

## Micro and Macro Validation of the Consumer Expenditure Survey\*

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### Abstract

This paper examines the quality of data collected in the CE Survey. The Consumer Expenditure (CE) Survey is the source for the Consumer Price Index weights and is the main source of U.S. consumption microdata. We take two complementary approaches to assess data quality by comparing CE data to administrative or aggregate sources and to other surveys. In the first approach, we compare reported spending on a large number of categories of goods and services to comparable national income account data. We do this separately for the two components of the CE—the Interview Survey and the Diary Survey—rather than a combination that has been used in past comparisons. We find that most of the largest categories of consumption are measured well in the Interview Survey as the ratio to the national account data is close to one and has not declined appreciably over time. Several other large categories are reported at a low rate or have seen the ratio to the national accounts decline over time. The results are less encouraging for the Diary. There is no large Diary Survey category that is both measured well and reported at a higher rate than in the Interview Survey. We also compare the ownership of and the value of durables, such as homes and cars, in the CE to other sources such as Federal Highway Administration motor vehicle registration records (for aggregate vehicle ownership), National Automobile Dealers Association data (for individual vehicle market value), and the Case-Shiller index (for average home values). This evidence suggests the CE performs fairly well. In our second approach to validating CE data, we compare reported information in the CE to the Current Population Survey for the years 1980 to 2010. We investigate how reported demographic characteristics align across these nationally representative surveys, focusing on characteristics that are not used to construct sample weights. Again, the CE performs fairly well. Our analyses provide an indication of what data are reported reasonably well in the CE and what data are badly reported. These results are important in interpreting and properly using CE data. These results are also important in determining how best to redesign the CE.

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## 1. Introduction

The Consumer Expenditure (CE) Survey is a vital data source. Assessing and improving the quality of the CE is a major policy and research issue for several reasons. The CE is the source of weights for the Consumer Price Index (CPI), which is used to index for inflation income tax brackets, government transfer payments such as Social Security benefits, private labor contracts and other economic variables. The CE is also the only comprehensive source of consumption information on the U.S. population.<sup>1</sup> The survey is used by government agencies for several purposes and has been extensively used by outside researchers. CE data have been used to address a long list of research issues that would be difficult or impossible to address with another source. The survey has been available in some form for almost a century, and in its current form for over 30 years. This long history allows researchers to examine changes over a long time period.

Many previous studies have compared the CE to other data sources. Some of these comparisons report alarming patterns. Several authors have pointed out that the weight on housing is much higher in the CPI than in the Personal Consumption Expenditure (PCE) deflator. Bosworth (2010) argues that the housing weight is about twice as large in the CPI as the PCE because of uneven under-reporting in the CE. Other authors have emphasized that the ratio of CE expenditures to PCE expenditures has declined from about 0.8 to just above 0.6 in recent decades (Attanasio et al. 2006).

It is important to recognize that these earlier studies often compare expenditures that are noncomparable and there are important gaps in our knowledge from these comparisons. A key gap is that comparisons of CE aggregates to national income account data are generally done with the integrated data that are a confusing amalgam of the two components of the CE: the Interview Survey and the Diary Survey. Researchers generally use one or the other of these components, so the benchmarking of the amalgam cannot be applied to the data that are typically used by researchers. A better understanding of the quality of spending data in each of these surveys will also inform efforts to redesign the CE, as the Bureau of Labor Statistics (BLS) is in

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<sup>1</sup> There are recent efforts to gather comprehensive, but less detailed expenditure data as part of other surveys (see Hurd and Rohwedder 2011 or Li, Schoeni, Danziger, and Charles 2010, for example). An interesting aspect of these papers given the focus of the current paper is that these efforts assess the quality of their data by comparing it to that of the CE.

the midst of a multi-year redesign of the surveys. The first reason given for the CE redesign in the BLS planning documents is under-reporting of expenditures (Bureau of Labor Statistics 2010). To evaluate the separate components of the survey it is necessary to compare them separately to outside sources.

In this paper we examine comparisons of CE data to micro and macro data from other sources. We examine the quality of reported expenditures, which can be roughly thought of as financial outlays, as well as parts of consumption, which can be thought of as a flow of resources used, including the flow of resources from the ownership of durables. The rental equivalent of owner-occupied housing, while not part of expenditures, is used to determine the CPI weights and is an appropriate measure of housing consumption. In the case of vehicles, an expenditures measure would include purchases, but consumption should be based on a flow of resources consumed, which depends on the number and value of vehicles. These durable measures are crucial in calculating consumption, but their reporting has not been extensively validated.

We begin by examining ratios of CE aggregate data to national income account data, looking separately at the Interview Survey and Diary Survey. We rely on information from the BLS and the Bureau of Economic Analysis as to which expenditure categories are most comparable and we focus on these. We find that most of the largest categories of consumption are measured well in the Interview Survey as the ratio to PCE data is close to one and has not declined appreciably over time. These categories include new vehicles, food and beverages at home, rent and utilities, the rental equivalent of owner-occupied housing, gasoline and other energy goods, and communication. Several other large categories are reported at a low rate or have seen the ratio to the PCE decline over time. These categories include food away from home, furniture and furnishings, clothing, gambling, and alcohol. There are no large Diary Survey categories that are both measured well and reported at a higher rate than in the Interview Survey. Overall, the categories of expenditures that are not reported well tend to be those that involve many small and irregular purchases. These poorly reported categories also tend to be private goods (clothing) and ones that one may not want to reveal that one buys, or buys to such an extent (alcohol, tobacco). Large salient purchases (like automobiles), and regular purchases like rent, utilities, and groceries, seem to be well reported.

We find that the number and value of cars compare closely to outside sources, and the time pattern of home values closely follows other data. Finally, we find that demographic

characteristics and the income distribution reported in the CE roughly mirrors that reported in the Current Population Survey (CPS).

The outline of the paper is as follows. In Section 2 we describe the Interview and Diary components of the CE. Section 3 summarizes past work comparing the CE to other sources. In Section 4 we provide our comparisons of the separate Interview and Diary Surveys to national income account personal consumption expenditure data. In Section 5 we provide comparisons of CE data on the ownership and value of durable goods to those from other sources. In Section 6 we compare the demographic characteristics of CE respondents to the U.S. distribution reported in other sources. Section 7 offers a summary and implications of the results.

## **2. The Consumer Expenditure Survey**

The Consumer Expenditure survey is a national survey designed to represent the noninstitutionalized population of the U.S. The survey has two parts: the Interview Survey and the Diary Survey. Both components are based on the same sampling frame, but they have different questionnaires that are administered to different samples. We examine the data from both of these surveys.

The Interview Survey took its current form in 1980, though it began much earlier. It includes about 5,000 families each quarter between 1980 and 1998 and about 7,500 families thereafter. It is a recall survey that collects information from families (or consumer units) about their expenditures for the previous three months. The survey is a rotating panel—about 20 percent of the sample is replaced each quarter. Consumer units remain in the sample for up to five interviews—an initial bounding interview, followed by four quarterly interviews. The bounding interview collects information on demographic characteristics and ownership of major durables. Data from the bounding interview are not publicly available. The next four interviews collect detailed expenditure information in addition to demographic, employment and income data. The interviews are generally done in person though phone interviews have become more common in recent years. Starting in 2003, interviewers used a Computer Assisted Personal Interview (CAPI) instrument. The interview lasts 60 minutes on average.

The Diary Survey collects consumer unit spending through direct recordkeeping. On a daily expense record consumer units self-report spending for up to two consecutive one-week

periods. This recordkeeping format is designed to capture spending on small, infrequent purchases that may be missed in a recall survey. The Diary also includes a questionnaire that collects information on household characteristics. This questionnaire is administered by an interviewer. Since 2004, a CAPI instrument has been used for this interview. The Diary Survey includes about 5,000 households annually. See U.S. Bureau of Labor Statistics (1997) for more details.

### **3. Earlier Consumer Expenditure Survey Comparisons**

CE data have been compared to data from many sources, but the most extensive and heavily cited comparisons are to the Personal Consumption Expenditure (PCE) data from the National Income and Product Accounts (NIPA). Past research (Gieseman 1987, Slesnick 1992, Branch 1994, Garner et al. 2006 and 2009, Attanasio et al. 2006, Meyer and Sullivan 2011a) has emphasized a discrepancy between CE and PCE data. In comparing the CE to the PCE data, it is important to recognize conceptual incompatibilities between these data sources. Slesnick (1992), when comparing CE data from 1960-61 through 1989, concluded that “approximately one-half of the difference between aggregate expenditures reported in the CEX surveys and the NIPA can be accounted for through definitional differences.” Similarly, the General Accounting Office in their summary of a Bureau of Economic Analysis comparison of the differences in 1992 reported that “more than half was traceable to definitional differences.”

A key conceptual difference between PCE and CE spending is that the CE measures out-of-pocket spending by households, while the PCE definition is wider, including purchases made on behalf of households such as employer-paid insurance or free financial services, and purchases made by nonprofits. The importance of this difference in how spending is defined has increased over time. McCully (2011) reported that in 2009 nearly thirty percent of the PCE was not intended to be captured by the CE, up from just over seven percent in 1959. In 2009, these differences include imputations excluding non-profit institutions serving households and employer contributions for group health insurance that account for over ten percent of the PCE. In-kind social benefits account for nearly another ten percent. Employer contributions for group health insurance and workers’ compensation account for over six percent, while life insurance and pension fund expenses and final consumption expenditures of nonprofits represent almost

four percent. Another important difference between the PCE and CE is that the CE is not intended to capture purchases by those abroad, on military bases and in institutions.

It is also important to note that the PCE aggregates do not necessarily reflect true total spending. The PCE numbers are the product of a great deal of estimation and imputation that is subject to error.<sup>2</sup> One indicator of the potential error in the PCE is the magnitude of the revisions that are made from time to time (Gieseman 1987; Slesnick 1992). An indication of this is the 2009 revisions to the PCE which substantially revised past estimates of several categories. Notably, food at home, one of the largest categories, decreased by over five percent after the 2009 revision.<sup>3</sup>

We reiterate that there are many differences between the the CE and the PCE and that the PCE should not be considered the truth. Nevertheless, the most extensive benchmarking of the CE, both in terms of the range of goods and services and the time period, is to the PCE, so we present the main patterns in past work.

One of the first evaluations of the current CE is Gieseman (1987) who reports CE comparisons to the PCE for 1980-1984.<sup>4</sup> He reports separate comparisons of Interview Survey and Diary Survey estimates, though the Diary estimates are only for food. In these early years, published tabulations separate Interview and Diary data, while published data for later years are integrated. Consequently, subsequent comparisons of CE to PCE almost exclusively rely on the integrated data that combine Interview Survey and Diary Survey data.<sup>5</sup> Gieseman found that the CE reports were close to the PCE for rent, fuel and utilities, telephone services, furniture, transportation, and personal care services. On the other hand, substantially lower reporting of food, household furnishings, alcohol, tobacco, clothing and entertainment were apparent back in 1980-1984. In separate Interview Survey and Diary Survey comparisons for food, he found that interview food at home exceeded diary food at home by ten to twenty percentage points, but was

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<sup>2</sup> The PCE estimates come from business records reported on the economic censuses and other Census Bureau Surveys. These business surveys are subject to a number of sources of error and are adjusted using input-output tables to add imports and subtract sales that do not go to domestic households. These totals are then balanced to control totals for incomes earned, retail sales, and other benchmark data.

<sup>3</sup> The 2008 value for food at home was 741,189 (in millions of \$2008) prior to revision and 669,441 after, but the new definition excludes pet food. A comparable pre-revision number excluding pet food is 707,553. The drop from 707,553 to 669,441 is 5.4 percent. Thank you to Clinton McCully for clarifying this revision.

<sup>4</sup> Comparisons of consumer expenditure survey data to national income account data go back at least to Houthakker and Taylor (1970).

<sup>5</sup> In cases where the expenditure category is available in both surveys, the BLS selects the source for the integrated data that is viewed as most reliable. See Steinberg et al. (2010) and Creech and Steinberg (2011).

still below the PCE. For the much smaller category, food away from home, the diary aggregate exceeded the interview aggregate by about twenty percentage points. Again, the CE numbers were considerably lower than the PCE ones. The current patterns have strong similarities to these from 30 years ago.

Garner et al. (2006) report a long historical series of comparisons for the integrated data that begins in 1984 and goes up through 2002. Some categories are reported well. Rent, utilities, etc. and utilities, fuels and related are reported at a high and stable rate relative to the PCE. Telephone services, vehicle purchases, and gasoline and motor oil are reported at a high rate that has declined somewhat over time. Food at home relative to the PCE is about 0.70, but has remained stable over time. The many remaining categories of expenditures have low and generally falling rates of reporting relative to the PCE, though some small categories such as footwear and vehicle rentals show increases.

The authors ultimately argue that this historical series can be replaced by a better series that focuses on categories that are the most comparable. “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 new comparison of the two sets of estimates.” The authors note that aggregates from the two sources tend to be more different for noncomparable categories. The new series is reported for every five years 1992 to 2002 in Garner et al. (2006), and updated and extended annually through 2007 in Garner et al. (2009).

When this new BLS methodology on categories that are comparable between the CE and the PCE is used, and when the PCE aggregates are adjusted to reflect differences in population coverage between the two sources, the ratio of CE to PCE is fairly high, but still has tended to fall over time. The ratio for 1992 and 1997 is .88, while in 2002 it is 0.84 and has fallen to 0.81 by 2007 (Garner et al. 2009). The share of the PCE that is comparable to the CE has also tended to fall somewhat over time, dropping from 0.57 in 1992 to 0.52 in 2007. A much larger share of the CE is comparable to the PCE, slightly over 70 percent in all years. For nine of the larger expenditure categories, Meyer and Sullivan (2010, 2011a) report limited comparisons over time for the Interview Survey only. They find that for most of these major categories reporting rates are high and stable.

Some research has sharply overstated the discrepancy by comparing noncomparable categories of CE and NIPA consumption and ignoring definitional differences. In addition, almost all comparisons are based on the integrated data that combine CE Diary and CE Interview data, so the results are not applicable to either the CE Interview data or Diary data alone, as they are typically used in research. Some authors have argued that despite the incompatibilities between the CE and PCE, in the absence of definitional changes one would expect the differences between the series to be relatively constant (Attanasio et al. 2006). While plausible, this conclusion is not at all obvious; one might still expect a gradual widening of the difference between the sources given their growing incompatibility as reported in McCully (2011).

