

BLS WORKING PAPERS



U.S. Department of Labor
U.S. Bureau of Labor Statistics
Office of Prices and Living Conditions

Understanding the Relationship: CE Survey and PCE

William Passero, U.S. Bureau of Labor Statistics
Thesia I. Garner, U.S. Bureau of Labor Statistics
Clinton McCully, Bureau of Economic Analysis

Passero, William, Thesia I. Garner, and Clinton McCully. "Understanding the Relationship: CE Survey and PCE," Chapter 6 in *Improving Measurement of Consumer Expenditures* (eds. [Christopher Carroll](#), [Thomas Crossley](#), and [John Sabelhaus](#)), University of Chicago Press, National Bureau of Economic Research in [NBER Book Series Studies in Income and Wealth](#), May 2015, pp. 181 – 203.

<https://www.nber.org/books-and-chapters/improving-measurement-consumer-expenditures/understanding-relationship-ce-survey-and-pce>

Working Paper 462
March 2013
Published May 2015

All views expressed in this paper are those of the authors and do not necessarily reflect the views or policies of the U.S. Bureau of Labor Statistics.

This PDF is a selection from a published volume from the National Bureau of Economic Research

Volume Title: Improving the Measurement of Consumer Expenditures

Volume Author/Editor: Christopher D. Carroll, Thomas F. Crossley, and John Sabelhaus, editors

Series: Studies in Income and Wealth, volume 74

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-12665-X, 978-0-226-12665-4

Volume URL: <http://www.nber.org/books/carr11-1>

Conference Date: December 2-3, 2011

Publication Date: May 2015

Chapter Title: Understanding the Relationship: CE Survey and PCE

Chapter Author(s): William Passero, Thesia I. Garner, Clinton McCully

Chapter URL: <http://www.nber.org/chapters/c12659>

Chapter pages in book: (p. 181 – 203)

Understanding the Relationship CE Survey and PCE

William Passero, Thesia I. Garner, and Clinton McCully

6.1 Introduction

The Consumer Expenditure Survey (CE) data from the Bureau of Labor Statistics (BLS) and the personal consumption expenditures (PCE) data from the Bureau of Economic Analysis (BEA) are two sources of expenditures that focus on households in the United States.¹ Both are used to assess the economic well-being of households in the United States. Comparisons of data from these two sources have been conducted for many years, both within the BEA and BLS and by outside researchers, with resulting studies showing varying degrees of disparities in expenditures from the two sources.

William Passero is supervisory economist at the Bureau of Labor Statistics, US Department of Labor in the Division of Consumer Expenditure Surveys. Thesia I. Garner is senior research economist in the Division of Price and Index Number Research at the Bureau of Labor Statistics, US Department of Labor. Clinton McCully is the former chief of the Research Group in the National Income and Wealth Division, Bureau of Economic Analysis, US Department of Commerce.

A presentation based on this chapter was given at the conference on Improving the Measurement of Consumer Expenditures. That conference was sponsored by the Conference on Research in Income and Wealth and the National Bureau of Economic Research, with support from the Centre for Microdata Methods and Practice, December 2–3, 2011, Grand Hyatt Washington, 1000 H Street, NW, Washington, DC. We thank Brent Moulton, John Greenlees, and others attending the CRIW-NBER conference on Improving Measurement of Consumer Expenditures for helpful comments and discussion, and John Sabelhaus for extensive comments and suggestions after the conference. All views expressed in this manuscript are those of the authors and do not necessarily reflect the policies of the Bureau of Economic Analysis, the Bureau of Labor Statistics, or the views of other staff members. The authors take full responsibility for any errors. For acknowledgments, sources of research support, and disclosure of the authors' material financial relationships, if any, please see <http://www.nber.org/chapters/c12659.ack>.

1. For a definition of consumer unit, and the Consumer Expenditure Surveys, see the Bureau of Labor Statistics website at <http://stats.bls.gov/cex/faq.htm#q3>.

