interview Survey is designed to collect expenditures on major items of expense, such as property or vehicles, and on those items for which outlays occur on a regular basis, such as rent or utilities. Respondents are encouraged to use records in reporting expenditures, but also can use recall to report expenditures over the 3-month reference period of each interview. For the Interview Survey, respondents report data to an interviewer once per quarter for four consecutive quarters.

Once received, the data are processed and then released by the Bureau of Labor Statistics. Processing includes imputations and allocations as necessary.<sup>38</sup> Although certain items are collected uniquely in either the Diary or Interview Survey instrument, there is considerable overlap, in general, in the coverage of items. Thus, in a procedure known as integration, the Bureau chooses the Diary or the Interview as the most statistically reliable source for each expenditure item for both CE publications and data comparisons.

The BEA defines the PCE essentially as expenditures made directly by households and, unlike the CE, excludes person-to-person transactions and includes expenditures made on behalf of households by nonprofit institutions. In contrast to the CE, the PCE also includes expenditures financed under government programs, such as Medicare and Medicaid. The PCE defines owner-occupied-housing expenditures as a service flow and imputes space rent to represent the value of that flow. (In contrast, the CE uses expenditure outlays, not including reductions in principal.) As with the CE estimates, The PCE estimates include all excise and sales taxes.

Data for the PCE are gathered from numerous surveys and censuses. For benchmark years, the major source of data the BEA uses is the comprehensive Economic Census, conducted by the Census Bureau every 5 years. (The most recent one was completed in 2002.) Between benchmark years, the BEA uses data from the Annual Survey of Manufactures, the Annual Wholesale Trade Survey, the Service Annual Surveys, the Annual Wholesale Trade Survey, and the Annual Retail Trade Survey. These data are collected at a higher level of aggregation than data from the Economic Census. To arrive at a final purchasers' value for each item, the BEA obtains the basic value of shipments for durables and nondurables, the value of receipts received for services, and data for calculating wholesale and retail trade margins, taxes, and transportation costs.

The total purchasers' value for each item is apportioned among the various users of that item, such as government, exporters, and industry (the last as an input for the items it produces). The portion allocated to the household sector as PCE frequently is derived as a residual after other users receive their allocations.

For PCE estimates, the operating expenses of nonprofit institutions serve as a proxy for the value of services provided to consumers. The BEA calculates the operating expenses of a nonprofit institution as the total expenses of that institution, less receipts from the sales of goods and services considered secondary to the nonprofit's main line of business. These receipts are assigned to a PCE category under which they are considered primary. For example, cafeteria receipts at a nonprofit hospital are moved from healthcare to food as purchased meals and beverages. This approach decreases the amount of PCE that is directly attributed to nonprofit institutions.

The data sources and methodologies the BEA employs differ slightly between benchmark years (years ending in "2" or "7") and nonbenchmark years (years between the benchmark years). Benchmark years coincide with the economic censuses conducted by the Census Bureau. Expenditures are available at a detailed item level for use in the benchmark PCE estimates. The annual survey data from the nonbenchmark years are not collected in such detail, so the BEA must extrapolate from those data to estimate PCE.

The populations covered by the CE and the PCE are defined somewhat differently. The CE collects data from consumer units representing the civilian noninstitutional population residing in the continental United States, Alaska, and Hawaii and not on military bases.

The PCE covers all "persons resident" in the United States and the nonprofit institutions that serve them. "Persons resident" include persons who are physically located in the United States, persons who are employees of U.S. businesses and who are working abroad for 1 year or less, and persons who are U.S.

Government civilian or military personnel stationed abroad, regardless of the duration of their assignments.<sup>39</sup>

These basic methodological differences between the CE and the PCE explain some of the disparities between the CE and PCE aggregates. To see more clearly the magnitude of the differences between the estimates, the Bureau developed techniques for producing comparisons.

## Historical comparison methodology

*Development of methodology.* CE estimates and PCE estimates have been compared since the early 1980s. This section summarizes the process by which the comparisons have been carried out historically.<sup>40</sup>

In the past, the first step was to select item categories for comparison. The initial framework on which to produce matching CE-to-PCE estimates came from the item categories in the reference tables of CE bulletins and reports published since August 1989.<sup>41</sup>

It was not possible to create conceptually similar CE-to-PCE categories in every case. In some cases, adjustments were made to published CE categories in order to produce categories comparable to PCE categories. This approach required using CE data at the level at which expenditures are defined for CE and CPI purposes. Expenditure items at this level are designated by Universal Classification Codes, or UCC's. Thus, UCC's representing the value of vehicles disposed of and trade-in allowances for new and used vehicles, neither of which category is included in estimates of vehicle purchases in published CE tables, were combined with net payments for vehicles in order to derive an estimate for vehicle purchases similar to PCE estimates. In other instances, it was necessary to combine expenditure item categories to achieve comparability. For example, rent, utilities, and public services were combined because the CE does not extract utility charges that are included in contract rent.

Irreconcilable conceptual differences prevented a matching of categories such as owner-occupied shelter, healthcare, education, cash contributions, and personal insurance and pensions in accordance with publication definitions. In CE publications, owner-occupied shelter expenditures are defined to include mortgage interest and charges, property taxes, maintenance and repairs, insurance, and other related costs. In contrast, the BEA defines the value of owner-occupied shelter for PCE as space rent, which excludes charges for utilities, major appliances, furniture, and furnishings.

In its estimates, the PCE includes expenditures made for healthcare and education by nonprofit institutions serving households. These expenditures are considered out of the scope of the CE. In addition, healthcare expenditures in the

PCE include third-party payments by insurance companies and others, whereas the CE includes only out-of-pocket payments by consumers. Cash contributions to nonprofit organizations do not appear as a category in the PCE, but rather are subsumed under the religious and welfare activities category. Because most religious and welfare activities are carried out by nonprofit institutions serving households, the PCE consists of expenditures made by these institutions. Personal insurance and pension expenditures also are not included in the comparison, due to definitional differences. In CE published estimates, such expenditures consist of premiums paid on life and other personal insurance policies and contributions made to pension plans by consumer units. The PCE includes only expenses incurred for handling life insurance and pension plans.

With comparable CE-to-PCE item categories identified, CE and PCE expenditure data historically were processed and formatted to calculate annual aggregate estimates and CE-to-PCE ratios of expenditures by type of expenditure. For each year's CE-to-PCE comparison, the CE estimates were computed with data from the same source (the Diary or Interview component) selected for that item in published tables for that year, and the aggregates were generated in the same way as the published annualized estimates.<sup>42</sup>

Estimates of PCE aggregate expenditures were generated by the BEA and published in tables, organized by type of product and type of expenditure, in the *Survey of Current Business*. Each year, the BEA supplies the Bureau of Labor Statistics with a table of annual expenditure estimates. The level of precision in the PCE estimates was adjusted to match that in the CE estimates.

For those CE and PCE expenditure categories deemed conceptually comparable, a concordance was established that identified which detailed CE and PCE items should have been included in each category. Annual aggregate estimates for these items were summed to create annual aggregates for the comparable categories in the CE and the PCE. Then, CE-to-PCE ratios were calculated from the aggregates of the comparable categories.

*Trends in historical CE and PCE estimates.* In the years since the historical comparison method was introduced to produce comparable aggregate expenditure estimates, certain trends have appeared in the ratios of CE estimates to PCE estimates. The following tabulation presents averages of aggregate expenditure ratios for a subset of major expenditure categories for two periods:

Category	1984-91	1992-2002
Total food .....	0.77	0.73
Rent, utilities, and other related goods and services .....	.91	.88
Household operations .....	.87	.73

Apparel and services .....	.65	.54
Transportation .....	.89	.79
Entertainment .....	.64	.54
Personal care .....	.67	.60
Miscellaneous .....	.29	.20

Note that the first period begins with 1984, the first year for which CE-to-PCE data comparisons historically were generated, and runs to 1991. The second begins with 1992 and ends with 2002, both benchmark years for the PCE. PCE estimates reflect revisions made to the earlier years' aggregates through February 2005.

At the level of aggregation represented in the preceding tabulation, the ratios indicate that the CE aggregates are lower than the PCE aggregates and the disparity between them has increased between the two periods shown. The CE survey and the PCE produce the closest aggregates for (1) rent, utilities, and other related goods and services and (2) transportation. By contrast, PCE aggregate miscellaneous expenditures are substantially larger than CE estimates, resulting in quite low ratios of 0.29 and 0.20, respectively, for the two periods. The decline in the ratios has been relatively steady across the years for most major categories. More detailed results reveal trends for item groups within categories, and these trends help identify areas most responsible for the decline. (See appendix table C-1.)

The ratios presented in the preceding tabulation and in appendix table C-1 may differ from aggregate expenditure ratios published earlier for the same year. Although CE aggregates for a particular year change occasionally due to previously undiscovered errors in the data, it is more likely that the trend line in the aggregates exhibits spikes or disjoint shifts over time. These aberrations coincide with changes in sample design, data collection methods, and data processing in the CE. In contrast, changes in PCE aggregates are retrospective. When a new year's PCE aggregates are produced, the aggregates for previous years often are revised, due either to updated source data that the BEA has received in the interim or to the culmination of the benchmarking process.

A summary of trends in the ratios presented is presented in exhibit 1. A ratio is defined as stable if the difference between the average ratio for 1992-2002 is within 3 percentage points of the 1984-91 ratio. If the 1992-2002 ratio is 4 or more percentage points lower than the 1984-91 ratio, then the ratio is defined as decreasing. The subheadings in the exhibit denote the relative magnitudes of the ratios. Only two expenditure categories had increasing ratios, and just four had stable ratios.

## Revised comparison methodology

*Examination of historical trends.* As the ratios and trends suggest, gaps between aggregate expenditures in the CE and

the PCE are widening for most expenditure groups, making the study of the underlying reasons more pressing. Although some of the reasons for the gaps, such as differences in definition, coverage, and methodology, had been recognized and documented in the past when comparative estimates were presented, a more formal, comprehensive examination has never been conducted. For this reason, a team of researchers was formed to conduct an investigation into the matter and extend it to comparisons of the CE and other data sources. Among the objectives of this team were the following:

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

A summary of points made earlier concerning the methodology and concepts involved in obtaining the CE and PCE estimates is useful to review before examining possible reasons for differences in the estimates. The CE and the PCE each provide a measure of consumer expenditures, but these measures are derived from different types of data. The PCE is defined in terms of sales or the output of production, 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 defining their output. In theory, if (1) all sales and purchases are recorded accurately, (2) expenditures of nonprofit organizations are excluded from the PCE, and (3) the respective populations are adjusted to be the same, the CE and PCE estimates should be similar, if not the same, for the majority of items in the survey. In practice, however, these estimates are disparate.

Three major reasons for differences between CE and PCE estimates are the *methodology* of the two surveys, their *scope* (in terms of both whose expenditures are being measured and how expenditures are defined), and the *definitions* they employ. Aside from including the expenditures of nonprofit institutions, the PCE covers military personnel and others whose expenditures are ignored by the CE. In addition, certain expenditure categories were out of the scope of the PCE in previous comparisons because the BEA used the CE survey as the primary source for the PCE estimates. For example, the BEA used or still uses CE data, directly or through extrapolation, on motor vehicle leasing (cars and trucks), motor vehicle rental, taxis, nursery schools, and childcare.<sup>43</sup> The BEA also used CE estimates for medical and hospitalization insurance premiums in the PCE. Beginning with the 2000 annual revision of the PCE, however, the BEA adopted the Medical Expenditure Panel Survey (MEPS) as the primary data source for the medical care and hospitalization insurance component of the PCE.<sup>44</sup>

*Methodological reasons for differences.* The methodologies designed to produce CE and PCE estimates are dissimilar and account for some of the difference between the estimates. The BEA starts with a basic initial dollar value for each item. This dollar value consists of the value of manufacturers' shipments of goods or the value of receipts received by service providers. The data are obtained from various economic censuses and surveys. Data from these sources can suffer from reporting errors and, in the case of surveys, sampling errors. Using its expert judgment, the BEA staff makes adjustments for what it considers to be misreporting errors.

Wholesale and retail trade margins can account for a large proportion of the final purchasers' value of an item assigned to the PCE. The algorithm by which these margins are calculated can be summarized simply as *total receipts from sales by wholesalers and retailers, less total costs of acquisition, adjusted by changes in the value of unsold inventories held*. Because data limitations do not permit the production of trade margins at the item level, the BEA carries out an iterative series of adjustments and reallocations to obtain a reasonable estimate for wholesale and retail trade margins across items.

Commodity, wholesale, and retail taxes, which take the form of sales taxes, also are incorporated into the purchasers' value. On the basis of data from trade surveys, Census Bureau analysts determine sales tax rates, which the BEA then applies to sales receipts at the wholesale and retail levels. Next, total taxes are distributed among expenditure categories. The surveys that provide the data for deriving tax rates are subject to sampling and reporting errors, so adjustments similar to those made in the allocation of trade margins to expenditure categories also are applied to taxes.