There have been comparisons of the CE to many other sources. Most are summarized on the BLS Comparisons web page.<sup>6</sup> These comparisons include utilities compared to the Residential Energy Consumption Survey (RECS), rent and utilities compared to that reported in the American Housing Survey (AHS), food at home compared to trade publications *Supermarket Business* and *Progressive Grocer*, health expenditures compared to the National Health Expenditure Accounts (NHEA) and the Medical Expenditure Panel Survey (MEPS). With the exception of health expenditures, the comparisons generally suggest that the CE does a fairly good job of reporting these types of expenditures. However, except for health expenditures, these comparisons are to categories for which the comparisons to the PCE have indicated high and roughly stable reporting, though the reporting of food at home is at a lower rate, especially in the Diary Survey. See Garner et al. (2009) or Branch (1994) for summaries.

#### **4. Comparisons to National Income Accounts**

For the purposes of assessing survey quality, it is important to know how each of the survey components is performing. Differences in spending across these two data sources provide evidence on how best to collect spending data. For some important categories there are large differences between the mean reported values in the Interview and Diary Surveys. For example,

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<sup>6</sup> <http://www.bls.gov/cex/cecomparison.htm>.



between 1998 and 2003, average spending on food at home in the CE Interview Survey exceeded the average from the CE Diary Survey by more than 20 percent.<sup>7</sup>

Recognizing that not all non-comparabilities can be removed, we examine the ratio of CE Interview and Diary Survey values weighted by population to corresponding categories of PCE data for select PCE categories. We have followed the approach of Garner et al. (2006, 2009) and Passero (2011) who select categories in the PCE and CE that are most comparable based on “concepts and comprehensiveness”. These comparable categories are 56 percent of the PCE in 2010. To align each CE spending subcategory with the comparable PCE category, we have heavily relied on a concordance supplied to us by the BLS. The data appendix notes the cases where expenditure subcategories are not available in either the Interview or Diary Survey, and Appendix Table 1 provides our concordance of UCCs in the Diary and Interview Survey for each of these comparable PCE categories. In Tables 1a and 1b, we report CE/PCE ratios for categories of expenditures for which we can define reasonably comparable CE and PCE categories for either the Interview or the Diary Survey alone.<sup>8</sup> Table 1a summarizes the findings for the largest categories in 2010. Table 1b reports the results for 46 comparable categories for 1986, 1991, 1996, 2001, and 2006, as well as 2010.<sup>9</sup>

Among the ten largest categories in Table 1a (combining the BLS subcategories of clothing into one so that it is large enough to be in the top ten) six are reported at a high rate in the Interview Survey and that rate has been roughly constant over time. These well-measured categories are the imputed rent on owner-occupied nonfarm housing, rent and utilities, food at home, gasoline and other energy goods, communication and new motor vehicles. These six categories are all among the eight largest. In 2010, the ratio of CE to PCE exceeds 0.94 for imputed rent, rent and utilities, and new motor vehicles. It exceeds 0.80 for food at home and communication and is just below this for gasoline and other energy goods. The 2010 ratios for

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<sup>7</sup> The fact that food at home from the Interview Survey compares more favorably to PCE numbers than does food at home from the CE Diary Survey does not necessarily imply that the former is reported more accurately. For example, the CE Interview Survey numbers may include non-food items purchased at a grocery store. Battistin (2003) argues that the higher reporting of food at home for the recall questions in the Interview component is due to over-reporting, but as Browning et al. (2003) state, this is open to question. We stick to the presumption that more is better as the CE is almost always below the PCE and this criteria is largely used by the BLS in selecting which source, Interview or Diary, is preferred for a particular expenditure category (see Creech and Steinberg 2011).

<sup>8</sup> A larger set of categories can be examined of course with the union of the Interview and Diary data.

<sup>9</sup> We do not correct for differences in population coverage. Such corrections have averaged two to three percentage points in past analyses (Garner et al. 2006, 2009).

both the Interview and Diary Surveys for food away from home are close to 0.51 and for furniture and furnishings close to 0.43 with the Diary slightly higher for food away from home and the Interview slightly higher for furniture and furnishings. For clothing and alcohol, the Interview Survey ratios are both low and below those for the Diary Survey, which are below half themselves.

Looking at the full 46 categories reported in Table 1b, among the remaining categories outside the top ten in size, only six in the Interview and five in the Diary have a ratio of at least 0.80 in 2010. The largest of these categories reported well in the Interview Survey are motor vehicle accessories and parts, household maintenance, and cable and satellite television and radio services. In the Diary Survey household cleaning products and cable and satellite television and radio services are reported well in 2010, though the historical pattern for both exhibits substantial variation. The remaining categories that are reported poorly in both surveys with ratios below one half include glassware, tableware, and household utensils, and sporting equipment. Gambling and alcohol are especially badly reported with ratios below 0.20 and 0.33, respectively, in both surveys in most years.

While the ratios for selected years are shown in Table 1b, the patterns for the ten largest categories of expenditures can be more easily seen in a series of figures. We discuss the categories in order of their size beginning with the largest. Figure 1a reports the ratio of CE to PCE imputed rent from 1984 onward and new motor vehicles from 1980 onward.<sup>10 11</sup> Among the ten largest categories, these categories are the only two available for the Interview Survey, but not the Diary Survey.<sup>12</sup> Both categories have reporting rates near one that have not declined appreciably over time. The CE imputed rental of owner-occupied nonfarm housing typically exceeds the PCE equivalent by about ten percent, slightly more so in the most recent years. While some analyses of CE to PCE aggregates omit housing because the ratio exceeds one, we include it because selecting only those categories with low ratios would necessarily bias the overall picture. The CE/PCE ratio for new motor vehicles is overall very close to one, just above

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<sup>10</sup> Information on the rental equivalent of the home is not available in the Interview Survey in 1980 and 1981.

<sup>11</sup> For the surveys administered in the fourth quarter of 1981 through the fourth quarter of 1983, the CE sampling frame only covered urban areas. For this reason, we exclude data from the 1982 and 1983 surveys. In addition, the 1981 estimates we report are not entirely nationally representative, because part of this spending comes from the fourth quarter of 1981 survey and the first quarter of 1982 survey.

<sup>12</sup> The Diary does collect data on new vehicle purchases, but we do not report ratios for this category for the Diary because these data appear to be incomplete. See the discussion in the Data Appendix for more details.

one (approximately 1.05) in the 1980s, slightly below one in the 1990s (approximately 0.97), and right around one in the 2000s.

Figure 1b reports Diary and Interview comparisons for rent and utilities. In the Interview Survey the CE/PCE ratio is just below one, averaging around 0.95, while the Diary Survey ratio is about ten percentage points lower. Food at home in the Interview and Diary Surveys is reported in Figure 1c. Interview food at home has a ratio just under 0.90 in nearly all years excepting 1981-1987 when a different wording of the food at home question was employed.<sup>13</sup> The Diary Survey ratio is about twenty percentage points lower at 0.70. Food away from home is reported in Figure 1d. This category has a low ratio in both surveys and one that has declined since the 1980s. The Diary Survey ratio is also about ten percentage points higher than the Interview Survey ratio, although the two surveys give similar numbers following a change in the wording of the food away question in the Interview Survey in 2007.<sup>14</sup> The ratio for the Diary Survey is biased downward somewhat because the Diary does not collect data on food away from home spending that occurs during out-of-town trips. The Interview Survey does collect these data; in 2010 spending on food during out-of-town trips was about 6 percent of the PCE aggregate for food away. Ratios for spending on gasoline and other energy goods are displayed in Figure 1e. The ratio is nearly always above 0.80 in the Interview Survey and about five to ten percentage points lower in the Diary Survey. The Interview Survey ratio did fall over the 1980s. Clothing is shown in Figure 1f, combining the categories of women's and girl's clothing, men's and boy's clothing, and shoes and footwear. This category is the first one that is reported poorly. The reporting ratio has declined from about 0.60 to less than one-half, for the Diary Survey, with the Interview Survey consistently lower. The ratio for communication is shown in Figure 1g. The Interview Survey shows a ratio of about 0.80 for most years, though there is a dip to nearly 0.70 for much of the 1990s and early 2000s. Furniture and furnishings in Figure 1h is badly reported with a ratio in the Interview Survey that falls over time from about 0.75 to 0.45. The

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<sup>13</sup> The effect of this change in wording has been known for a long time (see Gieseman 1987). During 1980-1981 the Interview Survey asked usual weekly expenditure on food over the past three months, while from 1982-1987 spending on food over the previous month was asked. In 1988, the survey returned to the earlier question. Because the January to March 1982 surveys collected data for part of 1981, the change in questionnaire is partly reflected in the 1981 totals.

<sup>14</sup> Starting with the second quarter of 2007, the question on food away from home changed from a query about usual monthly spending to usual weekly spending. This change resulted in a noticeable increase in reported food away spending.

ratio for this category is more variable in the Diary Survey, at about 0.50 in the early years, high in the middle years and then near the Interview Survey numbers in the most recent years. Alcoholic beverages purchased for off-premises consumption in Figure 1i is a very badly reported category, with both Interview and Diary ratios that drop from 0.33 to just over 0.20.

The overall pattern indicates much better reporting in the Interview Survey than the Diary Survey. There is maybe one of the 46 categories where the Diary Survey reports expenditures at a higher rate than the Interview Survey and reports them well, i.e. at a high absolute rate that has not declined appreciably over time. The fairly small category of household cleaning products has a ratio of 1.15 in 2010 in the Diary Survey and has not declined appreciably in the past 20 years. On the other hand, there are many categories of expenditures, in particular most of the largest ones, that are reported at a higher rate in the Interview Survey and which have maintained high and roughly stable rates. This finding of higher reporting in an interview survey is consistent with other evidence. There is a long history of papers that have noted the presence of “diary fatigue” meaning that respondents tire of completing the diary and omit purchases. Evidence of this pattern in the CE that is frequently cited is the much lower reporting in the second diary week (U.S. Bureau of Labor Statistics 1983; Stephens 2003).

This pattern of lower reporting in diary surveys than interview surveys is also evident in other North American data. Statistics Canada conducted in parallel two versions of the Canadian Survey of Household Spending in 2009. One version was a 12-month recall interview survey, while the second was the redesigned survey that gathers spending on many items through two week diaries. The interview spending on average exceeds the diary spending for comparable categories by 9 percent for frequent expenses and 14 percent for less frequent expenses (Dubreuil et al. 2011). The authors believe the difference between the modes is not due to other features of the survey that changed, such as the elimination of balance editing. For example, balance editing tends to affect income and savings rather than expenditures. Possible reasons that this difference might arise are that insufficient motivation may lead diary respondents to omit many items to reduce the burden of the process. Consistent with this hypothesis, the Canadian Food Expenditure Survey (Ahmed et al. 2010) finds that the second diary week tends to have lower reported expenditures (by 11 percent) than the first as respondents tire of the process. A recall measure from this same survey has food expenditures 14 percent higher than the two-week diary average.

While in principle an attentive, motivated respondent could report better data in a diary than in a recall survey. The evidence shows that the typical respondent does not fit this profile. The diary task also requires respondent effort at many distinct times during the two weeks, whereas an interview survey requires a single short (albeit taxing) interview. These results suggest that the presence of an interviewer may be helpful in coaxing greater compliance with the survey.

The categories of expenditures that are not reported well tend to be those that involve many small and irregular purchases. These poorly reported categories also tend to be private goods (clothing) and ones that one may not want to reveal that one buys, or buys to such an extent (alcohol, tobacco). Large salient purchases (like automobiles), and regular purchases like rent, utilities, and groceries, seem to be well reported. These patterns have been largely evident since the 1980s or even earlier. However, over the past three decades there has been a slow decline in the quality of reporting of many of the mostly smaller categories of expenditures in both the Interview Survey and the Diary Survey.

## **5. Durables in the CE**

Reporting ownership of houses and vehicles is very different from reporting the small, discretionary purchases that seem to be badly reported in the CE. We begin by examining how the reported stock of cars matches that from other sources. This information does not enter expenditures, but enters consumption when we calculate a value of the services of owned cars. In Tables 2a and 2b, we compare reported car and truck ownership to administrative data on motor vehicle registrations.

These comparisons are complicated by a number of issues. First, the CE is intended to capture only vehicles owned by households, but the registration data include commercial and publicly owned vehicles including farm trucks. We were able to obtain an estimate of the number of two types of commercial vehicles, taxis and rental cars, for four states. The taxi share ranged from 0.04 percent (Arizona in 2003) to 0.68 percent (New York in 1998). The rental car share ranged from 0.30 percent (Mississippi in 2004) to 1.54 percent (Arizona in 1998). We do not have an easy way to estimate the prevalence of corporate cars and other commercial vehicles.

Second, the registration data include leased vehicles and motor homes which are not included in the CE survey numbers. We were able to obtain estimates of the motor home shares for seven states. The share of motor homes ranged from 0.3 percent (Maine in 2007) to 1.8 percent (Oregon in 2000). The total number of leased cars and trucks in the CE Survey for 2002 was 6.96 million, or about 3.75 percent of all cars and trucks. These first two complications imply that we understate the share of vehicles owned by households that are reported in the CE. Third, our survey count of vehicles will not include those that have been disposed of by the household, but have not been reported as disposed to the state or have not had their registrations expire. Conversely, registrations will not include vehicles that have not been registered. This issue, which is likely less important, could bias the measure of reporting either up or down. Fourth, prior to 1985, personal passenger vans, minivans and utility vehicles were included in automobile registrations, while subsequently they were included in trucks. For this reason, we generally report comparisons for cars and trucks combined so that we have a consistent concept over time.

Bearing these caveats in mind, ratios of cars and trucks in the CE to those in the administrative records are reported in the bottom line of Table 2a. The ratios are consistently well above 0.80. Given that a large share of cars and trucks are commercially owned as the numbers in the previous paragraph suggest, these numbers indicate a very high reporting rate.

We are able to refine the comparisons for trucks for some of the earlier years using the Vehicle Inventory and Use Survey (VIUS). Data for the years 1987, 1992, 1997 and 2002 (the last available year) are reported in Table 2b. This survey asks the major use and primary operator of trucks, allowing us to better determine which trucks should be reported in the CE. We consider several alternative definitions. The numbers suggest that the CE reports are close to an unbiased report, maybe overstating somewhat truck ownership, with all of the ratios of CE counts to VIUS counts slightly over one.

We have also verified that the purchase price of vehicles in the CE is reported fairly well. Purchase prices are directly part of expenditures and also are used to determine the rental value of car ownership which enters flow consumption. We validate the reported purchase price of new and used vehicles in the CE by comparing the reported values to published values in National Automobile Dealers Association (NADA) bluebook guides. For a sample of 100 cars with a reported purchase price in each of the years 1990 and 2000, we compare the reported

vehicle values in the Interview Survey to bluebook data. We match these cars from the Interview Survey to a bluebook price based on the reported make, model, year and number of doors for each car. We report the correlations in Table 3. The comparisons are probably most relevant for cars that have been recently purchased. For those that have been owned six months or less the correlations are very high, 0.956 and 0.912 in 1990 and 2000, respectively. This is especially impressive given that there are many characteristics of cars that are not reported in the CE or cannot be matched to bluebook features.