Recent studies within the BEA and BLS include those by Garner, McClelland, and Passero (2009); Garner et al. (2006); and McCully (2011). For earlier BLS studies of CE-to-PCE comparisons, see BLS (2008). One of the earliest comparisons by outside researchers was conducted by Houthakker and Taylor (1970). In this work, the authors compared 1960–1961 CE data with PCE aggregate expenditures. Later and more recent related studies, in which CE and PCE are compared, include those by Attanasio, Battistin, and Leicester (2006); Bee, Meyer, and Sullivan (2012); Meyer and Sullivan (2010, 2011); and Slesnick (1992, 1998, 2000). Maki and Garner (2010) conducted a study of CE expenditures relative to PCE; their results suggest that much of the difference in the two is due to measurement error. Barrett, Levell, and Milligan (chapter 9, this volume) also considered a measurement issue in their study of the relationship between declining CE participation rates and declines in CE-to-PCE ratios over time; they compared the US results to those from other countries.² The CE and PCE have also been compared to assess economic growth and other economic trends. For example, Attanasio and Weber (1995) used the data to address the question of whether consumption growth is consistent. Parker and Preston (2005) have studied precautionary savings and consumption. Bosworth, Burtless, and Sabelhaus (1991) have studied the decline in savings, and Fernandez-Villaverde and Krueger (2007) have considered consumption over the life cycle. See Meyer and Sullivan (2009, 2011) for a study of consumption and poverty. Blair (chapter 2, this volume) examined differences in the Consumer Price Index (CPI) expenditure weights based on the CE and the PCE (also see McCully, Moore, and Stewart 2007).

When ratios of CE to PCE aggregate expenditures diverge, many express concern about the quality of the CE data, since the assumption is that both the CE and PCE are designed to measure the same phenomenon, household spending. However, household spending differs for the two. The CE is designed to collect expenditures made by households for goods and services. The PCE is designed to reflect spending by households and by nonprofits on behalf of households. As noted by various researchers (e.g., McCully 2011; Garner, McClelland, and Passero 2009; Bee, Meyer, and Sullivan 2012; Slesnick 1998), some differences in estimates of CE and PCE are expected because of differences in coverage and definition. However, even after accounting for these differences, CE and PCE aggregate expenditures still diverge because of measurement differences. In the first part of this chapter, we try to account for these differences using published CE and PCE data, referring to functional categories of goods and services (e.g., clothing, housing). In the second part, our focus is on building a data concordance at a finer level of detail to develop a series of the most comparable categories of expenditures for the

2. Battistin and Padula (2008) examined the role of measurement errors in distributions of expenditures from the Tucker, Biemer, and Meekins (2005) examined levels of underreporting of expenditures using latent class analysis.

CE and PCE by type of product (i.e., durable, nondurable, service). For the concordance, much attention is given to making adjustments in expenditures so that they are as comparable as possible; this means that the definition of certain categories of expenditures differ from the published estimates (for example, the use of rental equivalence in the concordance versus the use of spending in publication estimates). This concordance is the product of joint work conducted over the past several years by BEA and BLS researchers. Earlier comparisons within the BEA and BLS were based on independently developed CE-to-PCE concordances. The joint concordance was developed using the classification system introduced by the BEA in July 2009, with the goal that the concordance would be acceptable to the BEA and BLS for data comparisons. Results presented at the Conference on Research in Income and Wealth (CRIW) in December 2011 revealed that this jointly created concordance results in CE-to-PCE ratios that are very similar to those produced by the BLS in the past (Passero et al. 2011).

Research that uses the joint concordance to build PCE-adjusted CPI, presented in Blair (chapter 2, this volume), uses a set of alternately weighted indexes created using PCE expenditure weights and CPI methodology. The CE-to-PCE concordance from this paper is used in Blair's work to map PCE items to CPI entry-level items so that the CPI can be adjusted according to PCE rather than CE expenditure levels. Conceptual differences, noted in the concordance, are used in the Blair chapter to create two PCE-weighted CPIs: one that is adjusted to match CE and CPI item definitions and one to match PCE item definitions.

The purpose of this chapter is to present similarities and differences between the CE and PCE and to present results in two ways: first, by making adjustments in published CE and PCE estimates in terms of coverage, definition, and measurement, and second, by redefining expenditure categories and restricting the expenditures to those deemed most comparable. Two questions are addressed: (1) How well does the CE and PCE match up overall and across categories? and (2) How has this relationship changed over time? The CE and PCE data from 1992 to 2010 are analyzed.