The process of moving products from producer to wholesaler to retailer imposes transportation costs that increase the final purchasers' value. Data on air transit costs come from the Department of Transportation. The Census Bureau conducted the 1997 Commodity Flow Survey, which serves as the source for shipping charges by truck. The now-defunct Interstate Commerce Commission previously provided data on freight costs charged by railroads. These data are currently compiled by the American Association of Railroads.

After obtaining a final purchasers' value for an expenditure item, the BEA allocates that value to end users of the item, such as domestic industries, government, exporters, and consumers (PCE). Some allocations of the final purchasers' value are made directly to an end user on the basis of source data the BEA has, but in many cases, BEA staff draws on its past experience and expertise to determine these allocations. Often, the portion of an item's output allocated to PCE is the residual value left after allocations have been made to all other users.

In contrast to the methods used to arrive at PCE estimates, the CE estimates are derived from expenditure information provided directly by consumers through the Diary and Interview Surveys. Again, these surveys are subject to reporting and sampling errors that can affect expenditure estimates. Moreover, collecting data on family spending behavior through personal interviews and recordkeeping raises particular issues that can affect estimates of spending. The expenditures of some consumer items, such as alcoholic beverages and tobacco products, are likely underreported by respondents because of the sensitive nature of those items.

Proxy reporting is another reason for under- or misreporting. For example, in a comparison of CE health insurance premium data with MEPS health insurance data, the CE estimates for family policies were lower.<sup>45</sup> Further analysis pointed to employer-sponsored policies as the locus of the difference in estimates. The insurance component of MEPS (MEPS-IC) provides data on premiums for employer-sponsored coverage. The MEPS-IC is an establishment survey rather than a household survey, and the collection unit is an enrollee rather than a policy as in the CE survey. Operationally, the CE selects one respondent who reports for all members of the consumer unit and, as such, might not have perfect knowledge of the paying arrangements and out-of-pocket premium amounts for policies held by other members of the unit. For example, some respondents may have claimed that policy premiums were paid entirely by an employer or a union when, in reality, another member of the consumer unit 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. For instance, expenditures for the use of automatic teller machines of financial institutions would be captured in the Interview survey through questions that ask, “Do you (or any members of your [consumer unit]) have any expenses for checking accounts or other bank services?” Because of the global nature of this question, respondents may not record expenses for automatic teller machines or may not record *all* expenditures related to the use of such machines.

Trends in the relationship between CE and PCE estimates also can 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 also may have an impact. The influence of these changes on estimates for specific categories is an area for further work.

*Scope-related reasons for differences.* Although the scopes of the CE and the PCE largely coincide in terms of transactions covered and expenditure items included, there are some notable instances in which they differ, with a resulting impact on the CE and PCE estimates.

In addition to the earlier noted population differences between the two surveys, the following expenditures are components of the PCE, but are outside the scope of the CE: the value of home production by persons living on farms for their own consumption; standard clothing issued to military personnel; and services, except life insurance services, furnished without payment by financial intermediaries. Also captured in the PCE, but not included in CE estimates, are expenditures made by third-party payers on behalf of the consumer, such as employer-paid benefits and insurance reimbursements. The Interview instrument does collect some reimbursement data for items such as expenditures on auto repairs and on medical care, but not on a systematic basis, because its emphasis is on respondents providing data on direct out-of-pocket spending.

The CE collects expenditure data on transactions between consumer units that can be significant for some categories, such as purchases of used vehicles. The PCE explicitly excludes these transactions in the derivation of its estimates. Also, allocations or payments into Social Security are included in the CE published estimates, but not in PCE estimates.

*Definitional reasons for differences.* The CE and the PCE define some expenditure categories differently, leading to differences between the CE and PCE estimates. For example, the CE defines education expenses as out-of-pocket expenditures, whereas the PCE estimates the operating expenses of private educational institutions as part of its estimate of education expenditures by households. Also, for publication purposes, the CE defines expenditures for owner-occupied housing to include spending for mortgage interest and charges, property taxes, maintenance and repairs, and other expenses; the PCE imputes space rent to estimate expenditures for owner-occupied dwellings. Finally, the CE defines retirement and pension expenditures as out-of-pocket contributions by the consumer unit to pension plans; the PCE estimates such expenditures from the administrative expenses incurred by sponsors managing pension plans.

*Development of revised methodology.* To understand better the differences between the CE and the PCE, the team decided to revamp the historical methodology used in earlier analytical work (for example, that of Raphael Branch)<sup>46</sup> by regrouping the CE items into PCE detailed categories. The categories are based on the framework of the 1992 Bridge table<sup>47</sup> and incorporate the item detail from the 1997 input-output data used in producing the PCE for the National Income and Product Accounts.<sup>48</sup> The Bridge table provides the most detailed information available regarding what is included in each PCE category. The CE items are represented by UCC’s. In many instances, there is no perfect match between the CE



and PCE items assigned to a particular aggregate category, even when concepts are generally the same. These situations are discussed in the next subsection, in which each group is reviewed.<sup>49</sup>

The CE and the PCE are compared with respect to the following major classifications: durable goods, nondurable goods, and services. Within each of these classifications, expenditure aggregates are presented for subgroups. First, aggregate expenditures for both the CE and the PCE are presented, regardless of comparability of the category. Then, only those aggregates from categories with items deemed most comparable by the team are examined. Next, brief analyses explain why differences arise between the CE and PCE estimates, especially when they may be due to noncomparability of the CE and PCE component items. As will be seen, many fewer item categories are considered comparable than in past comparisons. The comparison of aggregate expenditures for 1997, the most recent benchmark year for which PCE estimates are available, is presented here. The comparison for 2002, the latest benchmark year, but not based on 2002 benchmark PCE estimates, is displayed in appendix table D-1.

All UCC's that nominally fit into the PCE framework are included in the initial analysis of comparable and non-comparable categories. In some cases, such as healthcare, the category is within the scope of both the CE and the PCE, but the operational definitions are sufficiently different to result in estimates that are not comparable. For example, as noted earlier, the full costs of healthcare are included in the PCE, but only the expenditures made by consumer units, net of reported reimbursements, are included in the CE definition.

Differences in scope and definition affect the comparability of estimates for purchases of used cars. The PCE includes (1) the retail trade margin for purchases by households from intermediaries, such as car dealers, for cars traded in by other households, (2) net purchases by households for cars originally in the business sector, such as company cars previously rented or leased, and (3) a value for scrap metal—representing used cars scrapped by households—which is deducted from purchases. The CE, by contrast, does not have estimates either for the retail trade margin from the first type of transaction or for the value of scrap metal. It does collect the transaction price of used-car purchases and thus covers business-to-household transactions, although it does not specifically identify such transactions. Direct household-to-household sales are included in the CE survey, but are out of the scope of the PCE, as mentioned earlier. Thus, used-car comparisons produced with the earlier methodology were very rough proxies and are now deemed not comparable.

*Evaluation of revised comparisons.* As seen in table 1, which presents CE and PCE aggregate expenditures for all item

groupings (comparable and not comparable) for 1997, the ratio of CE-to-PCE estimates for total goods and services is 0.65. CE aggregate durable goods expenditures are 81 percent of those for the PCE. CE nondurable goods spending equals 63 percent of the PCE value, while the CE-to-PCE ratio for service expenditures is 0.62. These ratios are not adjusted to account for the differences in the populations represented by the CE and the PCE. Recall that PCE expenditures represent those made by a larger population than the CE population. For most categories that are deemed comparable in definition and scope and that are adjusted for population differences, the CE and the PCE produce estimates that tend to be reasonably close to each other. For categories that differ in concept or vary in composition beyond that for which adjustments can be made, aggregate expenditures are more disparate—substantially in some cases.

*1. Durable Goods.* The item category of durable goods consists of motor vehicles and parts, furniture and household equipment, and other durable goods. Among the comparable durable-goods groups, estimates of expenditures for new automobiles and for kitchen and other household appliances were similar.

CE aggregate expenditures for motor vehicles and parts are higher than those calculated for the PCE. (The ratio is 1.04.) For the comparable category of new automobiles, the CE-to-PCE ratio is 1.03. The impact of the scope and definitional differences noted earlier on expenditures for used autos is reflected in much higher CE aggregate expenditures, compared with PCE estimates. (The CE-to-PCE ratio is 1.57.)

Within the component of other motor vehicles in both the CE and the PCE are trucks (new and used) and recreational vehicles. Like purchases of automobiles, purchases of trucks are distinguished between new and used; thus, as regards CE-to-PCE comparisons, the used-truck portion is subject to the same comparability issues as is the category of used cars. In the PCE, trucks also include truck tractors and bus chassis. While expenditures on these items are not likely to be reported by consumer units in the CE, they probably are small in the PCE. Estimates of expenditures for recreational vehicles for the CE and PCE are very close, although the category is not considered comparable because of the differential treatment of used vehicles.

The category “tires, tubes, accessories, and other parts” is composed chiefly of the same items in both surveys; however, there are significant differences in the estimates, probably because the CE estimate consists of expenditures net of reimbursements for insurance and warranty coverage, while the PCE retains the full cost for these items, regardless of the payer. CE estimates for specific items in this category may be higher than those derived for the PCE, because, in some cases, the CE instrument allows the respondent to include in the expenditure report labor charges associated

**Table 1. Comparison of 1997 aggregate Consumer Expenditures with Personal Consumption Expenditures based on 1997 PCE benchmark**

[In millions of dollars]

PCE categories	Raw aggregates		
	PCE	CE	Ratio
Total durables, nondurables, and services .....	\$5,544,512	\$3,589,914	0.65
Durable goods .....	689,767	561,031	.81
Motor vehicles and parts .....	302,228	315,177	1.04
New autos <sup>1</sup> .....	82,326	84,636	1.03
Net purchases of used autos .....	54,166	84,917	1.57
Other motor vehicles .....	123,810	129,980	1.05
Trucks, new and net used .....	114,566	121,129	1.06
Recreational vehicles .....	9,244	8,851	.96
Tires, tubes, accessories, and other parts .....	41,926	15,644	.37
Furniture and household equipment .....	256,165	174,753	.68
Furniture, including mattresses and bedsprings <sup>1</sup> .....	56,467	42,012	.74
Kitchen and other household appliances <sup>1</sup> .....	26,383	28,391	1.08
China, glassware, tableware, and utensils .....	25,464	6,966	.27
Video and audio goods, including musical instruments, and computer goods <sup>1</sup> .....	92,340	50,427	.55
Video and audio goods, including musical instruments <sup>1</sup> .....	58,871	30,644	.52
Computers, peripherals, and software <sup>1</sup> .....	33,469	19,783	.59
Other durable house furnishings (for example, floor coverings, clocks, lamps, and furnishings; blinds, rods, and other; writing equipment, handtools, tools, hardware, and supplies) .....	55,511	46,897	.84
Other durable goods .....	131,374	71,161	.54
Ophthalmic products and orthopedic appliances .....	18,621	7,789	.42
Wheel goods (including bicycles and motorcycles), sports (also includes guns) and photographic equipment, boats, and pleasure aircraft .....	44,783	33,842	.76
Jewelry and watches .....	40,944	18,086	.44
Books and maps .....	27,026	11,444	.42
Nondurable goods .....	1,618,967	1,026,129	.63
Food .....	796,201	559,008	.70
Food purchased for off-premise consumption <sup>1</sup> .....	492,521	337,499	.69
Alcoholic beverages purchased for off-premise consumption <sup>1</sup> .....	61,162	18,972	.31
Purchased meals and beverages <sup>1</sup> .....	294,942	218,288	.74
Alcoholic beverages in purchased meals <sup>1</sup> .....	32,170	13,604	.42
Food supplied to employees: civilians .....	7,688	3,221	.42
Food supplied to employees: military .....	523	( <sup>2</sup> )	...
Food produced and consumed on farms .....	527	( <sup>2</sup> )	...
Clothing and shoes .....	258,085	157,359	.61
Shoes <sup>1</sup> .....	40,732	33,126	.81
Women's and children's (girls' and infants') clothing and accessories, except shoes <sup>1</sup> .....	127,456	79,788	.63
Men's and boys' clothing and accessories, except shoes <sup>1</sup> .....	80,594	42,883	.53
Standard clothing issued to military personnel .....	315	( <sup>2</sup> )	...
Sewing goods for males and females .....	5,000	936	.19
Luggage for males and females .....	3,988	1,026	.26
Gasoline, fuel oil, and other energy goods <sup>1</sup> .....	147,739	127,847	.87
Other nondurable goods .....	416,942	181,515	.44
Tobacco products <sup>1</sup> .....	53,848	27,565	.51
Toilet articles and preparations <sup>1</sup> .....	51,624	25,749	.50
Semidurable house furnishings .....	31,400	9,069	.29
Cleaning and polishing preparations, and miscellaneous household supplies and paper products .....	53,854	34,339	.64
Drug preparations and sundries .....	111,140	37,231	.33
Nondurable toys and sport supplies .....	48,399	17,568	.36
Stationery and writing supplies .....	16,856	12,985	.77
Net foreign remittances .....	2,958	( <sup>2</sup> )	...
Magazines, newspapers, and sheet music .....	31,153	10,881	.35
Flowers, seeds, and potted plants .....	15,710	6,128	.39
Services .....	3,235,778	2,002,754	.62
Housing and household operations .....	1,179,605	1,286,839	1.09
Owner-occupied dwellings <sup>1</sup> .....	597,957	751,763	1.26
Rent and utilities, excluding telephone <sup>1</sup> .....	374,363	366,184	.98
Tenant-occupied nonfarm dwellings .....	198,957	208,293	1.05

See notes at end of table.