Some past work has found that respondents seem to report home values fairly accurately in household surveys (Kiel and Zabel 1999; Bucks and Pence 2006). We have compared the reported rental equivalent of homes to the reported house values. The rental equivalent and home value are highly correlated, at around 0.6 in a typical year. The ratio of the rental equivalent to home value has been fairly stable, though it declined appreciably in the mid 2000s, as one might expect during a period of rising home prices. To see whether the general pattern over time in reported home values in the CE is sensible, we plotted in Figure 2 the average home value reported in the CE compared to the Case-Shiller house price index. The average CE rental equivalent has the same qualitative time pattern as the Case-Shiller index, but it rises faster over time. The Case-Shiller index holds housing characteristics fixed, while the CE average does not. Since many characteristics of houses are improving over time such as square footage, presence of air conditioning, and other home amenities (see Meyer and Sullivan 2011b), the CE rise should be more pronounced, which is what is evident in Figure 2.

## **6. Representativeness of the CE**

There are concerns that the CE misses certain types of households. The main way that past studies have assessed the likely bias due to unit nonresponse in the CE is by comparing respondents contacted through more intensive methods to the remainder of respondents (Chapova et al. 2008; King et al. 2009). These studies suggest little bias. However, these analyses are not without their drawbacks as those contacted through more intensive efforts may not be representative of those who are never contacted at all or are unwilling to respond.

To directly examine the representativeness of the CE we compare the distribution of household characteristics in the CE to those in the Current Population Survey (CPS).<sup>15</sup> While the distribution of characteristics in the CPS does not necessarily reflect the true distribution in the U.S. population, the CPS is a large survey (about a 100,000 households annually in recent years) that is relied upon for many official statistics. Our results indicate that characteristics of those in the CE line up quite closely with those of CPS respondents. These results do not necessarily confirm that the CE is representative of the U.S. population. Rather, they indicate that any concerns about representativeness in the CE are shared with the CPS.

In addition to a base weight to account for sampling probabilities, the CE has two stages of post-stratification adjustment to weights. The first stage is a “non-interview” adjustment based on region of country, household tenure (owner or renter), consumer unit size, and race of the reference person. The second stage is a “calibration factor” that accounts for frame under-coverage by adjusting the weights to 24 “known” population counts for region, race, tenure, age, and urban/rural status. Thus, we do not focus on these characteristics of households.

In Table 4, we report a number of demographic characteristics of the Interview Survey respondents for the years 1980-2010, as well as corresponding CPS values. We examine characteristics at the individual level, rather than at the level of the family or household to facilitate comparability. The educational attainment distributions match quite closely, though the CE has slightly greater representation of those without a high school degree and this tendency has increased slightly over time. Marital status, weeks and hours worked, and age match very closely, though the CE has somewhat fewer young children. The share that owns a home matches very closely, but that should not be surprising given that housing tenure is used to weight the CE data.

One of the principal concerns about unit nonresponse is that the CE may disproportionately miss households with either high or low income. Table 5 directly compares the distribution of reported income for CE and CPS respondents. We report annual comparisons beginning in 2004, the year the CE began imputing missing income, as is done in the CPS. Again, the distributions match quite closely, though there is some understatement of families with incomes over \$100,000 in the CE, but the difference is not pronounced. In a typical year

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<sup>15</sup> For these comparisons we use the Annual Social and Economic Supplement, formerly called the Annual Demographic File or the March CPS.



the understatement in this highest income group relative to CPS counts is about 0.016 percentage points, or 6 percent. How to interpret the impact of the understatement of families in this income range for the under-reporting of expenditures is more difficult to say as it depends on who in that 1.6 percent of the population is not represented. Sabelhaus et al. (2011) discuss many of the difficulties in quantifying the understatement of expenditures due to unit nonresponse. Recognizing these difficulties, they in the end use a different approach to provide a rough upper bound based on a comparison of aggregate income reported in the CE to that in the Survey of Consumer Finances.

## **7. Summary and Implications**

This paper compares CE data to a number of survey and administrative or aggregate sources. In our comparisons of the CE to national account PCE data, we emphasize separate comparisons for the Interview and Diary components of the CE. Recognizing that there are many noncomparabilities between CE and PCE data, we examine the most comparable categories. The Interview Survey does quite well in terms of a high and roughly constant share of expenditures relative to the national accounts for some of the largest components of consumption. These components include imputed rent on owner-occupied housing, rent and utilities, food at home, gasoline and other energy goods, new motor vehicles, and to a lesser extent, communication. The Interview Survey does poorly for food away from home, clothing, furniture and furnishings and alcoholic beverages. Our results are less encouraging for the Diary Survey which does poorly overall. There is no major category for which the Diary Survey both has a higher ratio to the PCE than the Interview Survey and the ratio is high and stable. We also find that the number and value of cars compare closely to outside sources, and the time pattern of home values closely follows other data in the Interview Survey.

The concerns about nonrepresentiveness of the CE sample in terms of most demographic characteristics, while not without merit, do not appear on the surface to be a major problem with the survey. However, current methods do not provide much guidance as to the likely bias from under-representation of high income households.

These results have implications for researchers and for the redesign of the CE Survey. For researchers, unit nonresponse, while a concern, does not seem to be a major problem along

most dimensions of households. In terms of recording aggregate expenditures, unit nonresponse may be a significant issue, but our methods and those of others are not well-designed to assess its overall magnitude. On the other hand, taking the PCE as the truth, under-reporting of expenditures is a first order problem. The categories of expenditures that are not reported well tend to be those that involve many small and irregular purchases. These poorly reported categories also tend to be private goods (clothing) and ones that one may not want to reveal that one buys, or buys to such an extent (alcohol, tobacco). Large salient purchases (like automobiles), and regular purchases like rent, utilities, and groceries, seem to be well reported. In the Interview Survey large categories such as these could be used by researchers because they are reported at a high rate and reporting has not declined much over time. These patterns have been largely evident since the 1980s or even earlier. However, over the past three decades there has been a slow decline in the quality of reporting of many of the mostly smaller categories of expenditures in both the Interview Survey and the Diary Survey.

One could reasonably estimate total expenditures or consumption from these well-measured categories, relying on the constancy of the relationship between these categories and total spending as measured in the early years. Such a procedure will give a consistent series over time, but is unlikely to deliver an unbiased measure of the level of consumption because of under-reporting that was present in the 1980s. Alternatively, scaling up total expenditures using CE/PCE ratios for all categories would be suspect given that so much of the CE is not comparable to the PCE. Methods that use CE data recognizing the nature of under-reporting need to be further developed and validated.

There are also implications of our results for the redesign of the CE Survey. While overall, the sample appears fairly representative, the plutocratic nature of the CPI weights means that potentially missing a small share of households that account for a large share of expenditures could generate significant bias to the total expenditure based weights. In deciding which type of survey, Interview or Diary, to emphasize in the future it is important to recognize how the current versions perform. The Interview Survey does well at recording many large categories of expenditures, but does poorly at others. The Diary Survey does better than the Interview Survey for some categories, particularly some small categories that the Interview captures poorly, but rarely does the Diary do well on both an absolute basis and compared to the Interview Survey.

These results are also consistent with the evidence on diary and interview reporting from the Canadian Survey of Household Spending as well as the Canadian Food Expenditure Survey. Diary reporting seems to capture less spending than is obtained through an interview.

While the evidence we report emphasizes bias, given the large CE Survey samples, it is likely that most of the mean squared error in means comes from bias. For some of the key uses of the CE, such as the weighting of the CPI, it is means that matter. In addition, it appears that the diary data are more variable. For the categories of spending reported in McCarthy et al. (1998), the coefficient of variation in the diary survey is two to three times as high as in the Interview Survey. Lastly, conceptually diary data may not be appropriate to capture the longer term distribution of expenditures needed for distributional analyses and may not provide a full picture of consumption if categories of spending are omitted.

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## **Data Appendix**

Below is a list of expenditure categories for which we have compared Interview Survey (IS) and/or Diary Survey (DS) data to PCE aggregates. These categories were selected following Garner et al. (2006, 2009) and Passero (2011) who identified categories in the PCE and CE that are most comparable based on “concepts and comprehensiveness”. These comparable categories are 56 percent of the PCE in 2010. The concordance between PCE categories and the CE assembled in this previous work is based on integrated data—the combination of data from both the IS and DS. Our analyses compare the IS and DS to the PCE separately. Consequently, some additional non-comparabilities will arise when a spending category is only available in one of the surveys.

For each of the PCE spending categories below, we summarize the compatibility between the IS and DS (note, we do not comment on the comparability between these surveys and the PCE) by labeling them as “compatible”, “mostly compatible”, or “not compatible”. A category is labeled as “compatible” if the same spending subcategories (or Universal Classification Codes, UCCs) are designed to be captured in both surveys. A category is labeled as “mostly compatible” if at least one subcategory is missing from either the IS or DS, and the missing UCCs are not a substantial fraction of PCE spending for that category. Finally, a category is labeled as “not compatible” if a substantial fraction of spending for that category is not designed to be captured by either the IS or DS. Appendix Table 1 provides our concordance of UCCs in the IS and DS for each of the comparable PCE categories.

### **Durable Goods**

**New motor vehicles:** Not compatible. The IS reports spending separately for net outlays on new purchases and the trade-in allowance. The DS does not report these separately, and it is not clear whether the spending reported in the DS is net of trade-ins. In addition, the value of the “New trucks, pick-ups, vans, or jeeps” UCC in the DS is zero for 2007-2010, and it is not clear whether spending on these types of vehicles is reported in another UCC. For this reason, we do not report DS results for this category.

**Motor vehicle accessories and parts:** Mostly compatible. The Interview Survey (IS) does not contain “Global positioning devices,” which totaled \$628 million in the 2010 DS, or about 2 percent of the PCE aggregate for this category. The DS does not contain “Vehicle accessories



including labor,” which totaled \$392 million in the 2010 IS or about 1 percent of the PCE aggregate for this category. Although the IS and DS are mostly compatible for this PCE category, the ratio in the DS varies considerably over time. Because we are not able to resolve these sharp changes, we do not report the ratios for the DS for this category.

**Furniture and furnishings:** Mostly compatible. “Rental of party supplies for catered affairs” is included in the IS but not the DS. This UCC is about 1 percent of the PCE aggregate for this category. The IS’s “Replacement wall-to-wall carpet in owned homes” is represented by “Installed wall-to-wall carpet” in the DS. “Floor coverings, nonpermanent” in the IS is represented by “Room-size rugs and other non-permanent floor coverings” in the DS. “Wall-to-wall carpet” in the IS is included in “Capital improvements--service” in the DS, but the latter category is too broad, so it is excluded from the DS aggregate. This UCC is less than 1 percent of the PCE aggregate for this category.

**Household appliances:** Mostly compatible. “Dishwashers (built-in), garbage disposals, and range hoods” in both rented and owned homes do not have a unique subcategory in the DS, but presumably they are included in the “Miscellaneous household appliances” subcategory in the DS. All other appliances are divided between renter and owned homes in the IS but combined in the DS.

**Glassware, tableware, and household utensils:** Mostly compatible. Some UCC titles in the DS are not listed in IS. For example, “Tableware, nonelectric kitchenware” and “Miscellaneous household equipment and parts” are not recorded in the IS, but these subcategories may be captured in “Flatware,” “Glassware,” and “Nonelectric cookware,” which are available in the IS.

**Outdoor equipment and supplies:** Compatible. Although the IS and DS are compatible for this PCE category, the ratios in both surveys vary considerably over time. Because we are not able to resolve these sharp changes, we do not report the ratios for this category.

**Televisions:** Compatible.

**Audio equipment:** Mostly compatible. Beginning in 1999:2 phonographs were replaced by “Accessories and other sound equipment” in the IS. “Digital audio players” were added in 2005. Both surveys include “vehicle audio equipment, excluding labor.” Until 2005:2 the IS also included “vehicle audio equipment including labor,” but it is not clear that this is captured in the DS. In 2005, this UCC represented about 0.1 percent of the PCE aggregate for this category.

In 1994:1 “Battery replacement, audio equipment, floor mats, seat covers, other accessories, batteries, and other equipment installed by CU” in the IS was split into two new UCCs: “Parts, equipment, and accessories,” which is in the Motor vehicle accessories and parts category, and “Vehicle audio equipment excluding labor,” which is in the audio equipment category. The latter seems larger, so we assign the pre-1994 combined UCC to the audio equipment category.

Likewise, in 1994:1 “Purchase and installation of vehicle accessories, including audio equipment, customizing, and items such as luggage racks, fog lamps, and trailer hitches” was split into “Vehicle accessories including labor” and “Vehicle audio equipment including labor.” As above, the pre-1994 combined UCC was assigned to the audio equipment category, which contains the latter UCC.

**Recording media:** Compatible. In the IS mail-order club purchases were merged into all audio media purchases beginning in 2005.

**Photographic equipment:** Mostly compatible. “Photographic equipment” is contained in both surveys, but “Visual goods” is only contained in the DS. In 2010 “Visual goods” was about 5 percent of the PCE aggregate for this category.

**Sporting equipment, supplies, guns, and ammunition:** Mostly compatible. Only the DS contains “Fireworks,” but this UCC is very small relative to the PCE aggregate for this category. There is no DS equivalent to “All other vehicles, trade-in” in the IS. This UCC represents about 0.4 percent of the PCE aggregate for this category. There is also no DS equivalent to “Recreation expenses, out-of-town trips,” in the IS. This UCC represents about 5 percent of the PCE aggregate for this category. In 1994:1 in the IS “Motorized camper-coach or other vehicles (net outlay)” was split into “Purchase of motorized vehicle,” which is in the other recreational vehicles category described below, and “Purchase of other vehicle” which is in this Sporting equipment category. Because the former UCC is larger in the late 1990s, the pre-1994 UCC was assigned to the other recreational vehicles category. The same was done for trade-ins, which were similarly split in 1994:1.

**Bicycles and accessories:** Compatible. This category consists of one UCC “Bicycles” that is consistent across time and recorded in both surveys.

**Pleasure boats:** Not compatible. “Purchase of boat with motor” in the IS does not have an analogous category in the DS. These boats might be included in “Powered sports vehicles” in

the DS, but this is a broader subcategory that is included in Sporting equipment above. The IS contains trade-ins for boats but the DS does not.