Aggregate expenditures, adjusted for differences in coverage, definition, and measurement are presented in table 6.1 for CE and PCE. Without accounting for these differences, published CE total expenditures as a percentage of PCE decreased from 71 percent in 1992 to 57 percent of PCE in 2010. After these adjustments, the aggregate published CE value of comparable items decreased from 75 percent of PCE comparables in 1992 to 62 percent in 2010. Aggregate expenditures and ratios of CE to PCE are produced for durables, nondurables, and services in tables 6.2A, 6.2B, and 6.2C. The CE aggregates in these tables have been adjusted to reduce, at a more detailed level, differences in expenditures with respect to the PCE. Through this exercise, CE aggregate expenditures have been made more comparable to PCE expenditures; CE expenditures are 84 percent of PCE aggregates for 1992 but fall

Table 6.1 Reconciliation of published Consumer Expenditures (CE) and personal consumption expenditures (PCE) (values in billions of dollars)

	1992	2010	Change 1992 to 2010	Percent change		Shares of increase	
				1992 to 2010	CE-PCE disparity	CE-PCE disparity	Measurement differences
Personal consumption expenditures	4,236.9	10,245.5	6,008.6	141.8	—	—	—
Less: Final consumption expenditures of nonprofit institutions	92.3	280.2	187.9	203.4	5.1	—	—
Equals: Household consumption expenditures	4,144.5	9,965.3	5,820.8	140.4	—	—	—
Less: Coverage adjustments	28.6	67.2	38.6	135.2	0.6	—	—
Less: Definitional differences (net)	414.1	1,663.4	1,249.3	301.7	43.3	—	—
PCE not comparable to CE	1,265.3	3,518.5	2,253.2	178.1	53.1	—	—
Expenditures financed by government and employers	535.0	1,630.2	1,095.2	204.7	29.7	—	—
Government social benefits	275.7	1,022.7	747.0	270.9	24.5	—	—
Health	260.4	949.9	689.5	264.8	22.3	—	—
Other	15.3	72.8	57.5	376.0	2.2	—	—
Employer-paid health insurance & workers' compensation	259.3	607.5	348.2	134.3	5.1	—	—
Imputed rental value of owner-occupied housing	468.2	1,215.1	746.8	159.5	15.2	—	—
Financial services and insurance	212.1	560.5	348.4	164.3	7.4	—	—
Financial services	174.7	511.0	336.3	192.5	8.6	—	—
Insurance	37.4	49.5	12.1	32.4	(1.2)	—	—
Net purchases of used motor vehicles	49.4	112.4	63.1	127.7	0.8	—	—
Food produced & consumed on farms	0.6	0.3	(0.3)	(43.5)	(0.0)	—	—
Less: CE not comparable to PCE	851.2	1,855.1	1,003.9	117.9	9.8	—	—
Expenses of owner-occupied housing	349.3	773.2	423.9	121.4	4.6	—	—
Used motor vehicles	80.0	134.9	55.0	68.7	(1.1)	—	—
Finance charges	31.0	35.5	4.6	14.8	(1.3)	—	—
State and local registration and license	8.3	13.5	5.2	62.0	(0.1)	—	—
Cash contributions incl. alimony/child support	95.8	197.8	101.9	106.4	0.5	—	—
Life insurance/annuity premiums	35.3	38.5	3.2	9.1	(1.5)	—	—
Contributions to pensions and Social Security	239.7	612.1	372.3	155.3	7.3	—	—
Medicare premiums	11.8	49.7	37.9	322.0	1.4	—	—