**Table 1. Continued—Comparison of 1997 aggregate Consumer Expenditures with Personal Consumption Expenditures based on 1997 PCE benchmark**

[In millions of dollars]

PCE categories	Raw aggregates		
	PCE	CE	Ratio
Electricity .....	\$94,516	\$95,934	1.02
Gas .....	36,832	31,774	.86
Water and other sanitary services .....	44,058	30,183	.69
Other lodging <sup>1</sup> .....	45,699	30,842	.67
Telephone and telegraph .....	103,648	85,416	.82
Domestic service <sup>1</sup> .....	14,688	7,954	.54
Other household operations (for example, moving and storage, household insurance, rug and furniture cleaning, electrical repair, reupholstery and furniture repair, postage, household operation services not elsewhere classified) .....	43,250	44,680	1.03
Transportation <sup>1</sup> .....	245,666	225,711	.92
Repair, greasing, washing, parking storage, rental, and leasing .....	152,867	101,934	.67
Bridge, tunnel, ferry tolls .....	4,367	1,846	.42
Insurance .....	37,807	79,709	2.11
Mass transit systems .....	7,839	7,650	.98
Taxicab .....	3,258	2,169	.67
Railway .....	420	2,237	5.33
Bus .....	2,223	1,110	.50
Airline .....	29,836	26,269	.88
Other (including water passenger; passenger transportation arrangement; limousine service; other local transportation; part of Amtrak passenger, trucking, and courier services, except air) .....	7,049	2,787	.40
Medical care .....	873,033	149,348	.17
Physicians .....	198,242	14,104	.07
Dentists .....	50,931	21,491	.42
Other professional services .....	141,981	10,097	.07
Hospitals .....	338,516	9,232	.03
Nursing homes .....	78,251	1,382	.02
Health insurance .....			
Medical care and hospitalization health insurance .....	50,569	93,042	1.84
income loss insurance .....	1,172	( <sup>2</sup> )	...
Workers' compensation .....	13,371	( <sup>2</sup> )	...
Recreation .....	215,065	110,190	.51
Admissions to all events <sup>1</sup> .....	24,984	18,595	.74
Motion picture theaters, theatre, opera, and entertainment .....	15,783	13,582	.86
Spectator sports .....	9,201	5,013	.54
Radio and television repair <sup>1</sup> .....	3,900	775	.20
Clubs and fraternal organizations .....	16,299	7,931	.49
Commercial participant amusements .....	59,423	17,987	.30
Parimutuel net receipts .....	4,018	5,616	1.40
Other (including pets and pet services, excluding vets; veterinarians; cable TV; film developing; photo studios; sporting and recreational camps; high school recreation; lotteries; videocassette rental; commercial amusements not elsewhere classified) .....	106,441	59,286	.56
Personal care .....	69,650	39,079	.56
Cleaning, storage, and repair of clothing and shoes <sup>1</sup> .....	13,646	7,966	.58
Barbershops, beauty parlors, and health clubs .....	31,247	30,147	.96
Other (including watch, clock, and jewelry repair; miscellaneous personal services) .....	24,757	965	.04
Personal business .....	412,926	36,080	.09
Brokerage charges and investment counseling .....	60,841	( <sup>2</sup> )	...
Bank service charges, trust services, and safe deposit box rental .....	43,711	3,715	.08
Services furnished without payment by financial intermediaries except life insurance carriers .....	133,056	( <sup>2</sup> )	...
Expense of handling life insurance and pension plans .....	81,880	( <sup>2</sup> )	...
Legal services <sup>1</sup> .....	53,748	14,336	.27
Funeral and burial expenses <sup>1</sup> .....	13,001	8,731	.67
Other personal business (including labor union expenses, professional association expenses, employment agency expenses, money orders, classified ads, tax return preparation services, personal business services not elsewhere classified) .....	26,689	9,298	.35

See notes at end of table.

**Table 1. Continued—Comparison of 1997 aggregate Consumer Expenditures with Personal Consumption Expenditures based on 1997 PCE benchmark**

[In millions of dollars]

PCE categories	Raw aggregates		
	PCE	CE	Ratio
Education and research .....	\$129,682	\$65,829	0.51
Higher education .....	69,834	37,324	.53
Nursery, elementary, and secondary schools .....	29,411	26,472	.90
Elementary and secondary schools .....	22,850	9,517	.42
Nursery schools .....	6,561	16,955	2.58
Other education and research .....	30,437	2,033	.07
Commercial and vocational schools .....	20,203	( <sup>3</sup> )	...
Foundations and nonprofit research .....	10,234	( <sup>3</sup> )	...
Religious and welfare activities .....	134,234	89,678	.67
All contributions, including religion (not a PCE category) .....		78,857	
Political organizations .....	579	( <sup>3</sup> )	...
Museums and libraries .....	6,204	( <sup>3</sup> )	...
Foundations to religion and welfare .....	6,596	( <sup>3</sup> )	...
Social welfare .....	80,632	10,821	.13
Childcare .....	19,682	7,576	.38
Social welfare (including membership organizations, job training and vocational rehabilitation services, residential care, individual and family services, social services not elsewhere classified, civic-social-fraternal associations) .....	60,950	3,245	.05
Religion .....	40,223	( <sup>3</sup> )	...
Net foreign travel .....	-24,083	( <sup>3</sup> )	...

<sup>1</sup> Comparable CE and PCE categories.

<sup>2</sup> Category not within the scope of the CE survey.

<sup>3</sup> The CE survey does not collect data at the indicated level of detail for this category.

with installing the part. (For example, the purchase of tires may include the price of the labor required to mount them.) However, when most of the expenditures represent the provision of a service for this article, the item in question is included among 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 0.68. The two categories of furniture (including mattresses and bedsprings) and kitchen and other household appliances appear to be most similar conceptually and operationally among all durable goods. The ratios for these categories are 0.74 and 1.08, respectively. By contrast, “china, glassware, tableware, and utensils” is a category that, although defined similarly, displays a wide gap between the CE and PCE estimates, resulting in a ratio of only 0.27. There is no obvious reason for this disparity.

The category “video and audio goods, including musical instruments, and computer goods” includes a large mix of items. Computers, peripherals, and software expenditures reported in the CE are only 59 percent of those calculated for the PCE. The difference probably results from the way the CE survey and the PCE obtain data on purchases by households. Only purchases made for nonbusiness purposes are in the scope of the CE. Thus, if a consumer unit purchased a computer or workstation for a home office, the purchase would not be reported in the survey. The PCE, however,

assigns *all* purchases made by the general public as being for personal consumption.

The final subgrouping in furniture and household equipment is “other durable house furnishings.” The items included in the CE and the PCE do not match sufficiently to consider the respective categories comparable, even though the ratio, 0.84, is fairly high. The number of detailed component items used to derive the PCE estimate is significantly higher than the number of recall cues given to respondents in the CE survey in collecting similar expenditure data. Another source of difference is in the treatment of an item such as 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. (If the consumer unit considers the purchase of floor coverings to be a capital improvement to the dwelling, it will be excluded from the CE estimate and treated instead as an increase in the value of the home.)

Estimated aggregate expenditures for other durable goods are lower in the CE than in the PCE (the ratio is 0.54), although none of the corresponding subgroups in other durable goods are considered comparable categories. The CE excludes direct payments or reimbursements by third parties, such as insurance companies, for consumer purchases of ophthalmic products and orthopedic appliances; the PCE counts the full value for these items, regardless of payer. CE aggregate

expenditures for this grouping are 42 percent of the PCE estimate.

CE expenditures for wheel goods, sports and photographic equipment, boats, and pleasure aircraft are 76 percent of PCE expenditures. The category is not defined similarly in the two surveys, with some CE items included that actually overlap a number of PCE durable and nondurable categories. Within the CE item “general sports equipment” is golf equipment, such as golf clubs and golf balls. In deriving the PCE, the BEA allocates aggregate spending on golf equipment between wheel goods, sports and photographic equipment, boats, and pleasure aircraft, on the one hand, and nondurable toys and sport supplies in the “other nondurable goods” category, on the other hand. Although not explicitly stated, it can be assumed that the PCE durable allocation contains data on golf club expenditures, while the nondurable allocation includes data on golf balls. The CE survey cannot make the same allocation in “general sports equipment”; CE expenditures for this item are assigned to the durable category in the new comparison methodology. (See table 1.) The situation repeats itself with other sporting goods, reported in “general sports equipment” in the CE survey. As a result, the CE-to-PCE ratio of 0.76 for “wheel goods” is higher than it otherwise might be (and concomitantly, the CE-to-PCE ratio for nondurable toys and sport supplies is lower).

The ratio of CE-to-PCE expenditures for jewelry and watches is 0.44. Both surveys define the category similarly, but, as with the category “other durable house furnishings,” the PCE estimate is derived from a much more comprehensive set of items than is cued for in the CE. For example, the PCE category “jewelry made of precious metal” contains data on expenditures for school rings, cuff links, money clips, watch chains, rosaries, cigarette lighters, and locket. The CE instrument offers additional cues only for costume jewelry, rings, and infants’ jewelry. Also, proxy reporting may affect this category, in that a parent responding for the entire consumer unit may not be aware of purchases of costume jewelry made by his or her children.

The PCE category “books and maps” also is more comprehensive than its CE counterpart. The PCE category includes data on expenditures not only for books, but for publishing as well. By contrast, in the CE, consumers report expenditures for books, but not for publishing. The PCE also includes art reproductions and print maps in the “books and maps” category, whereas the CE includes them among household decorative items in the “other durable house furnishings” category.

*2. Nondurable goods.* Nondurable goods are grouped into four major categories: food; clothing and shoes; gasoline, fuel oil, and other energy goods; and other nondurable goods. Food, clothing, and the energy groups are the most

conceptually similar between the CE and the PCE. The ratio for the energy items, 0.87, is quite high. The ratio for food, 0.70, is lower, but still relatively high, while the ratio for clothing, 0.61, is lower still.

CE expenditures for food purchased for off-premise consumption is 69 percent of PCE expenditures in the same category. Included in PCE estimates, but not asked about in the CE, is the contribution of the Federal Women’s, Infants’, and Children’s (WIC) program to purchases of qualifying food groups. This contribution accounts for a portion of the CE shortfall with respect to the PCE. The CE estimate for purchased meals and beverages is 74 percent of that of the PCE; the latter includes food purchased at athletic venues, motion picture theaters, and other places that are not covered in such a specific manner in the CE. Although defined similarly in the CE and the PCE, the category “food supplied to employees—civilians” is not comparable between them, due to a major difference in the way the estimates are constituted. The CE collects respondents’ estimates of the monetary value of free meals received at work as part of pay. The BEA allocates a percentage of the value of many of the food items that are included in food purchased for off-premise consumption to derive its estimate. For example, part of the value for the detailed item “frozen vegetables” is assigned to “food purchased for off-premise consumption,” and part is assigned to “food supplied to employees—civilians.” There is no CE counterpart to either of the PCE categories titled “food supplied to employees—military” or “food produced and consumed on farms.” In the former case, military personnel living on base are not included in the CE population and therefore are not sampled in the survey; in the latter, the CE does not collect any data on the value of home production or any other good received, but not paid for, by a consumer unit.

The ratio of CE-to-PCE expenditures on clothing and shoes is 0.61. The ratio for shoes alone is somewhat higher (0.81). The category of shoes is considered comparable between the two surveys, even though the CE estimate excludes athletic shoes for sports-related use, which the PCE includes. Although expenditures for athletic footwear are relatively sizeable, purchases for sports-related use are likely to be dwarfed by purchases for general streetwear. The two clothing and accessories categories (women’s and children’s, and men’s and boys’) appear to be composed of the same universe of items. That the CE estimate is about two-thirds of the PCE estimate for women and children and about one-half for men and boys may be due to the issue of proxy reporting of expenditures in the CE. The only other major difference in the category of clothing and shoes is the inclusion of standard clothing issued to military personnel in the PCE, but not the CE, reflecting the fact that military personnel living on base are excluded from the CE sample.

The CE and the PCE appear to define nondurable energy

goods similarly. Aggregate expenditure estimates for this category also are fairly close, with the CE-to-PCE ratio standing at 0.87.

The category “other nondurable goods” comprises a mix of disparate item groups, such as tobacco products; toilet articles and preparations; and flowers, seeds, and potted plants. The CE-to-PCE ratio for the category is only 0.44, reflecting in some measure the noncomparability of many of the subgroups. Tobacco products make up one of the two comparable subgroups, yet the CE-to-PCE ratio, 0.51, is fairly low. Purchases of tobacco products are considered “sensitive” because they conceivably carry a negative connotation among consumers. Thus, respondents of the CE are more likely to either omit or underreport tobacco expenditures compared with other types of spending. The other comparable category—toilet articles and preparations—also has a relatively low ratio, 0.50, the reasons for which are not readily apparent.