**Other recreational vehicles:** Not compatible. Three UCCs in this category, “Purchase of motorized camper,” “Trailers, attached campers, trade-in,” and “Motorized campers, trade-in” are available in the IS but not the DS. Also, the DS does not have a UCC that is analogous to the IS subcategory “Trailer/other attachable campers”. The DS does have “Unpowered boats, trailers,” but this is a better match with the “Pleasure boats” category above.

**Recreational books:** Compatible.

**Musical instruments:** Compatible.

**Jewelry and watches:** Compatible.

**Telephone and facsimile equipment:** Compatible.

### **Nondurable Goods**

**Food purchased for off-premises consumption and Nonalcoholic beverages purchased for off-premises consumption:** Mostly compatible when these two categories are combined. A large set of UCCs in the DS align with a single IS UCC, “Average food and non-alcoholic beverage expenses.” There were several minor content changes in the DS in 1995 and 1996. In 1994 several DS categories were split and recombined, and a few minor categories (e.g., dried fruit, vegetable juices) were added.

**Alcoholic beverages purchased for off-premises consumption:** Compatible. Several UCCs in the DS for this category match up with a single UCC in the IS, “Beer, wine, and other alcohol for home use.” Note, that spending on non-alcoholic beer and wine is included in this category.

**Women's and girls' clothing:** Mostly compatible. The DS does not record spending on “Women’s costumes” or “Girls’ costumes,” but these UCCs are very small.

**Men's and boys' clothing:** Mostly compatible. The DS does not record spending on “Men’s costumes” or “Boys’ costumes,” but these UCCs are very small.

**Clothing materials:** Compatible.

**Shoes and other footwear:** Compatible.

**Gasoline and other energy goods:** Mostly compatible. Only the DS contains “Gasohol,” but this UCC is extremely small. The DS does not contain “Gasoline bought on out-of-town trips”

or “Motor oil bought on out-of-town trips.” Together these UCCs represent about 4 percent of the PCE aggregate for this category.

**Pets and related products:** Compatible.

**Film and photographic supplies:** Not compatible. This category consists of two UCCs, “Film” and “Other photographic supplies.” The latter UCC is not recorded in the IS. In the DS, the latter UCC is the larger of the two.

**Household cleaning products:** Not compatible. Out of five UCCs in this category, including “Soaps and detergents” and “Lawn and garden supplies,” the only UCC contained in the IS is “Termite/pest control products,” which may differ substantially from its most similar UCC in the DS, “Miscellaneous household products.”

**Household paper products:** Not compatible. This category consists of one UCC, “Cleansing and toilet tissue, paper towels and napkins,” which is only available in the DS.

**Household linens:** Compatible.

**Sewing items:** Compatible.

**Personal care products:** Not compatible. Out of nine UCCs, only three relatively minor UCCs are available in both surveys.

**Tobacco:** Mostly compatible. “Cigarettes” and “Other tobacco products” are available in both surveys, but “Smoking accessories” and “Marijuana” are only recorded in the DS. These latter UCCs in the DS are only about 0.5 percent of the PCE aggregate for this category.

**Newspapers and periodicals:** Mostly compatible. Only the DS contains “Newsletters,” but this UCC is extremely small.

## **Services**

**Rent and utilities:** Mostly compatible. “Rent” is contained in both surveys, but the IS also has home improvement materials for renters, while the DS does not distinguish between owners and renters for home improvement materials. “Wall-to-wall carpet (replacement) (renter)” and “Other repair and maintenance services, renter” are unavailable in the DS, but these UCCs are very small relative to the PCE aggregate for this category.

**Imputed rental of owner-occupied nonfarm housing:** Not compatible. Information on the rental equivalence of owned homes is not available in the DS. For the IS this category includes the rental equivalence of primary residences and vacation homes, but does not include the rental

equivalence of time shares. The data are reported as a monthly value. For owned homes we multiply the monthly value by 12, while for vacation homes, we multiply the monthly value by 6, which follows Passero (2011).

**Other motor vehicle services:** Not compatible. Of the 24 UCCs in this category, only eight are available in both surveys. We report ratios for this category for the IS only.

**Cable and satellite television and radio services:** Compatible.

**Photo processing:** Compatible.

**Photo studios:** Compatible.

**Gambling:** Compatible.

**Veterinary and other services for pets:** Compatible.

**Purchased meals and beverages:** Mostly compatible. This category includes spending by the family on food and beverages (both alcoholic and non-alcoholic) purchased at restaurants, school or employer cafeterias, and other eating establishments, as well as food or board at school. The IS also includes food and beverages purchased on out of town trips, but the DS does not collect these expenses. In 2010, this spending on out of town trips in the IS was about 6 percent of the PCE aggregate for this category.

**Food supplied to civilians:** Compatible. This category includes meals provided by employers. Respondents are asked to report spending on “free meals at work as part of your pay”.

**Communication:** Mostly compatible. “Postage” and “Delivery services” are provided in the DS, but unavailable in the IS. In 2010 “Postage” is about 3 percent of the PCE aggregate for this category while “Delivery services” is less than 0.2 percent.

**Legal services:** Compatible.

**Accounting and other business services:** Mostly compatible. In the DS, there are three UCCs that match up with this category: “Accounting fees,” “Miscellaneous personal services,” and “Employment counseling and fees.” The last of these is unavailable in the IS, but this subcategory is very small, and it may be captured in the IS by the miscellaneous subcategory.

**Funeral and burial services:** Compatible.

**Personal care services:** Mostly compatible. “Shopping club membership fees” is not recorded in the DS, but this UCC represents only about 1 percent of the PCE aggregate for this category. “Repair of personal care appliances” was removed from the IS in 1999:2 and not replaced, although it remained in the DS. In recent years, this UCC in the DS has contained no spending.

**Repair and hire of footwear:** Compatible.

**Child care:** Compatible.

**Household maintenance:** Mostly compatible. “Other home services” (340903) is available in both surveys; we assume that in each survey this residual UCC corresponds with several UCCs that are available in one survey but not the other. Two minor UCCs are not available in the DS: “Rental and installation of dishwashers, range hoods, and garbage disposals” and “Management fees for management, security, and parking—other properties,” but these categories are small relative to the PCE aggregate for this category.

Table 1a: CE PCE Comparisons for 10 Large Categories, 2010 [In millions of dollars]

PCE category	PCE	DS/ PCE	IS/ PCE
Imputed rental of owner-occupied nonfarm housing	1,203,053		1.065
Rent and utilities	668,759	0.797	0.946
Food at home	659,382	0.656	0.862
Food away from home	545,579	0.519	0.506
Gasoline and other energy goods	354,117	0.725	0.779
Clothing	256,672	0.487	0.317
Communication	223,385	0.686	0.800
New motor vehicles	178,464		0.961
Furniture and furnishings	140,960	0.433	0.439
Alcoholic beverages purchased for off-premises consumption	106,649	0.253	0.220

Table 1b: Aggregate Consumer Expenditure (CE) Interview and Diary Survey and Personal Consumption Expenditures (PCE), 1986-2010 [In millions of dollars]

PCE category	2010					2006					2001				
	PCE	CE DS	CE IS	DS/PCE	IS/PCE	PCE	CE DS	CE IS	DS/PCE	IS/PCE	PCE	CE DS	CE IS	DS/PCE	IS/PCE
<b>Total durables, nondurables, and services</b>															
Total	\$9,965,306					\$9,061,022					\$6,962,603				
Comparable items	5,547,993					5,167,673					4,050,704				
Ratio of comparable items to total	.56					.57					.58				
<b>Durable goods</b>															
Total durable goods	1,085,484					1,154,973					946,347				
Comparable durable goods	712,899					808,720					679,447				
Ratio of comparable durables to total durables	.66					.70					.72				
New motor vehicles	178,464		171,450		.96	233,047		248,551		1.07	230,018		214,367		.93
Motor vehicle accessories and parts	26,558		23,474		.88	27,316		18,729		.69	25,281		15,091		.60
Furniture and furnishings	140,960	61,010	61,859	.43	.44	160,233	75,975	80,770	.47	.50	124,482	70,966	62,428	.57	.50
Household appliances	40,536	27,323	30,034	.67	.74	44,601	31,840	31,439	.71	.70	35,739	28,145	22,261	.79	.62
Glassware, tableware, and household utensils	41,545	11,822	3,402	.28	.08	43,295	14,617	4,071	.34	.09	37,115	12,075	3,359	.33	.09
Televisions	37,407	11,730	14,379	.31	.38	34,515	18,759	15,496	.54	.45	16,669	5,708	8,511	.34	.51
Audio equipment	19,019	5,703	3,086	.30	.16	22,414	5,566	4,554	.25	.20	17,944	9,419	3,796	.52	.21
Recording media	33,077	6,892	4,985	.21	.15	37,331	11,881	8,940	.32	.24	36,179	11,171	7,722	.31	.21
Photographic equipment	2,844	3,860	2,937	1.36	1.03	5,501	3,318	3,870	.60	.70	3,638	3,363	2,379	.92	.65
Sporting equipment, supplies, guns, and ammunition	53,258	12,733	16,422	.24	.31	54,416	15,923	19,590	.29	.36	41,266	15,959	14,862	.39	.36
Bicycles and accessories	4,257	2,338	1,868	.55	.44	3,734	1,330	1,551	.36	.42	3,030	2,244	1,167	.74	.39
Pleasure boats	9,779		6,960		.71	14,248		13,670		.96	10,687		7,530		.70
Other recreational vehicles	9,580		5,245		.55	15,055		11,946		.79	11,471		12,963		1.13
Recreational books	30,412	4,079	5,582	.13	.18	28,854	6,086	6,364	.21	.22	24,749	3,914	6,242	.16	.25
Musical instruments	4,939	1,845	1,848	.37	.37	5,641	3,126	1,862	.55	.33	4,932	2,050	2,795	.42	.57
Jewelry and watches	61,485	26,774	14,320	.44	.23	62,334	24,431	17,404	.39	.28	47,577	16,776	13,687	.35	.29
Telephone and facsimile equipment	13,991	3,941	4,126	.28	.29	11,606	4,069	2,577	.35	.22	5,839	4,120	1,750	.71	.30
<b>Nondurable goods</b>															
Total nondurable goods	2,301,517					2,069,760					1,587,659				
Comparable nondurable goods	1,691,895					1,534,764					1,187,949				
Ratio of comparable nondurables to total nondurables	.74					.74					.75				
Food and nonalc. beverages purchased for off-premises consumption	659,382	432,541	568,134	.66	.86	582,168	400,248	514,347	.69	.88	482,228	335,712	416,927	.70	.86
Alcoholic beverages purchased for off-premises consumption	106,649	27,016	23,452	.25	.22	91,609	31,324	24,134	.34	.26	77,193	22,782	18,697	.30	.24
Women's and girls' clothing	161,192	80,450	49,737	.50	.31	158,903	90,353	56,748	.57	.36	132,134	72,636	57,615	.55	.44
Men's and boys' clothing	95,480	44,532	31,585	.47	.33	93,907	53,735	36,126	.57	.38	83,203	43,697	39,438	.53	.47
Clothing materials	4,203	1,227	687	.29	.16	4,303	2,196	644	.51	.15	4,218	1,102	504	.26	.12
Shoes and other footwear	59,334	36,679	17,896	.62	.30	56,606	36,058	18,573	.64	.33	46,092	33,311	13,791	.72	.30
Gasoline and other energy goods	354,117	256,573	275,691	.72	.78	335,246	269,741	281,553	.80	.84	183,583	143,247	153,922	.78	.84
Pets and related products	50,068	28,401		.57		39,084	22,332		.57		27,309	14,259		.52	
Household cleaning products	41,287	47,597		1.15		38,426	47,043		1.22		30,764	35,533		1.16	
Household paper products	40,325	12,502		.31		35,449	11,848		.33		26,353	8,317		.32	
Household linens	24,288	10,767	7,070	.44	.29	25,553	15,872	8,695	.62	.34	23,882	10,903	6,205	.46	.26
Sewing items	1,213	1,038	1,154	.86	.95	1,229	726	1,432	.59	1.16	1,285	833	1,061	.65	.83
Tobacco	94,357	29,057		.31		72,281	30,837		.43		69,705	26,362		.38	
<b>Services - household consumption expenditures</b>															
Total services	6,578,305					5,836,289					4,428,597				
Comparable services	3,143,199					2,824,189					2,183,308				
Ratio of comparable services to total services	.48					.48					.49				
Rent and utilities	668,759	533,202	632,560	.80	.95	553,313	466,860	558,834	.84	1.01	443,912	399,549	425,357	.90	.96
Imputed rental of owner-occupied nonfarm housing	1,203,053		1,281,521		1.07	1,111,028		1,292,026		1.16	829,759		960,176		1.16
Other motor vehicle services	58,612		33,654		.57	60,112		46,253		.77	60,943		48,036		.79
Cable and satellite television and radio services	79,524	64,014	77,063	.80	.97	63,722	56,165	64,038	.88	1.00	44,540	35,923	39,013	.81	.88
Photo processing	2,388	1,456	1,383	.58	.58	2,912	1,896	2,125	.65	.73	6,060	2,524	3,115	.42	.51
Photo studios	7,089	2,009	2,527	.28	.36	7,050	4,044	2,667	.57	.38	6,635	1,732	2,139	.26	.32
Gambling	99,578	9,517	6,288	.10	.06	101,052	8,422	6,414	.08	.06	69,990	5,155	6,362	.07	.09
Veterinary and other services for pets	25,669	19,101	17,401	.74	.68	21,490	20,601	15,185	.96	.71	14,541	8,474	9,451	.58	.65
Purchased meals and beverages	545,579	283,241	276,150	.52	.51	487,717	306,665	206,723	.63	.42	368,084	236,255	163,916	.64	.45
Communication	223,385	153,300	178,771	.69	.80	195,215	144,195	151,125	.74	.77	165,481	101,759	110,862	.61	.67
Legal services	96,788		15,590		.16	91,705	5,152	18,893	.06	.21	70,075	10,274	12,094	.15	.17
Accounting and other business services	27,745	15,921	7,934	.57	.29	26,604	10,264	7,410	.39	.28	18,569	6,953	6,158	.37	.33
Funeral and burial services	19,048	1,365	11,442	.07	.60	18,580	7,770	9,133	.42	.49	17,132	418	8,850	.02	.52
Repair and hire of footwear	457	416	187	.41	.41	441	279	163	.63	.37	461	449	169	.97	.37
Child care	30,309	9,270	9,629	.31	.32	25,592	10,499	9,576	.41	.37	19,924	7,365	7,145	.37	.36
Household maintenance	55,216	35,664	45,961	.65	.83	57,656	36,782	45,617	.64	.79	47,202	34,229	32,062	.73	.68

Notes: Data are from the Interview and Diary Consumer Expenditure Surveys and the U.S. Bureau of Economic Analysis. Reported categories are only those were the CE and PCE are most comparable. Comparable categories follows Passero (2011).