Equals: CE expenditures exclusive of measurement differences	3,701.9	8,234.8	4,532.9	122.4	—
Less: Measurement differences	716.7	2,408.4	1,691.7	236.0	—
Equals: CE total expenditures	2,985.2	5,826.3	2,841.2	95.2	51.1
CE total expenditures percent of PCE	70.5	56.9	(13.6)	(19.3)	—
PCE less CE total expenditures	1,251.7	4,419.2	3,167.5	253.0	—
Measurement differences as percent of total differences	57.3	54.5	(2.8)	(4.8)	—
PCE less CE comparables	716.7	2,408.4	1,691.7	236.0	—
PCE comparable	2,850.7	6,379.6	3,528.9	123.8	—
CE comparable	2,134.0	3,971.2	1,837.2	86.1	—
CE percent of PCE comparables	74.9	62.2	(12.6)	(16.8)	—
PCE-CE differences by functional category					
Food and beverages purchased for off-premises consumption	123.2	298.9	175.7	142.7	10.4
Clothing, footwear, and related services	73.0	172.1	99.1	135.7	5.9
Housing, utilities, and fuels	1.2	44.1	42.9	3,439.1	2.5
Furnishings, household equipment, and routine household maintenance	49.8	175.5	125.6	252.2	7.4
Health (including insurance)	81.1	251.4	170.3	210.0	10.1
Transportation (including insurance)	44.3	226.5	182.2	411.7	10.8
Communications	10.8	49.1	38.3	354.7	2.3
Recreation	140.0	514.5	374.5	267.5	22.1
Education	37.0	77.2	40.3	109.0	2.4
Food services and accommodations	56.4	212.6	156.2	277.0	9.2
Other goods & services	88.2	336.8	248.6	281.7	18.6

Table 6.2A Summary comparison of aggregate Consumer Expenditures (CE) and personal consumption expenditures (PCE), based on 2002 benchmark and restricted to the most comparable categories on the basis of concepts involved and comprehensiveness, 1992 and 2010 (in millions of dollars)

PCE category	1992			2010		
	PCE	CE	CE-to-PCE ratio	PCE	CE	CE-to-PCE ratio
Total durables, nondurables, and services						
Total	4,144,548	2,880,449	0.695	9,965,306	5,740,672	0.576
Comparable items	2,702,984	2,273,606	0.841	6,173,121	4,594,311	0.744
Ratio of comparable items to total	0.652	0.789		0.619	0.800	
Comparable items (adjusted for population)	2,630,940	2,273,606	0.864	6,066,251	4,594,311	0.757
Durable goods						
Total durable goods	508,082	393,010	0.774	1,085,484	594,752	0.548
Comparable durable goods	434,090	357,161	0.823	862,279	536,968	0.623
Ratio of comparable durables to total durables	0.854	0.909		0.794	0.903	
Motor vehicles and parts	204,798	203,566	0.994	340,124	306,545	0.901
Furniture and furnishings	69,274	58,009	0.837	140,960	75,230	0.534
Household appliances	24,287	15,735	0.648	40,536	32,137	0.793
Glassware, tableware, and household utensils	20,050	10,082	0.503	41,545	14,765	0.355
Outdoor equipment and supplies	1,684	413	0.245	4,788	448	0.094
Televisions	10,797	6,433	0.596	37,407	14,379	0.384
Audio equipment	9,847	6,271	0.637	19,019	4,989	0.262
Photographic equipment	2,383	1,379	0.579	2,844	3,072	1.080
Personal computers and peripheral equipment	9,112	7,346	0.806	47,355	24,689	0.521
Sporting equipment, supplies, guns, and ammunition	21,743	10,925	0.502	53,258	14,739	0.277
Bicycles and accessories	2,484	1,592	0.641	4,257	1,868	0.439
Pleasure boats	3,790	6,124	1.616	9,779	8,672	0.887
Other recreational vehicles	6,454	6,018	0.932	9,580	3,755	0.392
Recreational books	11,507	6,051	0.526	30,412	7,118	0.234
Musical instruments	2,186	1,862	0.852	4,939	1,848	0.374
Jewelry and watches	31,645	13,120	0.415	61,485	18,102	0.294
Telephone and facsimile equipment	2,049	2,235	1.091	13,991	4,612	0.330

Table 6.2B Summary comparison of aggregate Consumer Expenditures (CE) and personal consumption expenditures (PCE), based on 2002 benchmark and restricted to the most comparable categories on the basis of concepts involved and comprehensiveness, 1992 and 2010 (in millions of dollars)