All the remaining subgroups in other nondurables are not comparable between the CE and the PCE. Often, this is because CE items overlap PCE categories such that definitionally comparable subgroups cannot be created. In some instances, the overlap is between two subgroups of nondurables. For example, the CE assigns expenditures to an item category called “lawn and garden supplies,” which includes fertilizer and seeds. The PCE, by contrast, puts expenditures on fertilizer into the category titled “cleaning and polishing preparations, and miscellaneous household supplies and paper products,” while placing expenditures on seeds in the category “flowers, seeds, and potted plants.” In this article, CE’s lawn and garden supplies item is assigned to the cleaning preparations/household supplies category, thereby increasing the CE-to-PCE ratio for that category and decreasing the ratio for flowers, seeds, and potted plants from what they would be if the CE item were allocated differently.

Another instance in which a CE item overlaps PCE categories is musical instruments and accessories. Among the accessories included in the CE item category is sheet music. The PCE, however, assigns sheet music to a nondurable-goods category together with magazines and newspapers, but includes the remainder of musical instruments and accessories in durables, together with video and audio goods. The CE item, by contrast, is assigned entirely to the “video and audio goods” category, because PCE expenditures on sheet music are very small compared with PCE expenditures on video and audio goods.

A particularly thorny case that showcases all of these issues is the PCE nondurable category of stationery and writing supplies. The CE collects data for three UCC’s, parts of which are assignable to stationery and writing supplies. The first item, which comes from the Diary Survey, is “stationery, giftwrap, etc.” The stationery portion of this item

clearly belongs to the PCE category, but the giftwrap portion would be found among the paper products in the PCE’s “cleaning and polishing preparations/miscellaneous household supplies/paper products” nondurable category. The other two UCC’s contain expenditures for schoolbooks, supplies, or equipment for educational institutions other than colleges or universities. Among the cues for these UCC’s are items, such as art supplies, that fall within the PCE category “stationery and writing supplies.” The cues also include textbooks and microscopes, data on which would appear in the PCE durable categories “books and maps” and “wheel goods, sports and photographic equipment, boats, and pleasure aircraft,” respectively. Although school supplies could not be separated from books and equipment, they were expected to represent the largest share of the two education-related UCC’s, so it was decided to assign those UCC’s to stationery and writing supplies. The addition of expenditures on giftwrap, schoolbooks, and school equipment represented in the CE estimate for this category could explain the reasonably high CE-to-PCE expenditure ratio (0.77).

The CE-to-PCE ratio for the category “drug preparations and sundries” is among the lowest of the ratios in all the other nondurable-goods subgroups. CE expenditures are only 33 percent of similar expenditures derived in the PCE. As with other medical goods and services, CE estimates of drug preparations and sundries include only out-of-pocket payments by consumers, whereas the PCE estimate counts reimbursements and other third-party payments as well.

*3. Services.* The major expenditure categories in services are housing and 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. The analysis presented here shows that no major category is considered completely comparable between the CE and the PCE under the publication or new-methodology definition.

The category “housing and household operations” is composed of the following subgroups: owner-occupied dwellings; rent and utilities, excluding telephone; other lodging; telephone and telegraph; domestic service; and other household operations. Housing and household operations are treated as separate categories by the BEA in PCE tabulations, but are combined in this analysis to facilitate the creation of the comparable “rent and utilities” subgroup. The PCE assigns rent to the housing category and utilities to household operations. In the CE, however, some reports of rent include utilities, which cannot be split out.<sup>50</sup> The ratio of CE-to-PCE aggregates with rent and utilities together is 0.98 for 1997 and 0.91 for 2002. The CE estimates for individual utilities are slightly lower, due to the portion captured with rent. Despite this difference, these estimates compare closely

to PCE estimates. Expenditures for electricity are approximately the same for the CE and the PCE, yielding a ratio of 1.02. For gas, the ratio is 0.86, and for water and other sanitary services, the ratio is 0.69. This lower ratio for water may reflect the fact that water is more commonly included with CE rent than are the other utilities. For 1997, 67.3 percent of rent payments in the CE include expenditures for water, while only 22.1 percent include expenditures for gas and 14.4 percent include expenditures for electricity.

In comparisons using the historical methodology, expenditures for owner-occupied dwellings were not considered comparable because of differing CE publication-standard definitions and those used for the PCE. In the revised methodology, the CE redefines owner-occupied housing so that it matches the PCE definition more closely. The PCE defines owner-occupied housing expenditures starting with gross rents for equivalent renter-occupied units, excluding charges for utilities, major appliances, and furniture and furnishings. This measure, referred to as *space rent*, is imputed for owner-occupied housing units with the use of tabulations of contract-rent-to-property-value ratios by property-value class, matched to tables with counts of owner-occupied housing units by property-value class. The tabulations were obtained by the BEA from the Census Bureau's 1991 Residential Finance Survey (RFS), which is conducted once every 10 years in conjunction with the decennial census; the tables are from publications of the biennial American Housing Survey (AHS), starting with 1991 data. The RFS and AHS data are used to produce estimates for the 1991 PCE. In subsequent years, including the benchmark year 1992, average space rent is extrapolated with the use of the CPI for owner-occupied housing, as well as with an adjustment that would not be captured by the CPI alone. The quality adjustment takes into account additions, alterations, and depreciation of the housing stock. Average owner space rents are multiplied by the number of owner-occupied housing units as reported in the AHS for 1991 and every second year thereafter. For those years falling between AHS survey years, the BEA uses data from the Current Population Survey to interpolate and extrapolate the number of owner-occupied units.<sup>51</sup> PCE owner-occupied housing includes primary residences, vacation homes, and time shares.

For the revised comparison, reported rental equivalence values of owner-occupied properties made by respondents to the CE Interview are used to estimate expenditures for owner-occupied housing. For years prior to 1999, the CE data are not strictly comparable to the PCE data, lacking the rental equivalence value of owned vacation homes, including time shares. With rental equivalence used as a proxy for the space rent of owned nonvacation homes, the CE-to-PCE ratio for owner-occupied dwellings for 1997 is 1.26. (Were the rental

equivalence of vacation homes included, this ratio would be even higher.)

Since 1999, data on the rental value of owned vacation homes have been collected, making the CE estimate conceptually comparable to the PCE's. In the PCE, the rental value for vacation homes, including time shares, is calculated as 50 percent of the imputed value of housing units that are primarily rented. If a vacation home is for the homeowner's use only, then 100 percent of the imputed value is counted. The CE instrument does not detect whether the vacation home or time share is rented occasionally. (If it always is rented, then it is treated like a business property and is excluded from the survey.) In order to match the PCE process, 50 percent of the rental equivalence value for vacation homes and time shares (not rented as a business) reported in the CE is added to the CE's aggregate for owner-occupied housing. Even with the addition of an estimate for vacation homes, the ratio of CE to PCE aggregate expenditures has fallen over time. For example, the 2002 ratio is 1.22, compared with the earlier mentioned 1.26 for 1997.

The category "telephone and telegraph" is the first of the two subgroups in the services sector that are not considered comparable between the surveys. The major UCC that accounts for most of the CE estimate for telephone services includes expenses for pay phones. In the PCE, the receipts of pay phone operators are one of the miscellaneous personal services in the "other personal care" subgroup in the "personal care" category.

The other subgroup of services that is not considered comparable is household operations, although on first glance it would appear to be so because the CE and PCE estimates are so close. However, the household insurance component of other household operations is conceptually quite different in the CE and the PCE. As with other types of insurance, the CE defines household insurance as out-of-pocket premium payments made by consumers. The PCE, however, defines it as the premiums collected net of the losses paid by insurance companies. Because of this conceptual difference, CE estimates for expenditures for household insurance have averaged about 8 times greater than PCE estimates.

Transportation includes a broad range of services, from repairs to passenger fares. Many of the CE-to-PCE ratios are quite high, with some exceeding unity. Two of the subgroups—repair, greasing, washing, parking storage, rental, and leasing; and insurance—are deemed noncomparable. The locus of CE-PCE conceptual differences for the former subgroup is the repair component; these differences were noted earlier in the discussion of tires, tubes, accessories, and other parts. (See page 28.) Reimbursements for insurance and warranty coverage are included in the PCE, but not in the CE, estimates. In addition, as noted earlier, expenditures for repairs reported in the CE may combine the cost of parts with labor charges.

The vehicle insurance category encounters the same conceptual issues as household insurance. The PCE defines insurance as premiums collected less losses paid out, while the CE defines it as paid premiums only. Though not as dramatic as the difference between the estimates in the household insurance category, the conceptual difference in vehicle insurance leads to higher estimates in the CE such that the CE-to-PCE ratio is 2.11 for 1997.

Expenditures for mass transit systems are almost the same for the two data sources for 1997. Expenditures for taxicabs, buses, and airlines are lower in the CE, sporting CE-to-PCE ratios of 0.67, 0.50, and 0.88, respectively. Railway transportation expenditures are quite high in the CE, compared with PCE estimates; the CE-to-PCE ratio is 5.33. The source of the PCE data is Amtrak revenues. CE expenditures, by contrast, cover excursions on more rail lines than Amtrak, both in the United States and abroad.

Expenditures for medical care include expenditures for services provided by healthcare professionals and healthcare facilities and for health insurance premiums. The CE-to-PCE ratios are extremely low, with the exception of medical care and hospitalization health insurance, which has a ratio of 1.84. One reason for the low ratios is that the operating expenses of nonprofits serving households are included in the PCE estimate, but not in the CE aggregates. The low ratios also reflect the fact that the CE counts only out-of-pocket outlays net of payments and reimbursements by insurance companies and other third-party payers. Medical care expenditures for the PCE represent the full costs of care. The CE estimate for medical care and hospitalization insurance is much higher than that computed for the PCE and can be traced to the fact that the CE counts premiums paid, whereas the PCE deducts benefits and claims paid from premiums earned. Health insurance in the PCE also encompasses insurance against loss of income and workers' compensation insurance. Neither has a counterpart in the CE, which, on the one hand, does not directly collect data on income loss insurance purchased by consumers, and, on the other, does not consider workers' compensation as a consumer expenditure.

Recreation is composed of an eclectic set of categories. Each of two of the six subgroups—admissions to all events, and radio and television repair—is considered a comparable category between the two surveys. The CE-to-PCE ratio for admissions to all events, 0.74, is relatively high. Within this subgroup are two components whose CE-to-PCE ratios differ markedly: the CE estimate for admissions to motion picture theaters, the legitimate theatre, opera, and entertainment is 86 percent of the PCE estimate, while the CE estimate for admissions to spectator sports reaches only about one-half the PCE estimate. The CE-to-PCE ratio for radio and television repair, 0.20, is quite low.

The highest CE-to-PCE ratio in recreation is for parimutuel net receipts (1.4). However, the Diary item from which the CE calculates its estimate also includes licenses for pets, fishing, and guns, a component that is not in the PCE category. The CE-to-PCE ratio for commercial participant amusements is a very low 0.30. More than 60 percent of the PCE estimate is derived from casino gambling, which also includes slot machines and bingo. To the extent that casino gambling is associated with trips or vacations, the CE Interview instrument does not explicitly ask about it in collecting data on travel expenses. If respondents report gambling expenditures among their entertainment expenses on trips, those expenditures are distributed among other entertainment UCC's. In addition, casino gambling may suffer from both nonreporting and underreporting due to its "sensitive" nature. All of these factors may help account for the low CE-to-PCE ratio.

Overall CE personal care expenditures are about 56 percent of those derived for the PCE. For cleaning, storage, and repair of clothing and shoes—the only subgroup of personal care deemed a comparable category between the surveys—CE estimates are 56 percent of those calculated for the PCE. This ratio is similar to that reported for clothing and shoes (0.61) in nondurables. The CE and PCE estimates for the barbershops, beauty parlors, and health clubs subgroup are very close in magnitude, yielding a CE-to-PCE ratio of 0.96. However, while the PCE apportions most health club expenses to this subgroup, it allocates some such expenses to clubs and fraternal organizations, commercial participant amusements, and the commercial amusements component in the other subgroup of recreation. In the CE, by contrast, membership costs and other expenses for health clubs are combined into one UCC that is assigned to clubs and fraternal organizations. The personal care subgroup for which the CE-to-PCE ratio is lowest is "other personal care," which includes repair of watches, clocks, and jewelry and miscellaneous personal services. The ratio of just 0.04 is due primarily to the larger number of items included in the PCE estimate for which there are no counterparts in the CE. The only CE items that can be directly assigned to this category cover repairs of watches, jewelry, and personal care appliances, and the rental of clothing. The PCE includes bail bonding, dating services, buying clubs, shopping services, and a host of other miscellaneous services. In addition, as mentioned earlier, the PCE includes pay phone receipts in this subgroup, whereas the CE does not.