Table 1b (Continued): Aggregate Consumer Expenditure (CE) Interview and Diary Survey and Personal Consumption Expenditures (PCE), 1986-2010 [In millions of dollars]

PCE category	1996					1991					1986				
	PCE	CE DS	CE IS	DS/PCE	IS/PCE	PCE	CE DS	CE IS	DS/PCE	IS/PCE	PCE	CE DS	CE IS	DS/PCE	IS/PCE
<b>Total durables, nondurables, and services</b>															
Total	\$5,157,893					\$3,895,828					\$2,841,379				
Comparable items	3,066,232					2,389,267					1,841,989				
Ratio of comparable items to total	.59					.61					.65				
<b>Durable goods</b>															
Total durable goods	676,297					477,185					421,440				
Comparable durable goods	479,457					353,512					335,044				
Ratio of comparable durables to total durables	.71					.74					.79				
New motor vehicles	152,971		149,602		.98	112,903		126,430		1.12	134,047		154,574		1.15
Motor vehicle accessories and parts	21,608		15,145		.70	13,757		8,262		.60	11,446		7,065		.62
Furniture and furnishings	88,322	66,124	51,246	.75	.58	67,120	61,505	44,812	.92	.67	59,392	26,928	45,494	.45	.77
Household appliances	26,798	20,714	20,125	.77	.75	23,262	14,074	15,875	.61	.68	21,243	10,689	17,644	.50	.83
Glassware, tableware, and household utensils	24,772	8,966	3,222	.36	.13	18,537	9,233	3,077	.50	.17	15,142	5,653	2,983	.37	.20
Televisions	12,211	5,689	7,365	.47	.60	10,894	4,456	6,275	.41	.58	11,635	3,772	6,741	.32	.58
Audio equipment	13,750	8,963	5,387	.65	.39	9,184	3,722	10,466	.41	1.14	7,247	2,480	10,290	.34	1.42
Recording media	21,785	11,280	7,222	.52	.33	15,057	5,242	5,198	.35	.35	10,429	2,923	3,246	.28	.31
Photographic equipment	3,018	2,172	1,483	.72	.49	2,582	1,512	1,306	.59	.51	2,997	1,488	1,812	.50	.60
Sporting equipment, supplies, guns, and ammunition	28,529	16,658	14,329	.58	.50	20,452	11,645	10,418	.57	.51	13,147	6,329	7,420	.48	.56
Bicycles and accessories	3,029	2,212	1,458	.73	.48	2,531	2,279	1,799	.90	.71	2,114	978	1,195	.46	.57
Pleasure boats	7,096		10,532		1.48	4,428		8,410		1.90	4,828		4,909		1.02
Other recreational vehicles	8,728		15,282		1.75	6,051		8,626		1.43	5,446		7,235		1.33
Recreational books	18,116	3,837	5,884	.21	.32	11,041	3,763	5,400	.34	.49	7,771	3,104	4,127	.40	.53
Musical instruments	3,090	1,255	2,088	.41	.68	2,175	926	1,501	.43	.69	1,606	271	2,586	.17	1.61
Jewelry and watches	39,892	15,497	14,531	.39	.36	30,192	18,406	13,449	.61	.45	24,333	13,354	11,329	.55	.47
Telephone and facsimile equipment	3,389	2,505	1,924	.74	.57	1,874	5,892	1,742	3.14	.93	1,256	1,286	1,089	1.02	.87
<b>Nondurable goods</b>															
Total nondurable goods	1,241,376					1,020,250					774,189				
Comparable nondurable goods	976,196					821,943					640,271				
Ratio of comparable nondurables to total nondurables	.79					.81					.83				
Food and nonalc. beverages purchased for off-premises consumption	402,756	293,747	352,599	.73	.88	351,488	254,569	315,644	.72	.90	273,849	184,751	217,242	.67	.79
Alcoholic beverages purchased for off-premises consumption	58,676	18,864	14,735	.32	.25	50,858	15,524	12,861	.31	.25	41,670	13,899	14,252	.33	.34
Women's and girls' clothing	111,410	74,803	51,325	.67	.46	96,473	68,356	51,308	.71	.53	77,933	49,664	43,353	.64	.56
Men's and boys' clothing	75,838	45,019	36,018	.59	.47	59,392	39,859	31,409	.67	.53	44,884	30,115	26,207	.67	.58
Clothing materials	3,379	1,297	799	.38	.24	3,634	2,190	1,130	.60	.31	3,057	652	1,059	.21	.35
Shoes and other footwear	39,496	31,027	14,469	.79	.37	31,328	23,592	14,194	.75	.45	24,464	15,689	11,896	.64	.49
Gasoline and other energy goods	144,745	115,860	123,743	.80	.85	121,129	92,737	108,113	.77	.89	91,191	76,406	96,671	.84	1.06
Pets and related products	20,209	15,019		.74		14,070	9,760		.69		10,021	6,914		.69	
Household cleaning products	26,344	28,057		1.07		20,505	24,446		1.19		18,156	16,993		.94	
Household paper products	19,723	7,003		.36		15,376	5,741		.37		11,295	4,087		.36	
Household linens	21,161	9,321	5,434	.44	.26	14,582	7,232	4,591	.50	.31	11,020	6,102	4,077	.55	.37
Sewing items	1,040	825	1,398	.79	1.34	699	1,555	1,040	2.22	1.49	574	1,224	1,030	2.13	1.79
Tobacco	51,419	21,610		.42		42,409	21,687		.51		32,157	17,631		.55	
<b>Services - household consumption expenditures</b>															
Total services	3,240,220					2,398,393					1,645,750				
Comparable services	1,610,579					1,213,812					866,674				
Ratio of comparable services to total services	.50					.51					.53				
Rent and utilities	358,225	320,550	345,125	.89	.96	291,385	260,557	276,771	.89	.95	225,758	187,547	217,782	.83	.96
Imputed rental of owner-occupied nonfarm housing	592,467		639,125		1.08	436,687					304,497				
Other motor vehicle services	42,622		36,376		.85	15,010		12,946		.86	9,552		7,701		.81
Cable and satellite television and radio services	27,400	23,108	24,677	.84	.90	19,269	13,415	17,633	.70	.92	10,533	4,966	10,032	.47	.95
Photo processing	6,377	2,590	2,993	.41	.47	5,466	1,862	2,750	.34	.50	4,110	1,558	2,265	.38	.55
Photo studios	6,455	2,431		.38		4,867	1,350		.28		3,381	709		.21	
Gambling	50,291	6,279		.12		24,664	4,298		.17		15,516	3,458		.22	
Veterinary and other services for pets	9,816	7,411	6,843	.75	.70	5,554	5,203	5,675	.94	1.02	3,660	2,909	3,578	.79	.98
Purchased meals and beverages	286,963	163,818	140,121	.57	.49	243,658	137,351	116,351	.56	.48	166,928	116,882	102,636	.70	.61
Communication	104,928	84,820	81,545	.81	.78	71,996	59,018	60,507	.82	.84	55,600	41,837	44,260	.75	.80
Legal services	50,608	11,179	11,074	.22	.22	41,751	3,339	8,484	.08	.20	27,348	2,858	7,155	.10	.26
Accounting and other business services	10,995	9,190	4,787	.84	.44	7,089	6,253	4,561	.88	.64	3,729	11,137	3,192	2.99	.86
Funeral and burial services	12,721	13,369	11,311	1.05	.89	10,114	2,229	7,268	.22	.72	7,091	1,270	5,824	.18	.82
Repair and hire of footwear	482	434	270	.90	.56	622	445	407	.72	.65	449	296	351	.66	.78
Child care	14,412	7,462	7,696	.52	.53	10,948	7,874	7,528	.72	.69	7,983	8,081	7,126	1.01	.89
Household maintenance	35,817	23,006	25,465	.64	.71	24,732	19,054	23,215	.77	.94	20,539	8,892	17,347	.43	.84

Notes: Data are from the Interview and Diary Consumer Expenditure Surveys and the U.S. Bureau of Economic Analysis. Reported categories are only those were the CE and PCE are most comparable. Comparable categories follows Passero (2011).

Table 2a: Comparison of Vehicle Ownership in the CE Interview Survey to Motor Vehicle Registrations (in millions), 1972-2010

	1972	1973	1980	1987	1990	1992	1995	1997	2000	2002	2003	2004	2005	2006	2007	2008	2009
<b>Automobiles</b>																	
CE Survey	89.6	80.6	105.8	120.7	121.6	120.7	121.2	116.6	113.7	116.2	118.3	114.4	106.8	106.6	107.7	108.3	108.3
State Motor Vehicle Registrations	96.6	101.4	120.7	130.0	132.2	125.1	126.9	128.4	132.2	134.6	134.3	135.0	135.2	134.0	134.5	135.6	133.4
Ratio	0.928	0.795	0.876	0.928	0.920	0.965	0.955	0.908	0.860	0.863	0.881	0.848	0.790	0.795	0.801	0.798	0.812
<b>Trucks</b>																	
CE Survey	10.1	9.9	25.8	33.2	39.3	42.5	52.1	56.1	63.5	69.6	74.1	86.2	87.6	89.0	90.4	91.8	92.4
State Motor Vehicle Registrations	20.3	22.2	32.3	45.7	53.1	61.6	70.8	75.3	85.0	90.8	92.8	97.9	101.6	105.7	108.2	108.0	108.3
Ratio of CES to SMVR	0.498	0.447	0.801	0.727	0.740	0.690	0.736	0.744	0.747	0.766	0.798	0.881	0.862	0.842	0.835	0.850	0.853
<b>Automobiles &amp; Trucks</b>																	
CE Survey	99.7	90.5	131.7	153.9	160.9	163.2	173.2	172.7	177.1	185.7	192.4	200.7	194.4	195.6	198.1	200.1	200.7
State Motor Vehicle Registrations	116.8	123.6	153.0	175.7	185.3	186.7	197.7	203.8	217.3	225.5	227.2	232.9	236.8	239.7	242.7	243.6	241.7
Ratio	0.854	0.732	0.860	0.876	0.869	0.874	0.876	0.847	0.815	0.824	0.847	0.862	0.821	0.816	0.816	0.821	0.830

Notes: Motor vehicle registrations are from the U.S. Federal Highway Administration, Highway Statistics. Registration numbers include all commercial cars and trucks. In 1980, personal passenger vans, passenger minivans, and utility-type vehicles are included in automobile registrations. Starting in 1990 these vehicles are no longer included in automobiles but are included in trucks. Vehicle Inventory Use Survey data, which are only available through 2002, are from the Census Bureau. "Major Use" denotes the business survey respondents said for which their truck is used. "Primary Operator Classification" denotes the type of owner. "Personal Transportation" describes a vehicle that is operated for or owned by someone who operates it for personal use, such as pleasure driving, travel to work, carpool, etc. "Owner/operator" describes an independent trucker driving for his or her own business, or is on lease to a company.

Table 2b: Comparison of Vehicle Ownership in the CE Interview Survey to Motor Vehicle Registrations (in millions), 1972-2010

	1972	1987	1992	1997	2002
Trucks					
CE Survey	10.1	33.2	42.5	56.1	69.6
Vehicle Inventory and Use Survey					
Personal Transportation as Major Use	8.1	29.3	40.4	50.9	65.3
Personal Transportation as Primary Operator Classification	NA	29.3	41.1	51.8	65.3
Classification	NA	0.5	1.2	1.4	NA
Owner/Operator as Primary Operator Classification	NA	0.2	0.2	0.2	0.5
All Three as Primary Operator Classification	NA	30.0	42.5	53.3	65.9
Ratio of CES to PT as Major Use	1.244	1.135	1.051	1.101	1.065
Ratio of CES to PT as POC	NA	1.133	1.035	1.083	1.065
Ratio of CES to All Three as POC	NA	1.107	1.002	1.051	1.056

Notes: See notes to 2a.

Table 3: Correlation of Reported Vehicle Purchase Price in the CE Interview Survey to NADA values

Survey Year	1990	2000
Cars owned 6 months or less	0.956	0.912
Cars owned 12 months or less	0.937	0.790
Cars owned 24 months or less	0.879	0.779

Notes: For each of the survey years reported, we compute the correlation between the reported purchase price of a random sample of vehicles from the CE Interview Survey and the value of these vehicles reported in the NADA guides. Values from NADA guides were identified based on make, model, year, number of cylinders and number of doors for each vehicle. For each survey year, we select a random sample of 100 new and used vehicles with a reported purchase price from the CE Interview Survey.

Table 4: Comparison of Demographic Characteristics, CE Interview Survey and CPS, 1980-2010