PCE category	1992			2010		
	PCE	CE	CE-to-PCE ratio	PCE	CE	CE-to-PCE ratio
Total durables, nondurables, and services						
Total						
Comparable items	4,144,548	2,880,449	0.695	9,965,306	5,740,672	0.576
Ratio of comparable items to total	2,702,984	2,273,606	0.841	6,173,121	4,594,311	0.744
Comparable items (adjusted for population)	0.652	0.789		0.619	0.800	
	2,630,940	2,273,606	0.864	6,066,251	4,594,311	0.757
Nondurable goods						
Total nondurable goods	1,055,187	745,779	0.707	2,301,517	1,432,306	0.622
Comparable nondurable goods	983,314	690,254	0.702	2,154,925	1,349,644	0.626
Ratio of comparable nondurables to total nondurables	0.932	0.926		0.936	0.942	
Food purchased for off-premises consumption	305,188	241,497	0.791	580,641	381,772	0.658
Nonalcoholic beverages purchased for off-premises consumption	49,408	29,498	0.597	78,741	50,312	0.639
Alcoholic beverages purchased for off-premises consumption	49,294	16,511	0.335	106,649	27,473	0.258
Women's and girls' clothing	103,175	68,056	0.660	161,192	80,116	0.497
Men's and boys' clothing	63,009	45,018	0.714	95,480	46,175	0.484
Clothing materials	3,643	1,084	0.298	4,203	1,227	0.292
Shoes and other footwear	32,903	23,124	0.703	59,334	36,679	0.618
Gasoline and other energy goods	125,007	107,384	0.859	354,117	275,726	0.779
Pharmaceutical products	68,196	53,350	0.782	326,869	267,019	0.817
Pets and related products	14,756	10,572	0.716	50,068	39,653	0.792
Film and photographic supplies	3,641	2,006	0.551	2,238	213	0.095
Household cleaning products	20,689	12,861	0.622	41,287	20,676	0.501
Household paper products	16,191	9,933	0.613	40,325	20,331	0.504
Household linens	16,110	7,252	0.450	24,288	9,860	0.406
Sewing items	767	638	0.832	1,213	1,154	0.951
Personal care products	41,370	23,190	0.561	95,239	40,928	0.430
Tobacco	48,008	27,497	0.573	94,357	43,846	0.465
Newspapers and periodicals	21,959	10,783	0.491	38,684	6,484	0.168

Table 6.2C Summary comparison of aggregate Consumer Expenditures (CE) and personal consumption expenditures (PCE), based on 2002 benchmark and restricted to the most comparable categories on the basis of concepts involved and comprehensiveness, 1992 and 2010 (in millions of dollars)

PCE category	1992			2010		
	PCE	CE	CE-to-PCE ratio	PCE	CE	CE-to-PCE ratio
Total durables, nondurables, and services						
Total	4,144,548	2,880,449	0.695	9,965,306	5,740,672	0.576
Comparable items	2,702,984	2,273,606	0.841	6,173,121	4,594,311	0.744
Ratio of comparable items to total	0.652	0.789		0.619	0.800	
Comparable items (adjusted for population)	2,630,940	2,273,606	0.864	6,066,251	4,594,311	0.757
Services—household consumption expenditures						
Total services	2,581,279	1,741,660	0.675	6,578,305	3,713,614	0.565
Comparable services	1,285,580	1,226,191	0.954	3,155,917	2,707,699	0.858
Ratio of comparable services to total services	0.498	0.704		0.480	0.729	
Rent and utilities	300,537	300,378	0.999	668,759	625,584	0.935
Imputed rental of owner-occupied nonfarm housing	462,819	555,877	1.201	1,203,353	1,320,466	1.097
Other motor vehicle services	19,410	18,305	0.943	58,612	35,910	0.613
Audio-video, photographic, and information processing equipment services	42,597	28,425	0.667	102,654	83,783	0.816
Gambling	28,080	5,135	0.183	99,578	9,517	0.096
Veterinary and other services for pets	5,839	5,584	0.956	25,669	18,431	0.718
Purchased meals and beverages	247,054	174,692	0.707	533,078	322,435	0.605
Food supplied to civilians	6,573	2,609	0.397	12,501	3,325	0.266
Communication	79,093	68,262	0.863	223,385	184,529	0.826
Accounting and other business services	7,722	8,957	1.160	27,745	19,068	0.687
Funeral and burial services	10,969	6,711	0.612	18,731	7,451	0.398
Personal care services	35,661	25,273	0.709	95,870	35,037	0.365
Repair and hire of footwear	638	344	0.539	457	187	0.409
Child care	12,013	8,320	0.693	30,309	9,629	0.318
Household maintenance	26,575	17,319	0.652	55,216	32,347	0.586