Personal business comprises a broad set of services, the largest three of which, in dollar terms, are not comparable due to conceptual or operational differences between the CE and the PCE. Almost one-third of the PCE estimate for personal business is accounted for by services furnished without payment by financial intermediaries except life insurance



carriers. By definition, the PCE estimate is an imputation that represents checking, bookkeeping, and investment services received by consumers for which they do not pay through explicit service charges. Hence, it is not included in CE expenditures, which represent only actual service charges paid by consumers. The subgroup titled “expense of handling life insurance and pension plans” is the next-largest contributor to personal business. As the name implies, the operating expenses incurred by life insurance carriers and private sponsors to administer policies and pension plans are part of the PCE. The CE, however, treats each of these differently: life insurance expenditures are represented by payments of policy premiums, while contributions made by consumers denote outlays to private pension plans. The third-largest component of personal business in the PCE is brokerage charges and (fees for) investment counseling. In the CE, respondents are asked to include broker fees with the purchase price of any financial assets they buy and to deduct such fees, without explicitly identifying them, from the proceeds of any financial assets they sell. Thus, for publication or comparison purposes, these fees are not considered part of CE expenditures.

The subgroup of bank service charges, trust services, and safe deposit bank rental is deemed noncomparable, primarily because the PCE covers a wider range of items than the CE survey covers. The CE does probe for rental expenses for safe deposit boxes as a separate item; however, expenditures for banking services are collected in a general question with few cues, compared with the detailed items from which the PCE estimate is derived. In addition, services associated with trusts, custodial accounts, and escrow accounts are included in this subgroup in the PCE, whereas data on trust and estate management services are collected together with data on the preparation of tax returns in an umbrella category titled “accounting fees” in the CE. These accounting fees are included in the CE estimate of “other personal business expenditures.”

Conceptually, legal services and funeral and burial expenses are each comparable subgroups that display markedly different CE-to-PCE ratios. For legal services, the ratio is a very low 0.27, which may reflect a recall issue in that the CE instrument provides a limited number of cues for respondents concerning the types of legal proceedings for which the services of lawyers would be employed. It is also possible that respondents consider some of these proceedings—for, say, criminal or personal bankruptcy cases—to be sensitive and therefore are reluctant to report the attendant legal fees. The ratio for funeral and burial expenses, 0.67, is significantly higher than that for legal services. Operationally, the CE instrument is more comprehensive for the former than the latter subgroup. Although there is no obvious reason that the CE estimate is only two-

thirds of the PCE estimate, it is possible that respondents underreport funeral and burial expenses due to the personal and emotional nature of the subject.

The final subgroup of personal business, “other personal business,” consists of an amalgam of items such as labor union expenses, fees for tax return preparation, classified ads, and miscellaneous personal business services, including photocopying and duplicating services and the services of private mail centers. As noted earlier, in the CE, tax return preparation is included with trust and estate management, a category that is split into two in the PCE and assigned to bank service charges and safe deposit box rental. In addition, data on many of these items are collected in the CE Diary instrument and assigned to a UCC for miscellaneous personal services. However, that UCC also includes expenditures for bail bonding and shopping services, found in the “other personal care subgroup,” and for traffic or parking tickets, which are out of the scope of the PCE. For these reasons, other personal business was not considered comparable between the two surveys.

The category of education and research comprises (1) higher education, (2) nursery, elementary, and secondary schools, and (3) “other education and research.” The category of education and research is similar to medical care in the PCE in that much of the education portion of the expenditure estimate comes from nonprofit institutions serving households. More specifically, for private educational institutions, the PCE defines expenditures as operating expenses. In the case of higher educational institutions, operating expenses exclude expenditures for research and development financed under contracts or grants. For public educational institutions, education expenses are defined as payments of tuition for students. The CE includes out-of-pocket expenses for tuition and other educational expenses (excluding room and board) in its estimate for education. In addition, there is nothing collected in the CE instrument that is comparable to the “foundations and nonprofit research” portion of the PCE estimate. These differences render the category noncomparable between the CE and the PCE.

The high CE-to-PCE ratio of 2.58 for the nursery schools item in the nursery, elementary, and secondary schools subgroup stands out. As opposed to paying for other schools, consumers are more likely to pay the full costs of nursery schools. In the CE, education expenditures for nursery schools are combined into one UCC with similar expenditures for preschools and child daycare centers. The PCE, in contrast, derives its estimate by allocating one-third of the expenses for child daycare services reported by private providers to nursery schools. The remaining two-thirds is assigned to the childcare component of the social welfare subgroup in the category “religious and welfare activities.”

This allocation may explain the high CE-to-PCE ratio for nursery schools and, likewise, the relatively low ratio of 0.38 for childcare.

The “other education and research” subgroup is not deemed comparable between the two surveys primarily because the CE does not have a counterpart to the PCE expenditures derived from the operating expenses of grant-

making foundations and nonprofit firms engaged in research and development. The CE expenditures reported for other education and research come from schools that are actually very close in definition to the PCE component of commercial and vocational schools. The CE estimate, however, consists of tuition expenditures only, whereas the PCE estimate is derived from a broader class of items: operating expenses for

**Table 2. Summary comparison of aggregate Consumer Expenditures and Personal Consumption Expenditures based for 1992, 1997, and 2002 and restricted to the most comparable categories on the basis of concepts involved and comprehensiveness**

[In millions of dollars]

Category	1992			1997			2002		
	PCE	CE	CE-to-PCE ratio	PCE	CE	CE-to-PCE ratio	PCE	CE	CE-to-PCE ratio
<b>Total durables, nondurables, and services</b>									
Total .....	\$4,235,263	\$2,856,482	0.67	\$5,544,512	\$3,589,914	0.65	\$7,376,059	\$4,457,246	0.60
Comparable items .....	2,421,707	2,085,336	.86	3,027,956	2,563,644	.85	3,841,657	3,125,581	.81
Ratio of comparable items to total .....	.57	.73	...	.55	.71	...	.52	.70	...
Population-adjusted comparable items (PCE only) .....	2,357,166	2,085,336	.88	2,928,412	2,563,644	.88	3,730,773	3,125,581	.84
<b>Durable goods</b>									
Total durable goods .....	483,588	430,076	.89	689,767	561,031	.81	916,170	693,653	.76
Comparable durable goods .....	201,265	176,476	.88	257,516	205,466	.80	320,536	242,895	.76
Ratio of comparable durables to total durables .....	.42	.41	...	.37	.37	...	.35	.35	...
New autos .....	78,016	88,202	1.13	82,326	84,636	1.03	101,649	111,924	1.10
Furniture, including mattresses and bedsprings .....	38,957	31,922	.82	56,467	42,012	.74	68,288	46,171	.68
Kitchen and other household appliances .....	24,287	23,204	.96	26,383	28,391	1.08	31,537	33,666	1.07
Video and audio goods, including musical instruments, and computer goods .....	60,005	33,148	.55	92,340	50,427	.55	119,062	51,134	.43
<b>Nondurable goods</b>									
Total nondurable goods .....	1,330,504	866,976	.65	1,618,967	1,026,129	.63	2,080,101	1,212,863	.58
Comparable nondurable goods .....	1,167,003	808,815	.69	1,382,788	925,321	.67	1,723,492	1,083,624	.63
Ratio of comparable nondurables to total nondurables .....	.88	.93	...	.85	.90	...	.83	.89	...
Food purchased for off-premise consumption .....	415,693	299,635	.72	492,521	337,499	.69	615,604	389,640	.63
Alcoholic beverages purchased for off-premise consumption .....	48,853	16,388	.34	61,162	18,972	.31	75,461	25,497	.34
Purchased meals and beverages .....	245,954	179,103	.73	294,942	218,288	.74	380,021	267,770	.70
Alcoholic beverages in purchased meals .....	33,694	13,801	.41	32,170	13,604	.42	40,591	16,487	.41
Shoes .....	32,903	23,124	.70	40,732	33,126	.81	49,281	34,960	.71
Women's and children's (girls' and infants') clothing and accessories, except shoes ..	115,711	75,828	.66	127,456	79,788	.63	149,205	87,889	.59
Men's and boys' clothing and accessories, except shoes .....	63,645	45,018	.71	80,594	42,883	.53	92,586	45,769	.49
Gasoline, fuel oil, and other energy goods ...	124,639	107,384	.86	147,739	127,847	.87	177,467	148,800	.84
Tobacco products .....	48,008	27,266	.57	53,848	27,565	.51	89,122	35,668	.40
Toilet articles and preparations .....	37,903	21,268	.56	51,624	25,749	.50	54,154	31,144	.58
<b>Services</b>									
Total services .....	2,421,171	1,559,430	.64	3,235,778	2,002,754	.62	4,379,788	2,550,730	.58
Comparable services .....	1,053,439	1,100,045	1.04	1,387,652	1,432,857	1.03	1,797,629	1,799,062	1.00
Ratio of comparable services to total services ...	.44	.71	...	.43	.72	...	.41	.71	...
Owner-occupied dwellings .....	462,286	567,986	1.23	597,957	751,763	1.26	832,479	1,014,126	1.22
Rent and utilities, excluding telephone .....	302,733	300,749	.99	374,363	366,184	.98	466,483	424,634	.91
Other lodging .....	32,615	22,657	.69	45,699	30,842	.67	53,633	37,333	.70
Domestic service .....	11,356	7,937	.70	14,688	7,954	.54	16,754	8,958	.53
Transportation .....	157,664	158,353	1.00	245,666	225,711	.92	287,988	252,818	.88
Admissions to all events .....	16,614	12,658	.76	24,984	18,595	.74	34,583	21,888	.63
Radio and television repair .....	2,977	1,092	.37	3,900	775	.20	4,034	360	.09
Cleaning, storage, and repair of clothing and shoes .....	11,365	12,722	1.12	13,646	7,966	.58	15,784	13,501	.86
Legal services .....	44,860	9,180	.20	53,748	14,336	.27	71,258	14,910	.21
Funeral and burial expenses .....	10,969	6,711	.61	13,001	8,731	.67	14,633	10,534	.72

tax-exempt schools and tuition, fees, and other school receipts subject to Federal taxes.

Expenditures for religious and welfare activities in the PCE are derived almost exclusively from the operating expenses of nonprofits serving households. In contrast, most of the CE expenditures in this category are reported as contributions to charitable and other nonprofit organizations. Within the social welfare subgroup, CE estimates are for babysitting and child-care in noninstitutional settings, adult daycare, and home care for the elderly, disabled, handicapped, or convalescents. Because of this conceptual incompatibility, the category of religious and welfare activities is not considered comparable between the CE and the PCE. The ratio for the entire category is 0.67.

*Summary of comparable CE-to-PCE estimates.* When the CE and PCE estimates are focused on only those categories which are comparable to each other in the two surveys, the ratio of CE-to-PCE aggregate expenditures moves closer to unity. (See table 2.) Adjusting for population differences between the surveys brings the ratio even closer. The comparability adjustment also somewhat mitigates the decline in the ratio over time: for 1992, the ratio increases by 19 percentage points, from 0.67 to 0.86, and it rises by an additional percentage point for both 1997 and 2002.

Taking out noncomparable items increases the CE-to-PCE ratio for services by an average of about 40 percentage points for each of the 3 benchmark years. For the same 3 years, the ratio for nondurable goods increases an average of 4 points, while that for durable goods decreases marginally.

Not surprisingly, eliminating noncomparable items from the comparison has a major impact on services, because the estimates in many of that category's components are affected by

significant conceptual differences. Third-party payments in medical care; services provided by nonprofit institutions in medical care, education, and religious and welfare activities; and services furnished without payment by financial intermediaries in personal business are examples of noncomparable categories whose elimination from the comparison has a considerable impact on services. Thus, in some sense, the remaining service categories exhibit the "good ratios" that are closer to unity. For some comparable categories—for example, radio and television repair (0.20 for 1997) and legal services (0.27 for 1997)—the ratios nonetheless are still low.

In the case of nondurable goods, restricting the comparison to comparable categories does not improve the ratios as much. To some extent, this is because most of the aggregate expenditures for nondurables for 1997—85 percent for the PCE and 90 percent for the CE—are found in comparable categories. The lowest ratio in nondurable goods is 0.31, for purchases of alcoholic beverages. The CE is known to exhibit underreporting in sensitive items such as alcohol. Underreporting also explains the relatively low ratio for tobacco products (0.51).

The CE-to-PCE ratio for comparable categories of durable goods displays little change, despite the fact that the ratio has decreased more for durable goods than for the other two major expenditure groups.

Pinpointing the reasons for the increasing disparities between the two surveys is the continuing goal of the BLS team. Whether the differences are due to the way the PCE is derived, to the manner in which CE data are collected and adjusted, or to some combination of the two is yet to be determined. Future research will focus on expenditure categories for which estimates have been similar in the past, but that now show CE estimates growing less rapidly than their PCE counterparts. □

## Notes

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<sup>1</sup> Raymond Gieseman, "The Consumer Expenditure Survey: quality control by comparative analysis," *Monthly Labor Review*, March 1987, pp. 8–14, quote from p. 9.