	No High School Degree			High School Degree			Some College			College Graduate			Married			Weeks Worked			Hours Worked per Week			Under 18			Under 5			Hispanic Origin			Live in Owned Home		
	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff
1980	0.319	0.298	0.021	0.333	0.349	-0.016	0.200	0.202	-0.002	0.148	0.151	-0.003	0.643	0.632	0.011	35.345	35.713	-0.368	31.408	31.185	0.223	0.288	0.283	0.005	0.075	0.086	-0.011	.	.	.	0.705	0.725	-0.020
1981	0.293	0.289	0.004	0.340	0.355	-0.015	0.209	0.204	0.004	0.159	0.151	0.007	0.640	0.623	0.017	35.559	35.459	0.100	31.509	30.859	0.651	0.282	0.280	0.002	0.077	0.088	-0.012	.	.	.	0.705	0.720	-0.015
1984	0.263	0.258	0.005	0.342	0.359	-0.017	0.211	0.213	-0.002	0.184	0.170	0.014	0.621	0.607	0.014	35.670	35.300	0.371	31.873	30.526	1.347	0.273	0.268	0.004	0.078	0.092	-0.014	.	.	.	0.689	0.685	0.004
1985	0.264	0.254	0.009	0.328	0.356	-0.028	0.217	0.216	0.000	0.192	0.174	0.018	0.617	0.604	0.013	36.820	36.136	0.684	32.436	31.258	1.178	0.265	0.267	-0.002	0.074	0.091	-0.017	.	.	.	0.688	0.680	0.008
1986	0.261	0.246	0.015	0.339	0.358	-0.019	0.219	0.221	-0.002	0.181	0.175	0.006	0.608	0.603	0.005	37.186	36.348	0.838	32.666	31.525	1.141	0.271	0.266	0.005	0.075	0.091	-0.017	.	.	.	0.679	0.675	0.004
1987	0.248	0.240	0.007	0.351	0.358	-0.007	0.218	0.221	-0.004	0.184	0.180	0.004	0.618	0.604	0.014	37.192	36.867	0.325	32.937	31.988	0.949	0.274	0.264	0.010	0.077	0.091	-0.014	.	.	.	0.675	0.676	-0.001
1988	0.253	0.235	0.018	0.344	0.360	-0.015	0.218	0.221	-0.003	0.185	0.185	0.001	0.614	0.598	0.015	37.350	37.284	0.066	33.174	32.258	0.916	0.269	0.263	0.005	0.075	0.091	-0.016	.	.	.	0.665	0.675	-0.010
1989	0.241	0.230	0.011	0.339	0.355	-0.015	0.226	0.224	0.002	0.194	0.192	0.002	0.612	0.596	0.016	38.129	37.829	0.300	33.855	32.561	1.294	0.269	0.262	0.008	0.078	0.091	-0.013	.	.	.	0.672	0.674	-0.001
1990	0.238	0.224	0.014	0.332	0.351	-0.019	0.231	0.230	0.001	0.199	0.194	0.004	0.609	0.593	0.016	38.326	38.319	0.006	33.707	33.091	0.615	0.271	0.261	0.010	0.080	0.091	-0.011	.	.	.	0.669	0.670	-0.001
1991	0.231	0.216	0.015	0.336	0.354	-0.018	0.232	0.234	-0.002	0.201	0.195	0.006	0.616	0.588	0.027	38.120	38.241	-0.121	33.590	33.098	0.492	0.269	0.262	0.007	0.076	0.092	-0.016	.	.	.	0.678	0.668	0.010
1992	0.235	0.208	0.027	0.326	0.355	-0.028	0.234	0.243	-0.009	0.206	0.195	0.011	0.608	0.585	0.023	37.708	37.991	-0.282	33.384	32.893	0.490	0.278	0.262	0.016	0.081	0.092	-0.012	.	.	.	0.653	0.667	-0.014
1993	0.217	0.202	0.015	0.337	0.347	-0.010	0.238	0.253	-0.015	0.208	0.199	0.010	0.597	0.584	0.013	37.916	37.929	-0.013	33.378	32.830	0.548	0.271	0.267	0.005	0.078	0.094	-0.015	.	.	.	0.661	0.667	-0.006
1994	0.207	0.194	0.013	0.340	0.339	0.001	0.239	0.264	-0.025	0.213	0.203	0.011	0.602	0.581	0.021	37.910	37.897	0.013	33.521	32.914	0.607	0.276	0.267	0.009	0.079	0.093	-0.014	.	.	.	0.671	0.667	0.003
1995	0.207	0.189	0.018	0.339	0.335	0.004	0.235	0.266	-0.031	0.218	0.210	0.009	0.594	0.584	0.011	38.221	38.400	-0.179	33.545	33.235	0.309	0.272	0.268	0.004	0.075	0.093	-0.018	.	.	.	0.675	0.674	0.001
1996	0.192	0.189	0.003	0.334	0.332	0.002	0.258	0.264	-0.006	0.216	0.215	0.001	0.594	0.576	0.017	38.151	38.677	-0.526	33.398	33.390	0.008	0.273	0.268	0.005	0.075	0.092	-0.017	.	.	.	0.670	0.677	-0.007
1997	0.190	0.186	0.004	0.316	0.334	-0.018	0.270	0.263	0.008	0.224	0.217	0.006	0.598	0.571	0.027	38.572	38.989	-0.417	33.625	33.566	0.059	0.275	0.265	0.009	0.072	0.089	-0.018	.	.	.	0.677	0.682	-0.006
1998	0.177	0.179	-0.002	0.315	0.335	-0.020	0.281	0.265	0.017	0.227	0.222	0.005	0.602	0.572	0.029	38.833	39.295	-0.463	34.145	33.726	0.419	0.271	0.265	0.007	0.073	0.088	-0.015	.	.	.	0.686	0.689	-0.003
1999	0.168	0.174	-0.006	0.316	0.331	-0.014	0.282	0.266	0.016	0.234	0.229	0.005	0.595	0.572	0.023	39.224	39.510	-0.286	34.167	33.861	0.306	0.266	0.263	0.003	0.068	0.086	-0.018	.	.	.	0.684	0.694	-0.010
2000	0.171	0.169	0.002	0.319	0.328	-0.009	0.280	0.271	0.009	0.230	0.232	-0.002	0.587	0.573	0.014	39.462	39.822	-0.360	34.193	34.163	0.030	0.265	0.262	0.003	0.069	0.085	-0.017	.	.	.	0.690	0.699	-0.010
2001	0.166	0.169	-0.003	0.310	0.320	-0.010	0.289	0.272	0.017	0.235	0.239	-0.004	0.581	0.573	0.008	39.451	39.750	-0.299	34.220	33.908	0.312	0.264	0.257	0.006	0.068	0.083	-0.014	.	.	.	0.697	0.702	-0.005
2002	0.165	0.169	-0.004	0.305	0.318	-0.014	0.289	0.270	0.019	0.242	0.243	-0.001	0.579	0.567	0.012	39.161	39.335	-0.173	33.854	33.499	0.355	0.262	0.256	0.007	0.070	0.082	-0.013	.	.	.	0.697	0.705	-0.008
2003	0.168	0.164	0.004	0.295	0.318	-0.022	0.293	0.271	0.021	0.244	0.247	-0.004	0.579	0.566	0.013	38.414	38.879	-0.465	33.423	33.049	0.374	0.258	0.255	0.003	0.069	0.082	-0.013	.	.	.	0.708	0.709	-0.001
2004	0.162	0.158	0.004	0.289	0.317	-0.029	0.295	0.273	0.022	0.255	0.252	0.003	0.585	0.565	0.020	38.450	38.537	-0.087	33.628	32.699	0.929	0.257	0.254	0.003	0.068	0.082	-0.014	.	.	.	0.715	0.713	0.002
2005	0.173	0.157	0.016	0.282	0.319	-0.036	0.293	0.273	0.020	0.252	0.251	0.000	0.579	0.564	0.015	38.191	38.613	-0.422	33.558	32.627	0.931	0.255	0.252	0.002	0.066	0.082	-0.016	.	.	.	0.708	0.720	-0.012
2006	0.173	0.154	0.020	0.284	0.316	-0.032	0.291	0.275	0.016	0.251	0.255	-0.004	0.575	0.559	0.016	38.550	38.737	-0.186	34.068	32.794	1.273	0.254	0.250	0.004	0.067	0.082	-0.015	0.145	0.140	0.005	0.708	0.709	-0.002
2007	0.171	0.151	0.019	0.282	0.315	-0.033	0.284	0.272	0.012	0.263	0.262	0.001	0.578	0.560	0.018	38.840	38.945	-0.106	34.140	32.881	1.259	0.252	0.249	0.004	0.069	0.082	-0.013	0.153	0.143	0.010	0.705	0.708	-0.003
2008	0.165	0.142	0.022	0.279	0.309	-0.031	0.292	0.279	0.013	0.265	0.269	-0.005	0.579	0.550	0.028	38.478	38.969	-0.492	33.530	32.804	0.726	0.251	0.248	0.003	0.066	0.083	-0.017	0.155	0.147	0.008	0.706	0.704	0.002
2009	0.158	0.141	0.017	0.281	0.309	-0.028	0.294	0.280	0.014	0.267	0.271	-0.003	0.572	0.551	0.022	37.664	38.314	-0.651	32.854	32.288	0.567	0.247	0.246	0.001	0.066	0.083	-0.017	0.156	0.151	0.005	0.696	0.694	0.002
2010	0.167	0.137	0.030	0.279	0.310	-0.032	0.284	0.280	0.004	0.271	0.273	-0.002	0.563	0.541	0.021	36.394	37.061	-0.667	31.853	31.289	0.564	0.249	0.245	0.003	0.068	0.084	-0.015	0.158	0.154	0.004	0.687	0.685	0.001

Notes: All means are reported at the individual level and weighted using population weights. Education and marital status are reported for all individuals 18-64. Work hours and weeks worked are reported for all individuals 18-64. The remaining variables are reported for all individuals. For both surveys, the years refer to the year of the interview. The reference period for work hours and weeks worked are for the previous 12 months for the CE survey and for the previous calendar year for the CPS. For all other variables, the information is reported as of the interview date. Interviews for the CE occur throughout the year. Interviews for the CPS are conducted in primarily in March, although since 2003 interviews are also conducted in February and April.

Table 5: Comparison of Before-Tax Money Income, CE Interview Survey and CPS, 2004-2010

	Share below \$15,001			Share \$15,001 - \$30,000			Share \$30,001 - \$50,000			Share \$50,001 - \$75,000			Share \$75,001 - \$100,000			Share above \$100,000		
	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff	CE	CPS	Diff
	2004	0.076	0.082	-0.006	0.139	0.13	0.009	0.190	0.188	0.002	0.202	0.198	0.004	0.143	0.143	0.000	0.249	0.2588
2005	0.072	0.081	-0.008	0.135	0.128	0.007	0.194	0.188	0.006	0.204	0.197	0.006	0.145	0.141	0.003	0.251	0.2655	-0.015
2006	0.073	0.078	-0.005	0.127	0.126	0.001	0.189	0.19	-0.001	0.203	0.193	0.010	0.151	0.14	0.011	0.257	0.2724	-0.016
2007	0.067	0.079	-0.011	0.133	0.131	0.003	0.193	0.18	0.013	0.205	0.193	0.012	0.146	0.144	0.002	0.256	0.2734	-0.018
2008	0.080	0.085	-0.006	0.142	0.135	0.007	0.201	0.185	0.016	0.194	0.195	-0.001	0.139	0.14	-0.001	0.245	0.2602	-0.015
2009	0.083	0.093	-0.010	0.147	0.138	0.009	0.200	0.187	0.014	0.191	0.19	0.000	0.136	0.138	-0.001	0.243	0.2546	-0.012
2010	0.091	0.098	-0.007	0.150	0.141	0.010	0.205	0.188	0.017	0.191	0.188	0.003	0.135	0.134	0.001	0.228	0.2514	-0.024

Notes: Dollar cutoffs are in 2010 dollars.

Appendix Table 1: Concordance of Interview and Diary Survey UCCs for Each PCE Category

PCE Category	Interview Survey UCCs	Diary Survey UCCs
<i>Durable goods</i>		
New motor vehicles	1980-2010: 450110 450116 450210 450216	1986-2010: 450110 1986-2006: 450210
Motor vehicle accessories and parts	1980-2010: 480110 480213 490501 2005-2010: 480212	1986-2010: 480110 480212 480213 600903
Furniture and furnishings	1980-2010: 290110 290120 290210 290310 290320 290410 290420 290440 320901 290430 340904 680320 320220 690242 690241 690243 320120 280210 1980-2006: 320210 320231 2007-2010: 320233 1980-1998: 220511 220614 230132 320110 320162 1999-2010: 220616 230133 320111	1986-2010: 290110 290120 290210 290310 290320 290410 290420 290440 320901 290430 340904 320220 690242 690241 690243 230130 320110 320120 280210 1986-2006: 320210 320231 2007-2010: 320233
Household appliances	1980-2010: 230117 230118 300111 300112 300211 300212 300221 300222 300311 300312 300321 300322 320150 300331 300332 300411 300412 320511 320512 320522 690245 690244 320521	1986-2010: 230117 230118 300110 300210 300220 300310 300320 320150 300330 300410 320511 320512 300900 320522 320521
Glassware, tableware, and household utensils	1980-2010: 320310 320320 320330 320340 320350 320370 320360	1986-2010: 320320 320340 320350 320905 320370 320380 320310 320330 320360
Outdoor equipment and supplies	1980-2010: 320410	1986-2010: 320410
Televisions	1980-2004: 310110 310120 310130 2005-2010: 310140	1986-2004: 310110 310120 310130 2005-2010: 310140
Audio equipment	1980-2010: 480214 310311 310313 310315 310320 490502 2005-2010: 310314 1980-1998: 310312 1996-2010: 310333 1980-1995: 310330 1980-1993: 480211 490500	1986-2010: 480214 310311 310312 310313 310315 310320 310331 310332 2005-2010: 310314
Recording media	1980-2010: 310220 1980-2004: 310341 310342 2005-2010: 310340	1986-2010: 310340 310220
Photographic equipment	1980-2010: 610230	1986-2010: 610230 610903
Sporting equipment, supplies, guns, and ammunition	1980-2010: 600142 600144 600210 600410 600420 600430 610120 1980-1993: 610900 1994-2010: 600901 600902	1986-2010: 600130 600210 600410 600420 600430 600901 610120 610901
Bicycles and accessories	1980-2010: 600310	1986-2010: 600310
Pleasure boats	1980-2010: 600121 600132 600110 600138 600127	1986-2010: 600120 600130 600110
Other recreational vehicles	1980-2010: 600122 600128 1980-1993: 600131 600137 1994-2010: 600141 600143	(none)
Recreational books	1980-2010: 590220 590230 660310	1986-2010: 590220 590230 660310
Musical instruments	1980-2010: 610130	1986-2010: 610130
Jewelry and watches	1980-2010: 430110 430120	1986-2010: 430110 430120
Telephone and facsimile equipment	1980-2010: 320232 690210	1986-2010: 320232 690210

PCE Category	Interview Survey UCCs	Diary Survey UCCs
<i>Nondurable goods</i>		
Food purchased for off-premises consumption	1980-2006: 790220 790230 2007-2010: 790240	1986-2010: 010110 010120 010210 010310 010320 020110 020210 020510 020610 020810 020310 020410 020620 020710 020820 030110 030210 030310 030410 030510 030610 030710 030810 040110 040210 040310 040510 040410 040610 050110 050210 050310 050410 050900 060110 060210 060310 070110 070230 070240 090110 090210 100210 100410 100510 160310 080110 160320 160211 160212 100110 160110 110110 110210 110310 110410 110510 120110 120210 120310 120410 130310 140110 140210 140220 140230 140320 140330 140340 140310 130320 150110 150211 150212 150310 180210 180220 180110 180310 180320 180410 180420 180510 180520 180620 180710 180611 180612 1994-2010: 070210 070220 130120 130210 160210 180610
Nonalcoholic beverages purchased for off-premises consumption		1986-2010: 170520 170310 170410 130121 140410 140420 130122 130110 170110 170210 170510 170531 170532 130211 130212 2007-2010: 170533 2006-2010: 170530 1986-1994: 480211 1995-2010: 480213
Alcoholic beverages purchased for off-premises consumption	1980-2006: 790310 790320 2007-2010: 790330	1986-2010: 200210 200410 200533 200310 200523 200111 200513 200112
Women's and girls' clothing	1980-2010: 380110 380210 380311 380312 380313 380320 380331 380332 380340 380410 380420 380430 380510 380901 380902 380903 390110 390120 390210 390221 390222 390230 390310 390321 390322 390901 390902 1980-2006: 380331 380332 390221 390222 2007-2010: 380333 390223	1986-2010: 380110 380210 380311 380312 380313 380320 380331 380332 380340 380410 380420 380430 380510 380901 380902 390110 390120 390210 390221 390222 390230 390310 390321 390322 390901 1980-2006: 380331 380332 390221 390222 2007-2010: 380333 390223
Men's and boys' clothing	1980-2010: 360110 360120 360210 360311 360312 360320 360330 360340 360350 360410 360511 360512 360901 360902 370110 370120 370130 370211 370212 370213 370220 370311 370312 370313 370902 1980-2006: 360511 360512 370312 370313 2007-2010: 360513 370314 1980-1994: 370901 1995-2010: 370903 370904	1986-2010: 360110 360120 360210 360311 360312 360320 360330 360340 360350 360410 360511 360512 360901 370110 370120 370130 370211 370212 370213 370220 370311 370312 370313 370901 370904 1986-2006: 360511 360512 370312 370313 2007-2010: 360513 370314
Clothing materials	1980-2010: 420110 420120	1986-2010: 420110 420120
Shoes and other footwear	1980-2010: 400110 400210 400310 400220	1986-2010: 400110 400210 400310 400220