to 74 percent by 2010. The second analysis reveals that nondurable categories are most alike for the CE and PCE with about 93 percent of total nondurable expenditures identified as comparable within the CE and within the PCE. Regarding trends over time and focusing on comparable goods and services only, CE-to-PCE ratios have steadily decreased. The greatest decline in CE-to-PCE ratios is for durables, with a decrease of 24 percentage points. Ratios for comparable services dropped the least, with a decrease of 10 percentage points.

The next section of the chapter focuses on coverage, definitional, and measurement differences. This is followed by information regarding the motivation for the development of the more detailed concordance, and then further results from the joint concordance. These results are presented in terms of CE-to-PCE ratios and trends in CE and PCE expenditures over time. This is followed by a summary and discussion of future directions.

6.2 Coverage, Definitional, and Measurement Differences

Coverage, definitional, and measurement differences account for the overall differences in the BEA-produced reconciliation of published CE and PCE estimates presented in table 6.1. The CE total expenditures have been consistently lower than PCE, the differences are large, and relative differences have increased substantially over time. Without accounting for these differences, CE total expenditures as a percentage of PCE decreased from 70 percent in 1992 to 58 percent of PCE in 2010. According to results that underlie table 6.1, measurement differences have accounted for more than half of the CE-PCE differences throughout the 1992 to 2010 period, with their share ranging from 53 to 60 percent. The contributions of measurement differences and of coverage and definitional differences to the widening of the CE-PCE gap from 1992 to 2010 have been about equal.

6.2.1 Coverage

The share of CE-PCE differences accounted for by coverage differences decreased from 10 percent in 1992 to 8 percent in 2010. The primary source of coverage differences is the inclusion in PCE of the final consumption expenditures of nonprofit institutions serving households (NPISHs), measured as their gross expenses less sales to households and other sectors. The NPISHs have remained in the range of 2 to 3 percent of PCE throughout the 1992–2010 period.³ The PCE less NPISH final consumption expenditures equals household consumption expenditures (HCE). The NPISH sales to households, such as sales of education services, are included in the appropriate household consumption expenditures (HCE) categories. The remaining coverage differences have been less than 1 percent of PCE, and are accounted

3. This could also be treated as a definitional difference.

for by the net effect of differences in population coverage. The CE survey collects data from consumer units representing the civilian noninstitutional population residing in the United States. This includes those in noninstitutional group quarters, such as housing facilities for students and workers. Included in PCE but not in CE are expenditures of the institutionalized population, domestic military personnel living on post, federal military and civilian personnel stationed abroad regardless of the length of their assignments, and US citizens who are employees of US businesses working abroad for less than one year and whose usual residence is in the United States. Excluded from PCE but included in the CE are expenditures of students, temporary workers, and foreign nationals residing in the United States who are employees of international organizations and other countries. The PCE also includes expenditures by those who died during the year and could not be included in the CE, which asks households for their expenditures in the previous three months or week. The less than 1 percent coverage differences do not include the health care provided to the institutionalized and decedent populations through the Medicare and Medicaid programs. Including these expenditures would increase the population coverage differences to about 3 percent of PCE. Instead, all Medicare and Medicaid expenditures are treated here as definitional differences, part of third-party payments on behalf of individuals in PCE that are not part of CE.

6.2.2 Definitions

Definitional differences are accounted for by the net effect of PCE categories not comparable to CE and CE categories not comparable to PCE. The value of noncomparable PCE categories is significantly larger than for noncomparable CE categories, and relative differences between them have increased significantly over time. In 1992, noncomparable PCE was 50 percent larger than noncomparable CE, and by 2010 was 90 percent larger, at \$3,518.5 billion. The share of noncomparable PCE categories increased from 30 percent to 34 percent of PCE over the 1992 to 2010 period, while noncomparable CE expenditures increased from 29 percent to 32 percent of the CE total over the period.