<sup>2</sup> The CE consists of two components: a weekly Diary Survey and a quarterly Interview Survey. Simply put, in the former, respondents fill out two consecutive 1-week expenditure diaries. In the latter, respondents report expenditures through personal interviews every 3 months. Each CE component is described more fully later in this article. Early methodological work included the use of a supplementary Diary 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). Findings from this work led to the use of a CAPI instrument to collect data in the Interview component since April 1, 2003, and in the household characteristics questionnaire of the Diary component since January 2004.

<sup>3</sup> For recent published comparisons, see the following BLS publications: *Consumer Expenditure Survey 1992–93*, Bulletin 2462, September 1995; *Consumer Expenditure Survey 1994–95*, Bulletin 2492, December 1997; *Consumer Expenditure Survey 1996–97*, Report 935, September 1999; *Consumer Expenditure Survey 1998–99*, Report 955, November 2001; and *Consumer Expenditure Survey*

2001–02, Report 969, September 2003. Source data against which CE data 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. Other occasional comparisons also have been conducted. For example, health insurance expenditures from the CE survey have been compared with those from the Medical Expenditure Panel Survey supplied by the Agency for Healthcare Research and Quality of the U.S. Department of Health and Human Services. Appendix A includes a summary of sources that have been compared with the CE.

<sup>4</sup> A consumer unit comprises (1) all members of a particular household who are related by blood, marriage, adoption, or some other legal arrangement; (2) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or (3) two or more persons living together who use their income to make joint expenditure decisions. Financial independence is determined by the three major expense categories: housing, food, and other living expenses. For a respondent to be considered financially independent, at least two of the three major expense categories have to be provided entirely or in part by the respondent.

<sup>5</sup> Gieseeman, “The Consumer Expenditure Survey,” p. 9.

<sup>6</sup> In April 2000, a team of researchers from the Division of Consumer Expenditure Surveys and the Division of Price and Index Number Research, was convened to compare the CE data with data from other sources, primarily the PCE. The team’s first report describes the team charter, plans for comparing the data, and results obtained from comparing CE and PCE footwear aggregate expenditures. (See William Passero Thesis Garner, Sheila Sankaran, and Mark Vendemia, “Comparison of Estimates from the U.S. Consumer Expenditure Survey and the National Accounts Personal Consumption Expenditures: Footwear,” unpublished paper, Nov. 19, 2001).

<sup>7</sup> This methodology, which is based on the type of expenditure (for example, food, housing, or transportation) and has been used previously in official publications (most recently in *Consumer Expenditure Survey, 1998–99*, Report 955 (Bureau of Labor Statistics, November 2001)), is referred to as the “historical comparison methodology.”

<sup>8</sup> For example, Orazio P. Attanasio and Guglielmo Weber examine CE data in “Is Consumption Growth Consistent with Intertemporal Optimization? Evidence from the Consumer Expenditure Survey,” *Journal of Political Economy*, December 1995, pp. 1121–57; and Jonathan A. Parker and Christian Julliard focus on PCE nondurable expenditures in “Consumption Risk and Cross-Sectional Returns,” *Journal of Political Economy*, February 2005, pp. 185–222. Also, Daniel T. Slesnick, “Aggregate Consumption and Saving in the Postwar United States,” *Review of Economics and Statistics*, November 1992, pp. 585–97, and “Are Our Data Relevant to the Theory? The Case of Aggregate Consumption,” *Journal of Business and Economic Statistics*, January 1998, pp. 52–61, examines such adjustments to CE and PCE expenditures aimed at making the data from the two sources more comparable in an effort to estimate consumption. Finally, Jonathan Fisher and David S. Johnson, “Consumption Mobility in the United States: Evidence from Two Panel Data Sets,” unpublished manuscript (Bureau of Labor Statistics, 2004), and David S. Johnson, Timothy Smeeding, and Barbara Boyle Torrey, “Economic in equality through the prisms of income and consumption,” *Monthly Labor Review*, April 2005, use CE data to estimate the consumption of durables, nondurables, and services.

<sup>9</sup> To adjust the PCE estimates so that they refer to the same population as the CE does (that is, encompassing the noninstitutional population, those not living on a military base, and those not living overseas), the PCE aggregates would need to be multiplied by approximately 0.967 for 1997 and by 0.97 for 2002. The multiplier is derived by finding the proportion of the total U.S. population covered by the CE survey to the total population covered by the PCE. (See *Statistical Abstract of the United States: 2003*, 123rd edition (U.S. Census Bureau, 2003).)

<sup>10</sup> One of the earliest comparisons by outside researchers was Henrik S. Houthakker and Lester D. Taylor’s, *Consumer Demand in the United States: Analyses and Projections*, 2d ed. (Cambridge, MA, Harvard University Press, 1970). In this work, the authors compared 1960–61 CE data with PCE aggregate expenditures. (See also Slesnick, “Aggregate Consumption and Saving,” which cites Houthakker and Taylor.)

<sup>11</sup> For example, Attanasio and Weber, “Is Consumption Growth Consistent?” and Jonathan A. Parker and Bruce Preston, “Precautionary Saving and Consumption Fluctuations,” *American Economic Review*, September 2005, pp. 1119–43, use CE data to focus on consumption growth; Barry Bosworth, Gary Burtless, and John Sabelhaus, “The Decline in Saving: Evidence from Household Surveys,” *Brookings Papers on Economic Activity*, vol. 1991, no. 1 (1991), pp. 183–241, examine CE and PCE data with regard to the decline in savings in the United States; and Jesús Fernández-Villaverde and Dirk Krueger, “Consumption over the Life Cycle: Facts from Consumer Expenditure Survey Data,” unpublished manuscript, University of Pennsylvania and University of Frankfurt, 2004, use CE data and specify cohorts by the reference person’s age to examine consumption over the life cycle of consumer units.

<sup>12</sup> For example, see Jack E. Triplett, “Measuring Consumption: The Post-1973 Slowdown and the Research Issues,” *Federal Reserve Bank of St. Louis Review*, May–June 1997, pp. 9–42; Dennis Fixler and Ted Jaditz, “An Examination of the Difference Between the CPI and the PCE Deflator,” Working Paper 361 (Bureau of Labor Statistics, 2002); David S. Johnson and John Greenlees, “Comparison of Movements in the CPI and PCE Price Indexes,” paper presented to the Federal Economic Statistics Advisory Committee (FESAC) (Bureau of Labor Statistics, March 21, 2003); David E. Lebow and Jeremy B. Rudd, “Measurement Error in the Consumer Price Index: Where Do We Stand?” *Journal of Economic Literature*, March 2003, pp. 159–201; and Charles L. Schultze and Christopher Mackie, eds., *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 (Washington, DC, National Academy Press, 2002). Triplett also examined the relationship between the PCE deflator and the CPI.

<sup>13</sup> Slesnick, “Aggregate Consumption and Saving.”

<sup>14</sup> Slesnick refers to this exercise as a “crude attempt at reconciling the two series” (*Ibid.*, p. 593).

<sup>15</sup> *Ibid.*, p. 594.

<sup>16</sup> Gieseeman, “The Consumer Expenditure Survey.”

<sup>17</sup> Slesnick, “Aggregate Consumption and Saving,” p. 594.

<sup>18</sup> *Alternative Poverty Measures*, GAO/GGD-96-183R (General Accounting Office, 1996).

<sup>19</sup> *Ibid.*; see also “Reconciliation of PCE and Consumer Expenditure Survey Estimates of Consumer Spending,” preliminary draft (Bureau of Economic Analysis, Sept. 7, 1994).

<sup>20</sup> Nonprofit institutions serving households that are 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. (See Charles Ian Mead, “Separate Recognition of Income and Outlays of Nonprofit Institutions Serving Households,” mimeo (Bureau of Economic Analysis, 2002).)

<sup>21</sup> Slesnick, “Are Our Data Relevant to the Theory?”

<sup>22</sup> *Ibid.*, p. 54.

<sup>23</sup> Mead, “Separate Recognition of Income and Outlays,” table 1, “North American Industry 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, grantmaking, civic, professional, and similar organizations.

<sup>24</sup> Charles Ian Mead, Clinton P. McCully, and Marshall B. Reinsdorf, “Income and Outlays of Households and of Nonprofit Institutions Serving Households,” *Survey of Current Business*, April 2003, pp. 13–17.

<sup>25</sup> Triplett, “Measuring Consumption.”

<sup>26</sup> E. Raphael Branch, “The Consumer Expenditure Survey: a comparative analysis,” *Monthly Labor Review*, December 1994, pp. 47–55.

<sup>27</sup> Triplett, “Measuring Consumption,” p. 16.

<sup>28</sup> *Ibid.*

<sup>29</sup> David E. Lebow and Jeremy B. Rudd, “Measurement Error in the Consumer Price Index: Where Do We Stand?” *Journal of Economic Literature*, March 2003, pp. 159–201; quote from p. 168.

<sup>30</sup> *Ibid.*

<sup>31</sup> Charles, L. Schultze and Christopher D. Mackie, eds., *At What Price? Conceptualizing and Measuring Cost-of-Living and Price Indexes*, National Research Council Panel on Conceptual, Measurement, and Other Statistical Issues in Developing Cost-of-Living Indexes (Washington, DC, National Academy Press, 2002), p. 250.

<sup>32</sup> *Ibid.*, p. 274.

<sup>33</sup> Recommendation 9-1 reads as follows: “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” (Schultze and Mackie, *At What Price?* p. 274).

<sup>34</sup> Recommendation 9-2 states, “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” (Schultze and Mackie, *At What Price?* p. 274).

<sup>35</sup> For example, in an e-mail communication between David Lebow of the Federal Reserve Board and John Greenlees of the Bureau of Labor Statistics on Feb. 8, 2000, concerning CPI weights based on the CE, Lebow expressed concerns about the difference in magnitude of the CE weights used for the CPI relative to those used in the production of the PCE. Concerns also were expressed by attendees of the Conference on Current and Future Developments in the Consumer Expenditure Survey, sponsored by the MacArthur Network on Inequality and Poverty in Broader Perspectives and held at Princeton University, May 19–20, 1998. Weighing in as well were the Council

of Professional Associations of Federal Statistics, which held a statistical policy seminar titled “Integrating Federal Statistical Information Processes” in Washington, DC, in November 2000; and J. Steven Landefeld, Robert Parker, and others attending the BLS Conference on Issues in Measuring Price Change and Consumption, Washington, DC, June 5–8, 2000.

<sup>36</sup> The Bureau’s investigations are reflected in the work of Gieseman, “The Consumer Expenditure Survey,” and Branch, “The Consumer Expenditure Survey.”

<sup>37</sup> Descriptions of the CE survey and the PCE are based on various publications. (See, for example, *Personal Consumption Expenditures*, Methodology Paper Series MP-6 (Bureau of Economic Analysis, June 1990); *BLS Handbook of Methods*, Bulletin 2490 (Bureau of Labor Statistics, April 1997); and Carol S. Carson, “GNP: An Overview of Source Data and Estimating Methods,” *Survey of Current Business*, July 1987, pp. 103–27.)

<sup>38</sup> For more information on BLS adjustment of the data, see Appendix B.

<sup>39</sup> The PCE population typically has been about 3 percent higher than the CE population since 1992.

<sup>40</sup> In a BLS mimeo, “CE to PCE Comparison Methodology,” Thomas Pollard gives a comprehensive description of the steps followed by the Bureau to produce CE-to-PCE comparisons.

<sup>41</sup> *Consumer Expenditure Survey 1984–86*, Bulletin 2333 (Bureau of Labor Statistics, August 1989).

<sup>42</sup> For more information on selecting the appropriate source and on how annual estimates for publications are calculated, see chapter 16 of the *BLS Handbook of Methods*.

<sup>43</sup> Clint McCully, “Presentation on PCE to the CE Staff” (Bureau of Economic Analysis, Apr. 19, 2000).

<sup>44</sup> The BEA planned to continue monitoring expenditures on private health insurance reported in the CE on an annual basis as a cross-check on its own estimates (e-mail from Ernie Wilcox, Bureau of Economic Analysis, to Thesia I. Garner, Bureau of Labor Statistics, Nov. 2, 2000).

<sup>45</sup> Thesia I. Garner and Bill Passero, “Out-of-Pocket Expenditures for Private Health Insurance: An Analysis of Consumer Expenditure Survey and Medical Expenditure Panel Survey Data,” mimeo (Bureau of Labor Statistics, June 1, 2001). (See Appendix A for a more detailed description.)

<sup>46</sup> See Branch, “The Consumer Expenditure Survey.”

<sup>47</sup> “NIWD PCE Bridge to 1992 Input-Output Table,” unpublished data sent by Greg Key of the Bureau of Economic Analysis to William D. Passero of the Bureau of Labor Statistics, Mar. 19, 2002.

<sup>48</sup> “1997 Benchmark I-O Accounts,” data for BLS internal use only (Bureau of Economic Analysis, Feb. 5, 2003).

<sup>49</sup> The detailed concordance of PCE categories and CE UCC items used for this exercise is available from the authors upon request.

<sup>50</sup> In 1992, 1997, and 2002, 77 percent of all rent payments included payment of at least one of the following utilities: electricity, gas, water, and trash.