<u>PCE Category</u>	<u>Interview Survey UCCs</u>	<u>Diary Survey UCCs</u>
Gasoline and other energy goods	1980-2010: 470111 470112 470113 470211 470212 470220 250111 250112 250113 250114 250211 250212 250213 250214 250901 250902 250903 250904 250911 250912 250913 250914 250221 250222 250223 250224	1986-2010: 470111 470112 470114 470211 470220 250110 250210 250900 250220
Pets and related products	1980-2010: 610320	1986-2010: 610310 610320
Film and photographic supplies	1980-2010: 610210	1986-2010: 610210 610220
Household cleaning products	1980-2010: 330511 1980-1998: 990910	1986-2010: 320140 330110 330210 330610 330510
Household paper products	(none)	1986-2010: 330310
Household linens	1980-2010: 280110 280120 280130 280220 280900 320904	1986-2010: 280110 280120 280130 280220 280900 320904
Sewing items	1980-2010: 280230	1986-2010: 280230
Personal care products	1980-2010: 320130 640130 640420	1986-2010: 320130 640110 640120 640210 640220 640410 640310 640420
Tobacco	1980-2010: 630110 630210	1986-2010: 630110 630210 630900 630220
Newspapers and periodicals	1980-2010: 590310 590410 1980-1993: 590110 590210 1994-2010: 590111 590112 590211 590212	1986-2010: 590110 590210 590900
<u>Services</u>		
Rent and utilities	1980-2010: 800710 210110 230121 230141 230150 240111 240121 240211 240221 240311 240321 320611 320621 270211 270212 270213 270214 270411 270412 270413 270414 260111 260112 260113 260114 260211 260212 260213 260214 1980-1998: 230131 1999-2010: 230134 320163 1980-1993: 230111	1986-2010: 800710 210110 270210 270410 260110 260210 270905
Imputed rental of owner-occupied nonfarm housing	1980-2010: 910060 910070 1980-2006: 910100 2007-2010: 910101 910102 910103 1993-2010: 910050	(none)
Other motor vehicle services	1980-2010: 450312 450412 520511 520512 520521 520522 520902 520905 520904 620907 520541 520542 1980-1993: 620907 1994-2010: 620921 620922 1980-1990: 520530 620902 1991-2010: 520531 520532 620909 620919 450310 450313 450314 450410 450413 450414	1986-2010: 450310 450410 520511 520521 520902 520904 520531 520541
Cable and satellite television and radio services	1980-2010: 270310 270311	1986-2010: 270310 270311
Photo processing	1980-2010: 620330	1986-2010: 620330
Photo studios	1980-2010: 620320	1986-2010: 620320
Gambling	1980-2010: 620926	1986-2010: 620926 1986-2000: 620911

<u>PCE Category</u>	<u>Interview Survey UCCs</u>	<u>Diary Survey UCCs</u>
Veterinary and other services for pets	1980-2010: 620410 620420	1986-2010: 620410 620420
Purchased meals and beverages	1980-2010: 190901 190902 190903 790410 790420 790430 200900	1998-2010: 190111 190211 190311 190321 190911 190921 190112 190212 190312 190322 190912 190922 190113 190213 190313 190323 190913 190923 190114 190214 190314 190324 190914 190924 190115 190215 190315 190325 190915 190925 190116 190216 19031 190326 190916 190926 200511 200512 200516 200521 200522 200526 200531 200532 200536 1986-1997: 190110 190210 190310 190320 190901 190902 200510 200520 200530
Food supplied to civilians	1980-2010: 800700	1986-2010: 800700
Communication	1980-2010: 270104 620930 310350 690116 270105 690114 1980-2005: 270103 2005-2010: 310240 1980-1997: 270510 270610 1980-1990: 270000 1991-2010: 270101 270102	1986-2010: 270000 340110 340120 310241 310242 620930 310351 310352 690116 690114
Legal services	1980-2010: 680110	1986-2010: 680110
Accounting and other business services	1980-2010: 680902 001400 680903	1986-2010: 680902 680903
Funeral and burial services	1980-2010: 680140 680901	1986-2010: 680140 680901
Personal care services	1980-2010: 440150 620115 680904 1980-1998: 650110 650210 650900 1999-2010: 650310	1986-2010: 650310 650110 650210 440150 650900 680904
Repair and hire of footwear	1980-2010: 440110	1986-2010: 440110
Child care	1980-1992: 340210 1993-2010: 340211 340212	1986-2010: 340210
Household maintenance	1980-2010: 340310 340510 440900 340630 340620 230142 340901 340907 990900 270901 270902 270903 270904 340420 340903 340914 340911 340912 790640 340915 340410	1986-2010: 340310 340510 440900 340630 340620 230140 340901 340907 340913 270900 340903 340410

Notes: UCC refers to Universal Classification Code, which denotes a detailed expenditure category in the Interview or Diary Survey.

Figure 1a: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, New Motor Vehicles and Imputed Rent (Interview Only)

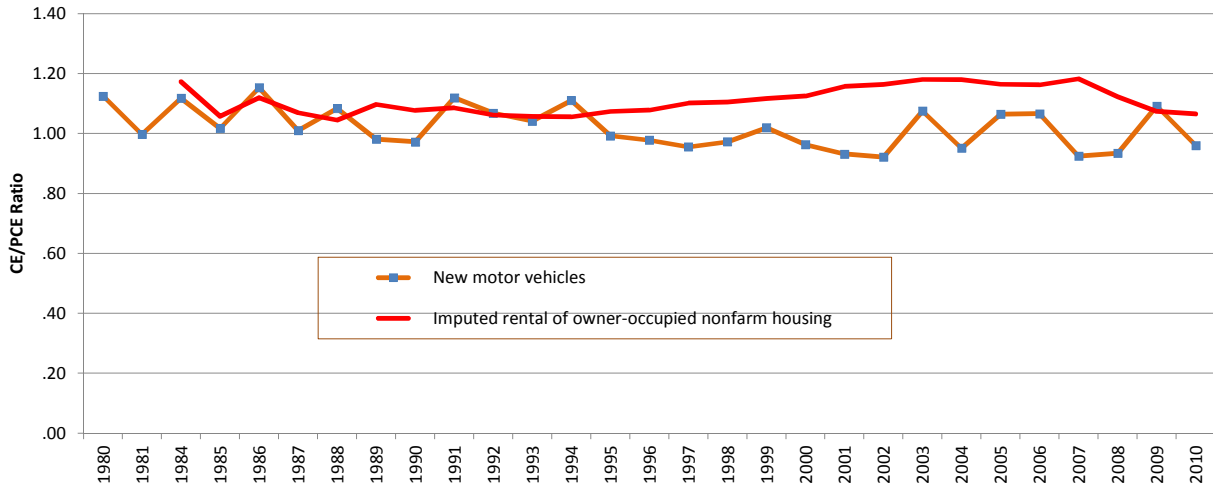


Figure 1b: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, Rent and Utilities

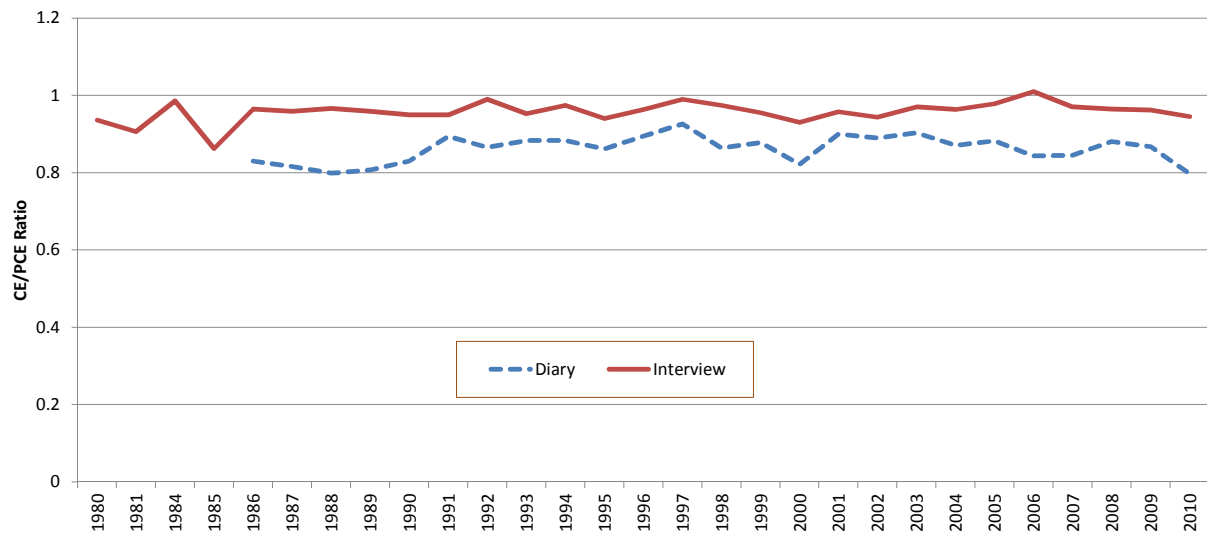


Figure 1c: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, Food at Home

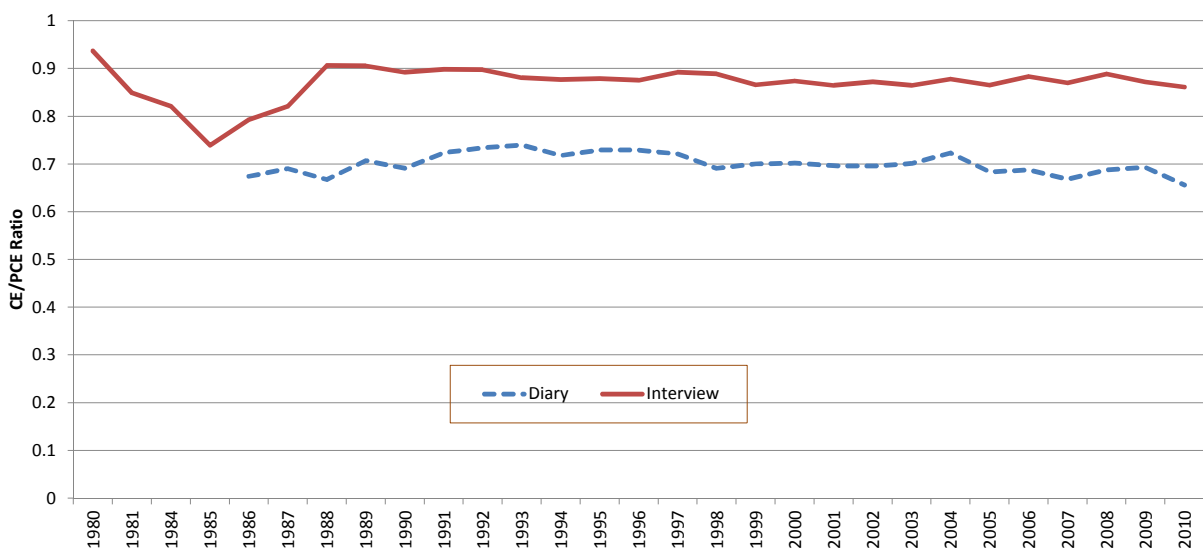


Figure 1d: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, Food Away from Home

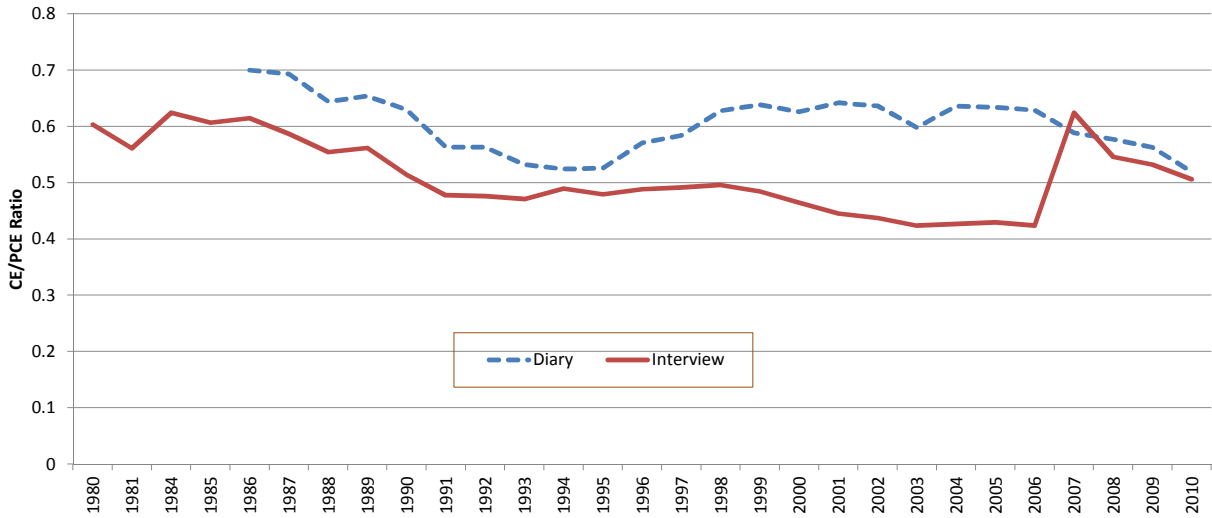


Figure 1e: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, Gasoline and Other Energy Goods