Exclusive of NPISHs, PCE measures out-of-pocket purchases of goods and services by households, purchases of goods and services made on behalf of households, and imputed purchases by households for some expenditure categories. The CE measures out-of-pocket expenditures by consumer units, including purchases of goods and services, interest payments, contributions to Social Security and pension plans, and cash contributions and other transfers to charitable organizations and other households.⁴ Expenditures in PCE

4. Consumer units as defined in the CE are not identical to households, in that a household can have more than one consumer unit if groups or individuals living in the household are financially independent. The use of consumer units results in differences in average expenditures compared to the use of households, but in comparisons of aggregate expenditures, the use of consumer units versus households does not have any substantive effect.

that have no CE counterpart primarily consist of third-party expenditures by government and employers, imputed expenditures for owner-occupied rent,⁵ and financial services and insurance including both direct and imputed expenditures. Together, these expenditures account for more than 95 percent of noncomparable PCE. Other noncomparable expenditures in the CE include used motor vehicles and the value net of expenses of food produced and consumed on farms.

Purchases of goods and services on behalf of households in PCE consist of purchases by government and employers. Expenditures by government primarily consist of payments for health care under the Medicare and Medicaid programs, but also include other health care expenditures and payments for education and energy assistance. These expenditures have increased very rapidly over time, and in 2010 were \$1,022.7 billion, 271 percent greater than in 1992, and accounted for about one-fourth of the widening of the CE-PCE gap over that time. Purchases by employers consist of employer contributions for health insurance and workers' compensation.⁶ While these are accounted for as part of personal income in the National Income and Product Accounts (NIPA) personal income and outlay account, these contributions are accounted for in PCE as well. Insurance payments for health care are included in the PCE health care categories, and premiums net of health care payments are accounted for in PCE for health insurance.⁷ These accounted for about \$600 billion in expenditures in 2010, but because they have not grown nearly as rapidly as have government third-party expenditures, they accounted for only about 5 percent of the widening of the CE-PCE gap.

Financial services in PCE have no CE counterpart, while insurance is considered noncomparable because of significant differences in treatment compared to the CE.⁸ These services were valued at \$560 billion in 2010, 164 percent more than in 1992, and accounted for 7 percent of the widening of the CE-PCE gap. Over the 1992–2010 period, PCE for financial services increased much more rapidly than insurance and more than accounted for the widening of the CE-PCE gap.

The PCE for financial services includes both imputed services and financial service charges, fees, and commissions. Imputed financial services are services furnished without payment by banks, other depository institutions, and regulated investment companies. For banks and other depository insti-

5. Although the CE program does not employ the rental equivalence concept, the BLS does use CE data to construct weights for owners' equivalent rent in the CPI.

6. Employers also make contributions for life insurance, but because life insurer expenses rather than life insurance premiums are measured in PCE, these are not included.

7. Cash benefits netted from workers' compensation premiums are not captured elsewhere in PCE, and these are accounted for as noncomparable insurance.

8. Noncomparable PCE for financial services removes bank service charges, safe deposit box rental, and credit card membership fees measured in both PCE and the CE. The value of these expenditures is 1 to 2 percent of total PCE for financial services.

tutions, these are services to depositors, and for commercial banks they include borrower services as well. For banks, the imputed charges to depositors are measured using the difference between interest paid on deposit accounts and interest that would have been paid if those assets were invested in riskless government securities. The difference accounts for the value of bank services that are not directly charged to depositors, such as book-keeping and check-clearing services. The value of these services is allocated to households in proportion to their share of deposits. The estimation of borrower services is done in a similar fashion, using the differences between interest earned by banks on loans and other assets and what those assets would have earned if invested in riskless government securities. For other depository institutions, including savings institutions and credit unions, depositor services are measured using the spread between interest earned by the institution and interest paid to depositors. Mutual fund expenses consist of expenses of regulated investment companies, largely portfolio management fees and brokerage commissions, which reduce the value of assets held. These expenses are deemed to be paid by the mutual fund holders, and are allocated to households in proportion to their share of holdings. Also included in PCE for financial services are expenses incurred by pension funds, which are deemed to be paid by households with pension fund assets. In the CE, expenditures for pension funds are measured by contributions. Financial service charges, fees, and commissions consist of fees charged by depository institutions and credit card issuers, commissions on securities transactions, portfolio management and investment advisory services, and trust, fiduciary, and custody activities. Noncomparable fees charged by depository institutions and credit card issuers are primarily penalty fees, such as overdraft fees of banks and over limit and late fees of credit card issuers. Securities commissions include both those charged directly on securities transactions and indirect charges through markups or spreads on transactions by market makers. Investment counseling fees and trust, fiduciary, and custody fees are those charged on individual accounts, and portfolio management fees are those charged on individual accounts and by hedge funds whose investors are individuals.