<sup>51</sup> For further information, visit the BEA Web site at [www.bea.gov](http://www.bea.gov).

## APPENDIX A: Sources that are compared with the Consumer Expenditure Survey

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*Personal Consumption Expenditures (PCE).* The principal source of independent estimates used in conjunction with the Consumer Expenditure Survey (CE) is the PCE component of the National Income and Product Accounts (NIPA) 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 NIPA. The personal sector consists of “persons resident” in the United States, where the term *persons* is defined as “individuals and the nonprofit institutions that serve them.” PCE estimates of aggregate expenditures represent the market value of goods and services purchased by all persons. The 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 include revisions to selected methods of estimation. In addition, the BEA conducts annual revisions to the PCE that affect earlier data and that also may include changes in estimation methods.

*National Health Expenditures.* The Centers for Medicare & Medicaid Services (CMS), formerly the Health Care Financing Administration (HCFA), of the U. S. Department of Health and Human Services publishes annual data on total U.S. aggregate healthcare expenditures. This data set, called the National Health Expenditures, consists of data on expenditures by all sources in the U.S. economy, including public and private sources. The National Health Expenditures cover U.S. citizens living abroad, military personnel, and parts of the institutional population (a larger population than is covered by the CE survey). In particular, CMS data cover the nursing home population, whereas the CE does not. Also, the CMS reports out-of-pocket healthcare 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, the CMS uses data from administrative and industry sources, as well as CE data.

*Residential Energy Consumption Survey (RECS).* The Energy Information Administration of the U.S. Department of Energy 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 data on energy use in occupied primary housing units. RECS data are obtained from three different sources: onsite personal interviews conducted in the housing unit; telephone interviews with the rental agents of housing units that

have any of their energy use included in their rent; and 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 comprises 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.

*Medical Expenditure Panel Survey.* The Medical Expenditure Panel Survey (MEPS) is published by the Agency for Health Care Research and Quality (formerly the Agency for Health Care Policy and Research) of the U.S. Department of Health and Human Services. The MEPS estimate, used to measure the cost of out-of-pocket private health insurance premiums, 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 by data from the Office of Personnel Management on Federal employees. The MEPS-HC collects data on hospitalization and physician coverage only, excluding single-purpose coverage such as insurance that provides for only dental or vision healthcare needs. 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 reports premiums—both employer-paid premiums and out-of-pocket premiums paid by employees—for employer-sponsored coverage (as well as providing information on the coverage itself); thus, the data representing the portion of out-of-pocket premiums can be compared against CE data on aggregate premiums.

*Supermarket Business, Inc., and Progressive Grocer.* Food expenditure comparisons between the CE, on the one hand, and *Supermarket Business, Inc.*, and *Progressive Grocer*, on the other, were published periodically from 1987 until 1997. *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* conducted annual independent studies of the sales performance of supermarkets (grocery stores with annual food sales of \$2 million or more) in relation to other kinds of retail outlets, comparing sales by product and by category. Such outlets accounted for about 80 percent of grocery store food sales. *Supermarket Business, Inc.*, and *Progressive Grocer* subsequently merged, and the combined entity no longer provides usable food expenditure data for comparison with the CE.

## APPENDIX B: Data adjustment in the Consumer Expenditure Survey

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In determining its estimates for the Personal Consumption Expenditures (PCE), the Consumer Expenditure (CE)-PCE comparison team learned that the Bureau of Economic Analysis employs substantial “expert judgment” in its production of PCE estimates. This judgment could affect the accuracy of the estimates and therefore affect the CE-to-PCE ratio. Several of the BEA adjustments to the PCE are presented in the main text of this article.

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 estimates, further contributing to differences between the CE and PCE aggregate expenditure estimates. Appendix table B-1 lists the percent of total expenditures that each of these “expert judgments” constitutes. The table provides information regarding the magnitude of the adjustments in the CE aggregates and suggests which categories of expenditures would be most affected, thereby influencing the CE-to-PCE ratios.

Appendix table B-1 presents expenditures and data adjustment results for 1997. As an example, 25 percent of food expenditures

is allocated, 0.6 percent is imputed, and 74.4 percent is directly reported (requiring no data adjustments).

The estimates in appendix table B-1 were computed with the use of indicator variables, or cost flags,<sup>1</sup> that are assigned to each UCC record in the CE data file to indicate whether the value was directly reported, imputed, allocated, or imputed and allocated. For this reason, grouping UCC's into the categories presented in the table may return a higher rate of adjustment for a particular category than it should. For example, one may say that a consumer unit paid  $x$  amount of money on utilities. The amount  $x$  would then be allocated to the different types of utilities on the basis of CE-developed formulas, so that each individual UCC for which an allocation was made would get a cost flag indicating that fact. Then, when the UCC's were regrouped under the utilities category, they would carry the allocation cost flags with them. The number of allocations in the utilities category would then include these expenditures (the original amount  $x$ ), even though they were directly reported as utilities. The total allocated expenditures for utilities would therefore appear to be higher than they actually are. This problem can occur in all categories for which respondents are likely to group items together.

Consequently, the estimates for allocations will be higher than the actual expenditures allocated.

### Note to Appendix B

- <sup>1</sup> The cost flags are as follows:
- 0 No adjustment
  - 1 One of the source fields was flagged by the Census Bureau (source flag > 0)
  - 2 Manually updated
  - 3 Imputation
  - 4 Allocation
  - 5 Imputation and allocation
  - 6 Computation only
  - 7 Computation and imputation
  - 8 Computation and allocation
  - 9 Computation, imputation and allocation
  - Q Manual imputation
  - R Manual allocation
  - S Section 18 special processing

Category of expenditures	Total expenditures (millions of dollars)	Imputations	Allocations	Imputations and allocations	Directly reported
Food .....	\$505,791	0.6	25.0	0.0	74.4
Food at home .....	303,340	.3	21.4	.0	78.3
Food away from home .....	202,451	1.0	30.4	.0	68.5
Alcoholic beverages .....	22,401	.3	12.0	.0	87.6
Rent, utilities, and public service .....	483,668	5.9	10.1	.2	83.9
Rent .....	228,987	11.0	3.5	.0	85.4
Utilities .....	169,265	1.2	24.0	.5	74.3
Telephone .....	85,416	1.2	.0	.0	98.8
Household operations .....	57,905	.8	3.1	.0	96.0
Housekeeping supplies .....	47,914	.0	6.4	.0	93.6
Household furnishings and equipment .....	159,560	1.1	10.2	.1	88.6
Household textiles .....	8,353	.6	6.3	.0	93.1
Furniture .....	40,894	.9	26.7	.3	72.1
Floor coverings .....	8,198	.3	5.3	.0	94.4
Major appliances .....	17,861	4.1	4.8	.4	90.7
Small appliances, miscellaneous household equipment .....	84,255	.7	4.2	.0	95.1
Apparel and services .....	175,752	.1	15.3	.1	84.4
Men's and boys' .....	42,883	.2	16.6	.2	83.0
Women's and girls' .....	71,670	.2	19.4	.2	80.2
Children under 2 years .....	8,117	.1	20.7	.1	79.2
Footwear .....	33,126	.0	11.7	.0	88.3
Other apparel products and services .....	19,956	.0	1.3	.0	98.6
Transportation .....	681,669	7.9	3.7	.0	88.4
Vehicle purchase .....	288,830	13.6	.0	.0	86.4
Gas and motor oil .....	115,872	1.9	.2	.0	97.9
Other vehicle expenses .....	235,459	4.6	4.0	.1	91.3
Public transportation .....	41,508	3.8	37.4	.2	58.6
Healthcare .....	194,300	5.3	3.1	.1	91.4
Health insurance .....	93,042	10.2	.0	.0	89.8
Medical services .....	56,000	1.0	6.4	.4	92.3
Drugs .....	33,804	.7	3.0	.0	96.3
Medical supplies .....	11,389	.7	12.8	.4	86.1
Entertainment .....	182,147	3.8	4.3	.1	91.7
Fees and admissions .....	49,699	4.0	10.8	.5	84.7
Televisions, radios, and sound equipment .....	60,946	1.9	1.0	.0	97.1

**Appendix table B-1. Continued—Percentage of data affected by data adjustment procedures, by category of expenditures, 1997**

Category of expenditures	Total expenditures (millions of dollars)	Allocations	Imputations	Imputations and allocations	Directly reported
Pets, toys, and playground equipment .....	25,222	.1	2.6	.0	97.3
Other entertainment supplies and equipment .....	46,281	8.1	2.8	.0	89.1
Personal care products and services .....	55,644	5.1	1.0	.0	93.9
Reading .....	17,270	5.7	.0	.0	94.3
Education .....	60,241	1.7	3.8	.0	94.5
Tobacco .....	27,839	3.7	.1	.0	96.2
Miscellaneous .....	58,846	14.5	2.2	.0	83.2
Life and other personal insurance .....	39,975	7.5	.0	.0	92.5

**Appendix table C-1. CE-to-PCE ratios of aggregate expenditures, historical methodology<sup>1</sup>**

Published title	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Food, total .....	0.77	0.80	0.77	0.78	0.75	0.78	0.76	0.74	0.75	0.74	0.72
Food at home .....	.69	.70	.67	.69	.67	.71	.69	.72	.73	.74	.72
Food away from home .....	.95	1.00	.97	.95	.89	.92	.88	.77	.77	.73	.73
Alcoholic beverages .....	.44	.47	.41	.43	.38	.38	.36	.35	.37	.32	.33
Rent, utilities, etc. ....	.95	.84	.92	.92	.92	.92	.91	.89	.92	.90	.92
Rented dwellings, total .....	.95	.85	.92	.93	.95	.95	.92	.88	.94	.91	.93
Utilities, fuels, and related ....	.94	.82	.92	.90	.88	.88	.89	.90	.90	.89	.90
Telephone services .....	.94	.83	.90	.91	.94	.94	.95	.95	.88	.88	.87
Household operations .....	.91	.82	.83	.88	.93	.91	.80	.85	.82	.76	.76
Housekeeping supplies .....	.58	.61	.59	.59	.59	.61	.60	.61	.60	.54	.51
Household furnishings .....	.76	.68	.71	.69	.68	.66	.67	.72	.68	.67	.67
Apparel and services .....	.70	.68	.64	.64	.62	.62	.62	.65	.62	.58	.56
Men and boys .....	.77	.75	.71	.70	.70	.68	.66	.70	.71	.64	.57
Women and girls .....	.69	.70	.64	.65	.61	.65	.66	.69	.63	.59	.59
Children under 2 years .....	1.03	1.02	1.08	1.06	1.08	1.22	1.21	1.07	.94	.95	.94
Footwear .....	.77	.73	.64	.67	.67	.60	.69	.75	.70	.72	.71
Other apparel .....	.54	.49	.51	.50	.46	.44	.41	.46	.43	.39	.37
Transportation .....	.95	.85	.98	.86	.91	.87	.83	.90	.86	.84	.87
Vehicle purchases .....	1.17	1.07	1.22	1.03	1.15	1.09	1.02	1.16	1.09	1.06	1.11
Gasoline and motor oil .....	1.03	.92	1.10	1.00	1.03	.98	.93	.92	.89	.88	.89
Other vehicle expenses .....	.62	.51	.58	.56	.55	.54	.55	.62	.61	.58	.59
Maintenance and repairs .....	.62	.51	.57	.55	.54	.53	.55	.62	.60	.57	.56
Vehicle rental and other .....	.59	.51	.65	.59	.59	.60	.53	.64	.66	.64	.66
Public transportation .....	.65	.59	.61	.61	.59	.57	.57	.61	.59	.59	.65
Entertainment .....	.68	.64	.65	.64	.65	.63	.59	.61	.59	.60	.57
Fees and admissions .....	.80	.69	.72	.73	.71	.67	.61	.59	.54	.56	.58
Televisions, radios, sound .....	.73	.65	.68	.63	.65	.63	.65	.67	.68	.75	.66
Pets, toys, and playground .....	.71	.66	.70	.70	.68	.66	.67	.62	.60	.60	.55
Other entertainment .....	.47	.52	.51	.51	.57	.57	.44	.53	.52	.45	.42
Personal care .....	.73	.70	.68	.67	.64	.66	.62	.67	.63	.60	.60
Reading .....	.59	.55	.58	.55	.52	.54	.51	.53	.53	.51	.47
Tobacco products, etc. ....	.70	.60	.67	.63	.66	.65	.65	.64	.57	.55	.56
Miscellaneous .....	.31	.29	.30	.29	.29	.29	.26	.26	.26	.22	.24
		<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>1984-91</b>	<b>1992-2002</b>
Food, total .....		0.72	0.75	0.73	0.72	0.73	0.71	0.71	0.70	0.77	0.73
Food at home .....		.73	.73	.72	.68	.69	.69	.67	.66	.70	.71
Food away from home .....		.71	.78	.75	.78	.79	.75	.76	.75	.92	.75
Alcoholic beverages .....		.33	.36	.35	.34	.34	.37	.34	.36	.40	.35
Rent, utilities, etc. ....		.80	.89	.90	.89	.88	.85	.88	.86	.91	.88
Rented dwellings, total .....		.80	.90	.90	.89	.89	.86	.87	.84	.92	.88
Utilities, fuels, and related .....		.80	.88	.90	.90	.87	.84	.91	.87	.89	.88
Telephone services .....		.79	.87	.82	.81	.78	.77	.79	.84	.92	.83
Household operations .....		.62	.69	.68	.64	.75	.73	.81	.78	.87	.73
Housekeeping supplies .....		.52	.54	.53	.52	.53	.51	.53	.52	.60	.53
Household furnishings .....		.63	.63	.66	.67	.59	.57	.55	.58	.70	.63

See note at end of table.