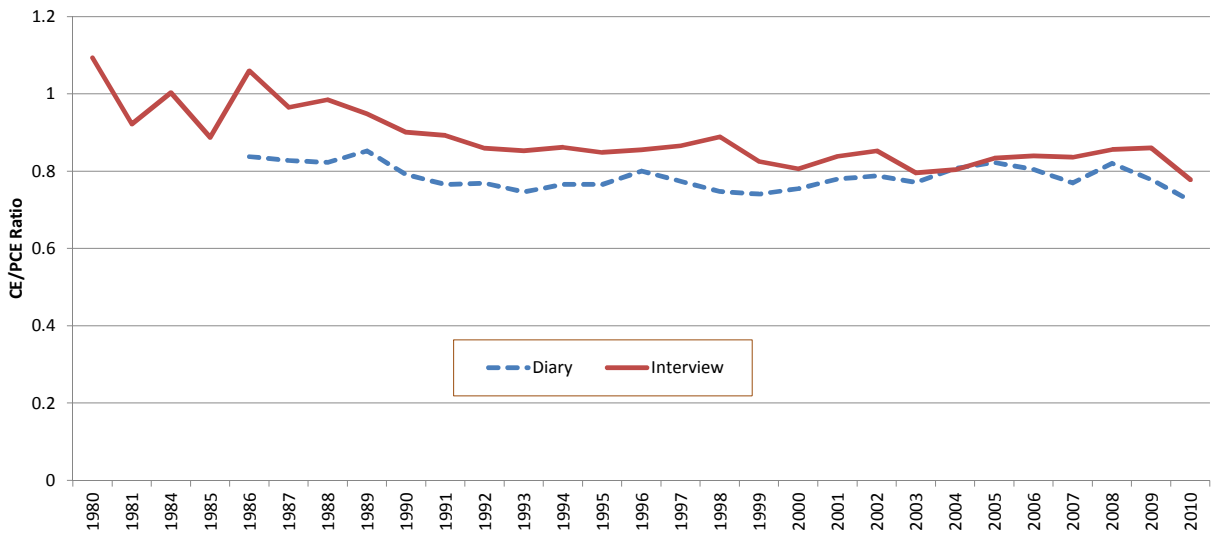


Figure 1f: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, Clothing and Shoes

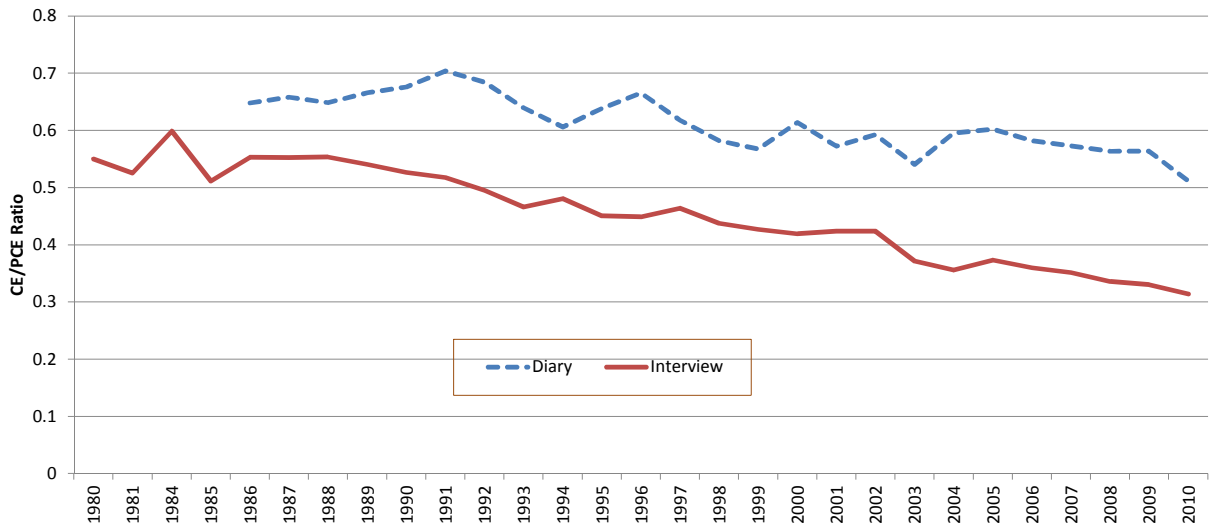


Figure 1g: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, Communication

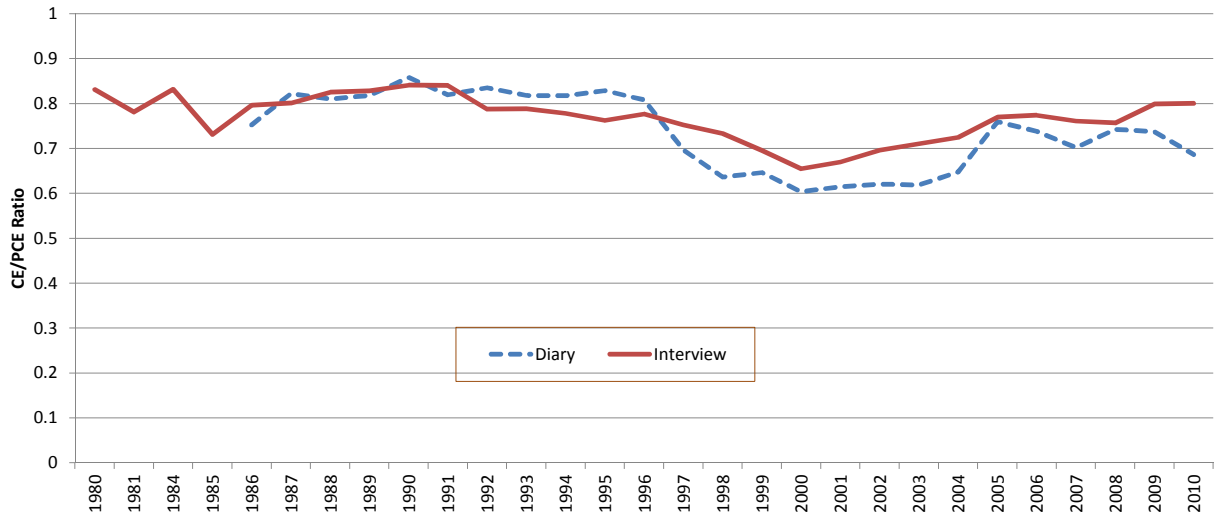


Figure 1h: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, Furniture and Furnishings

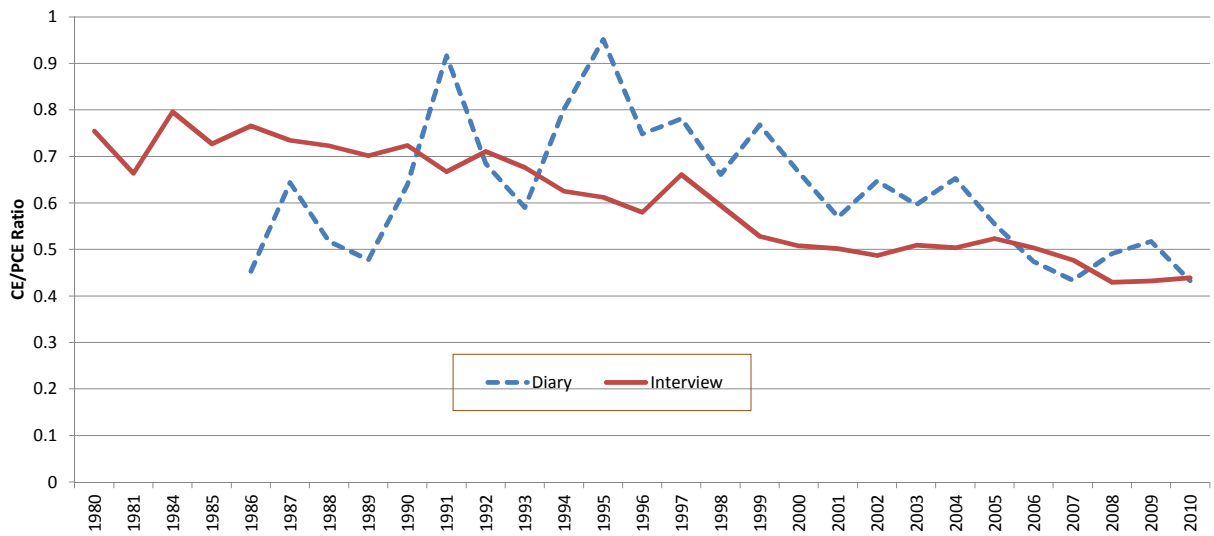
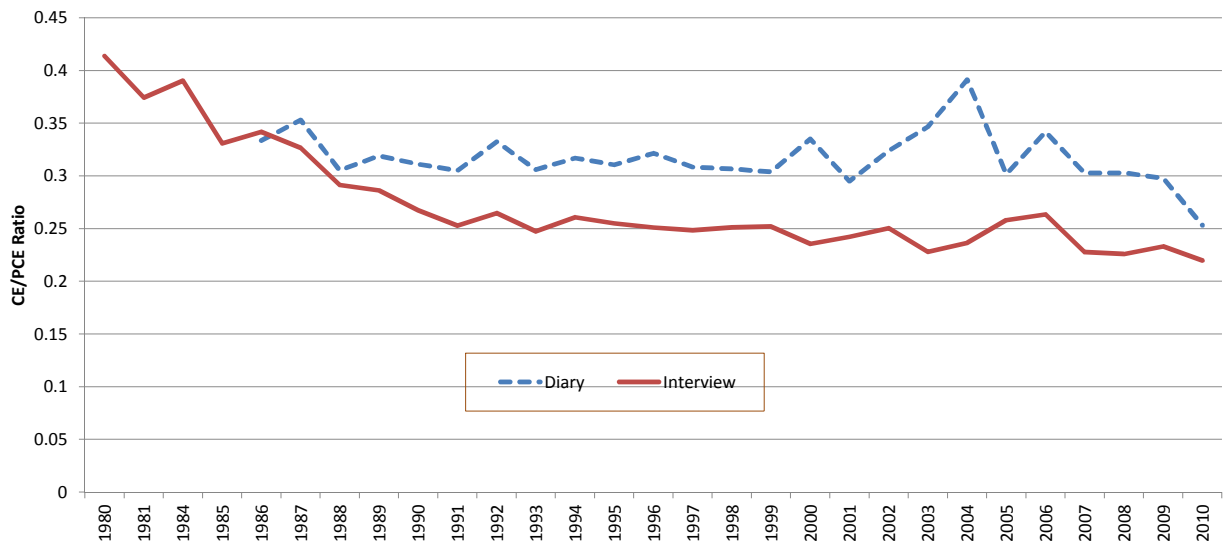
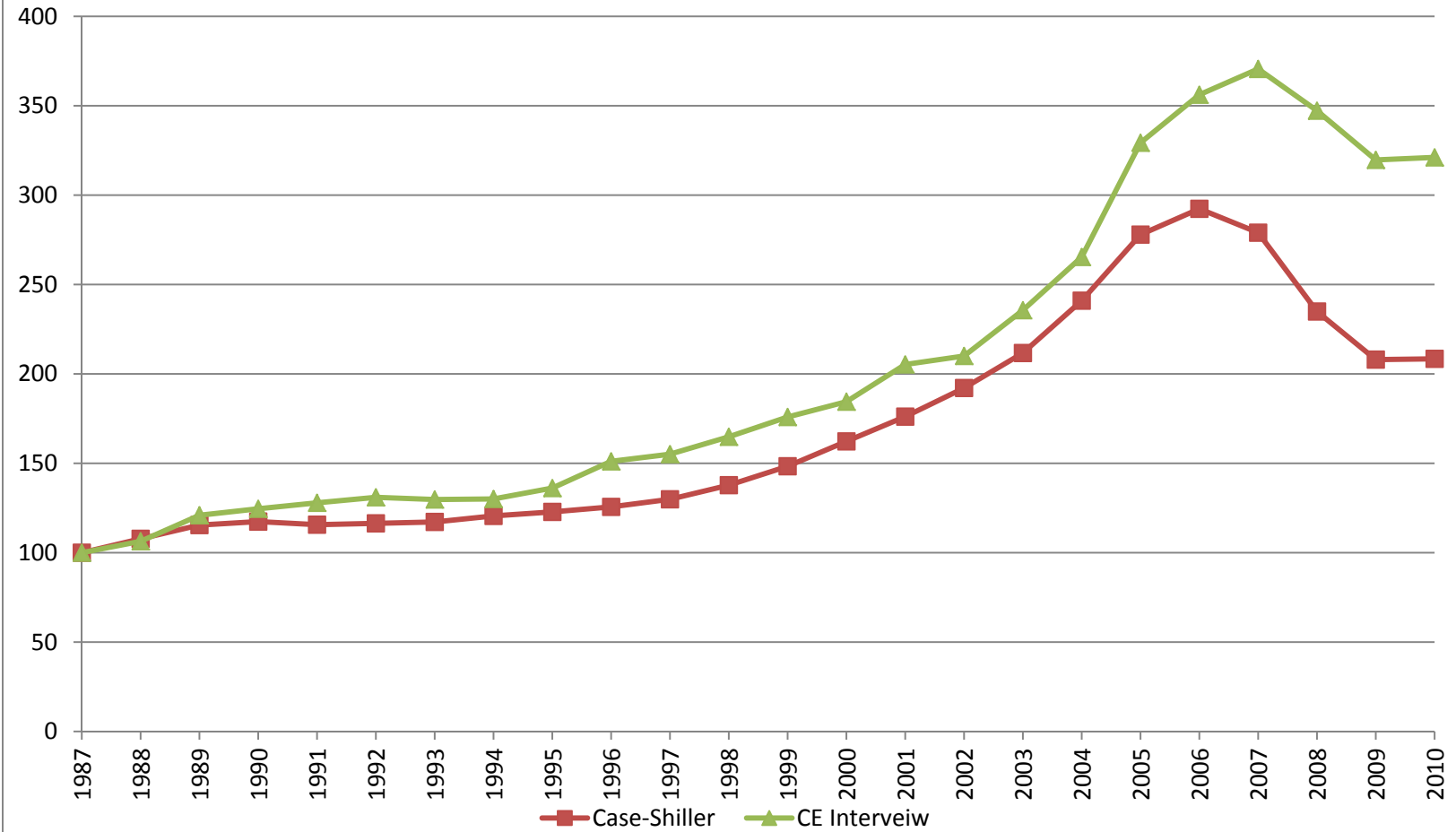


Figure 1i: Comparisons of CE Diary and CE Interview Aggregates to PCE Aggregates, Alcoholic Beverages



**Figure 2: Reported Value of the Home (CE Interview) Compared to Case-Shiller Annual Housing Price Indices (Base Year = 1987)**



Note: CE data excludes the following states because they are not included in the Case-Shiller Index: AL, AK, ID, IN, ME, MS, MT, SC, SD, WV, and WI. In addition, the following states are excluded because of limited state information in the CE data: DE, GA, MD, and MN.