**Appendix table C-1. Continued— CE-to-PCE ratios of aggregate expenditures, historical methodology<sup>1</sup>**

Published title	1985	1986	1987	1988	1989	1990	1991	1992	1984-91	1992-2002
Apparel and services .....	.54	.58	.55	.51	.50	.51	.49	.49	.65	.54
Men and boys .....	.59	.56	.51	.50	.51	.52	.51	.49	.71	.56
Women and girls .....	.59	.64	.61	.56	.54	.55	.54	.57	.66	.58
Children under 2 years .....	.92	.96	.87	.82	.71	.84	.82	.83	1.10	.87
Footwear .....	.76	.79	.81	.70	.72	.80	.70	.71	.69	.74
Other apparel .....	.29	.36	.35	.32	.33	.28	.27	.25	.48	.33
Transportation .....	.73	.82	.77	.77	.76	.75	.77	.77	.89	.79
Vehicle purchases .....	.90	1.05	.95	.94	.97	.97	.98	.96	1.11	1.00
Gasoline and motor oil .....	.82	.89	.88	.92	.85	.82	.84	.86	.99	.87
Other vehicle expenses .....	.51	.53	.54	.51	.49	.47	.49	.49	.57	.53
Maintenance and repairs .....	.48	.48	.49	.45	.44	.40	.42	.43	.56	.48
Vehicle rental and other .....	.59	.65	.66	.65	.61	.65	.65	.62	.59	.64
Public transportation .....	.54	.71	.58	.58	.51	.50	.52	.54	.60	.57
Entertainment .....	.50	.56	.55	.52	.51	.49	.49	.52	.64	.54
Fees and admissions .....	.50	.52	.51	.49	.47	.49	.48	.47	.69	.51
Televisions, radios, sound .....	.57	.61	.61	.56	.59	.56	.58	.59	.66	.61
Pets, toys, and playground .....	.52	.55	.52	.50	.50	.46	.45	.48	.68	.52
Other entertainment .....	.39	.54	.56	.50	.44	.41	.39	.49	.52	.46
Personal care .....	.56	.70	.68	.50	.50	.67	.57	.62	.67	.60
Reading .....	.39	.41	.41	.40	.38	.34	.33	.34	.55	.41
Tobacco products, etc. ....	.52	.52	.52	.50	.45	.44	.40	.40	.65	.49
Miscellaneous .....	.21	.22	.22	.19	.19	.15	.16	.17	.29	.20

<sup>1</sup> CE-to-PCE ratio, 1984-2002, for the categories in table 20 of *Consumer Expenditure Survey, 1998-1999*, p. 37.

**Appendix table D-1. Comparison of 2002 aggregate Consumer Expenditures with Personal Consumption Expenditures based on 1997 PCE benchmark**

[In millions of dollars]

PCE categories	Raw aggregates		
	PCE	CE	CE-to-PCE ratio
Total durables, nondurables, and services .....	\$7,376,059	\$4,457,246	0.60
Durable goods .....	916,170	693,653	.76
Motor vehicles and parts .....	426,144	436,625	1.02
New autos .....	101,649	111,924	1.10
Net purchases of used autos .....	58,392	112,513	1.93
Other motor vehicles .....	215,387	195,506	.91
Trucks, new and net used .....	203,461	183,394	.90
Recreational vehicles .....	11,926	12,112	1.02
Tires, tubes, accessories, and other parts .....	50,716	16,682	.33
Furniture and household equipment .....	319,917	180,432	.56
Furniture, including mattresses and bedsprings <sup>1</sup> .....	68,288	46,171	.68
Kitchen and other household appliances <sup>1</sup> .....	31,537	33,666	1.07
China, glassware, tableware, and utensils .....	31,843	8,660	.27
Video and audio goods, including musical instruments, and computer goods <sup>1</sup> .....	119,062	51,134	.43
Video and audio goods, including musical instruments <sup>1</sup> .....	74,898	33,617	.45
Computers, peripherals, and software <sup>1</sup> .....	44,164	17,517	.40
Other durable house furnishings (for example, floor coverings, clocks, lamps, and furnishings; blinds, rods, and other; writing equipment, handtools, tools, hardware, and supplies) .....	69,187	40,801	.59
Other durable goods .....	170,109	76,596	.45
Ophthalmic products and orthopedic appliances .....	21,642	8,122	.38
Wheel goods (including bicycles and motorcycles), sports (also includes guns) and photographic equipment, boats, and pleasure aircraft .....	60,559	43,976	.73
Jewelry and watches .....	51,039	11,577	.23
Books and maps .....	36,869	12,921	.35

See notes at end of table.

## Appendix table D-1.

## Continued—Comparison of 2002 Aggregate Consumer Expenditures with Personal Consumption Expenditures based on 1997 PCE benchmark (not adjusted for population differences)

[In millions of dollars]

PCE categories	Raw aggregates		
	PCE	CE	CE-to-PCE ratio
Nondurable goods .....	2,080,101	1,212,863	.58
Food .....	1,005,828	659,973	.66
Food purchased for off-premise consumption <sup>1</sup> .....	615,603	389,640	.63
Alcoholic beverages purchased for off-premise consumption <sup>1</sup> .....	75,461	25,497	.34
Purchased meals and beverages <sup>1</sup> .....	380,021	267,770	.70
Alcoholic beverages in purchased meals <sup>1</sup> .....	40,591	16,487	.41
Food supplied to employees: civilians .....	9,052	2,563	.28
Food supplied to employees: military .....	676	( <sup>2</sup> )	...
Food produced and consumed on farms .....	476	( <sup>2</sup> )	...
Clothing and shoes .....	302,114	170,775	.57
Shoes <sup>1</sup> .....	49,281	34,960	.71
Women's and children's (girls' and infants') clothing and accessories, except shoes <sup>1</sup> .....	149,204	87,889	.59
Men's and boys' clothing and accessories, except shoes <sup>1</sup> .....	92,586	45,769	.49
Standard clothing issued to military personnel .....	343	( <sup>2</sup> )	...
Sewing goods for males and females .....	6,501	1,486	.23
Luggage for males and females .....	4,199	671	.16
Gasoline, fuel oil, and other energy goods <sup>1</sup> .....	177,467	148,800	.84
Other nondurable goods .....	594,692	233,315	.39
Tobacco products <sup>1</sup> .....	89,122	35,668	.40
Toilet articles and preparations <sup>1</sup> .....	54,154	31,144	.58
Semidurable house furnishings .....	37,390	16,258	.43
Cleaning and polishing preparations, and miscellaneous household supplies and paper products .....	66,636	46,275	.69
Drug preparations and sundries .....	213,034	57,980	.27
Nondurable toys and sport supplies .....	58,955	16,107	.27
Stationery and writing supplies .....	18,077	14,609	.81
Net foreign remittances .....	4,035	( <sup>2</sup> )	...
Magazines, newspapers, and sheet music .....	35,273	9,108	.26
Flowers, seeds, and potted plants .....	18,016	6,166	.34
Services .....	\$4,379,788	\$2,550,730	0.58
Housing and household operations .....	1,553,754	1,647,839	1.06
Owner-occupied dwellings <sup>1</sup> .....	832,479	1,014,126	1.22
Rent and utilities, excluding telephone <sup>1</sup> .....	466,483	424,634	.91
Tenant-occupied nonfarm dwellings .....	258,677	240,872	.93
Electricity .....	111,748	109,987	.98
Gas .....	40,838	36,967	.91
Water and other sanitary services .....	55,220	36,808	.67
Other lodging <sup>1</sup> .....	53,633	37,333	.70
Telephone and telegraph .....	128,259	107,258	.84
Domestic service <sup>1</sup> .....	16,754	8,958	.53
Other household operations (for example, moving and storage, household insurance, rug and furniture cleaning, electrical repair, reupholstery and furniture repair, postage, household operation services not elsewhere classified) .....	56,146	55,530	.99
Transportation <sup>1</sup> .....	287,990	252,818	.88
Repair, greasing, washing, parking storage, rental, and leasing ..	185,992	107,196	.58
Bridge, tunnel, ferry tolls .....	5,829	1,624	.28
Insurance .....	45,842	100,168	2.19
Mass transit systems .....	9,000	7,266	.81
Taxicab .....	3,384	2,833	.84
Railway .....	573	1,804	3.15
Bus .....	2,336	1,287	.55
Airline .....	28,113	27,306	.97
Other (including water passenger; passenger transportation arrangement; limousine service; other local transportation; part of Amtrak passenger, trucking, and courier services, except air) .....	6,921	3,334	.48

See notes at end of table.

**Appendix table D-1. Continued—Comparison of 2002 aggregate Consumer Expenditures with Personal Consumption Expenditures based on 1997 PCE benchmark**

[In millions of dollars]

PCE categories	Raw aggregates		
	PCE	CE	CE-to-PCE ratio
Medical care .....	1,210,272	197,331	.16
Physicians .....	278,304	16,539	.06
Dentists .....	72,162	25,447	.35
Other professional services .....	189,695	13,164	.07
Hospitals .....	477,141	9,875	.02
Nursing homes .....	96,873	1,397	.01
Health insurance .....			
Medical care and hospitalization health insurance .....	79,721	130,909	1.64
Income loss insurance .....	1,999	( <sup>2</sup> )	...
Workers' compensation .....	14,377	( <sup>2</sup> )	...
Recreation .....	299,556	151,663	.51
Admissions to all events <sup>1</sup> .....	34,583	21,888	.63
Motion picture theaters, theatre, opera, and entertainment .....	21,091	16,129	.76
Spectator sports .....	13,492	5,759	.43
Radio and television repair .....	4,034	360	.09
Clubs and fraternal organizations .....	21,051	12,098	.57
Commercial participant amusements .....	78,332	21,032	.27
Parimutuel net receipts .....	5,314	5,491	1.03
Other (including pets and pet services, excluding vets; veterinarians; cable TV; film developing; photo studios; sporting and recreational camps; high school recreation; lotteries; videocassette rental; commercial amusements not elsewhere classified) .....	151,075	90,794	.60
Personal care <sup>1</sup> .....	92,893	43,015	.46
Cleaning, storage, and repair of clothing and shoes .....	15,784	13,501	.86
Barbershops, beauty parlors, and health clubs .....	41,637	27,893	.67
Other (including watch, clock, and jewelry repair; miscellaneous personal services) .....	35,472	1,621	.05
Personal business .....	552,124	40,022	.07
Brokerage charges and investment counseling .....	75,694	( <sup>2</sup> )	...
Bank service charges, trust services, and safe deposit box rental .....	75,502	3,652	.05
Services furnished without payment by financial intermediaries except life insurance carriers .....	\$193,684	( <sup>2</sup> )	...
Expense of handling life insurance and pension plans .....	84,750	( <sup>2</sup> )	...
Legal services <sup>1</sup> .....	71,258	14,910	.21
Funeral and burial expenses <sup>1</sup> .....	14,633	10,534	.72
Other personal business (including labor union expenses, professional association expenses, employment agency expenses, money orders, classified ads, tax return preparation services, personal business services not elsewhere classified) .....	36,603	10,926	.30
Education and research .....	190,736	93,658	.49
Higher education .....	103,853	52,716	.51
Nursery, elementary, and secondary schools .....	38,310	38,080	.99
Elementary and secondary schools .....	28,188	14,455	.51
Nursery schools .....	10,122	23,625	2.33
Other education and research .....	48,573	2,862	.06
Commercial and vocational schools .....	33,259	( <sup>2</sup> )	...
Foundations and nonprofit research .....	15,314	( <sup>2</sup> )	...
Religious and welfare activities .....	202,882	124,384	.61
All contributions, including religion (not a PCE category) .....	...	110,900	...
Political organizations .....	4,149	( <sup>2</sup> )	...
Museums and libraries .....	8,524	( <sup>2</sup> )	...
Foundations to religion and welfare .....	11,842	( <sup>2</sup> )	...
Social welfare .....	125,853	13,484	.11
Childcare .....	30,319	7,107	.23
Social welfare (including membership organizations, job training and vocational rehabilitation services, residential care, individual and family services, social services not elsewhere classified, civic-social-fraternal associations) ...	95,535	6,377	.07
Religion .....	52,514	( <sup>2</sup> )	...
Net foreign travel .....	-10,418	( <sup>2</sup> )	...

<sup>1</sup> Comparable CE and PCE categories.

<sup>2</sup> Category not within the scope of the CE survey.

<sup>3</sup> The CE survey does not collect data at the indicated level of detail for this category.