The PCE for insurance that are not comparable to CE include expenses incurred by life insurance companies, premium supplements on property-casualty insurance, household insurance premiums, cash benefits for property-casualty insurance, and income loss insurance.⁹ Life insurance is measured in PCE by the expenses of life insurance companies in providing life insurance and annuity services, rather than by premiums, and for stock life insurance companies includes profits as well. In the CE, life insurance expenditures are measured by premiums paid. Premium supplements

9. Employer contributions for health insurance and workers' compensation have already been discussed as noncomparable third-party payments and are not considered here.

included in PCE are earnings on technical reserves of property-casualty insurance policies. Household insurance premiums are noncomparable because they include only that portion of homeowners' insurance premiums that cover household contents. Cash benefits for property-casualty insurance are a subtraction from premiums plus premium supplements and have no offset elsewhere in the PCE, unlike benefits for motor vehicle repair and health care. Premiums net of benefits of income loss insurance covering temporary disability are not comparable to CE.

Net purchases of used motor vehicles in PCE measure net purchases from other sectors through dealers and include dealer margins. They do not reflect person-to-person sales and can be alternatively measured as purchases from dealers less trade-ins and sales to dealers. The CE measure of used motor vehicles includes purchases from both dealers and persons and nets out trade-ins to dealers but not sales by persons. Using used motor vehicle sales by persons collected in the CE but not included in published CE total expenditures eliminates comparability differences between CE and PCE.

Owner-occupied housing is treated differently in PCE than in CE publications. In PCE, owner-occupied housing expenditures are defined as a service flow, and a space rental value is imputed to represent the value of that flow.¹⁰ (For the joint concordance, a rental equivalence measure is used for CE housing in order that the CE and PCE are more comparable.) In CE publications, owners' out-of-pocket shelter expenditures are counted, which include mortgage interest and charges, property taxes, and maintenance, repair, insurance, and other expenses. In the NIPAs, these expenses are subtracted from the imputed rental value of owner-occupied housing to derive rental income of persons, a component of personal income. The rental value for owner-occupied housing remained in the range of 11 to 12 percent of total PCE throughout the 1992 to 2010 period, and accounted for about 15 percent of the widening of the CE-PCE gap, though the net effect was about 11 percent, as the contribution of the homeowners' expenses measured in the CE partially offset the PCE contribution. Using the estimated rental value of owner-occupied houses reported in the CE, but not included in CE published total expenditures, eliminates comparability differences. In the comparison of these measures, CE has been consistently higher than PCE.

Noncomparable expenditures in the CE are expenditures other than purchases of goods and services, and purchases that are measured differently than in PCE. Nonpurchases in the CE include interest payments, cash contributions including alimony and child support, contributions for Social Security and pensions, fees for licenses and registrations, and Medicare premiums. Purchases in CE that are treated differently than in PCE include homeowner

10. See Garner and Short (2009) for a description of the PCE method of estimating rental equivalence of owner-occupied dwellings; this description is based on communications with staff at the BEA.

expenses, used car purchases, and insurance. In the NIPAs, nonmortgage interest is included in interest paid by persons, part of personal outlays along with PCE and net private remittances. Mortgage interest is an intermediate expense of homeowners subtracted from rental value in deriving rental income of persons in personal income. Contributions to charitable organizations and other nonhousehold entities in CE are not captured in personal outlays in the NIPAs, but are captured in household outlays in the disaggregated personal sector. Transfers between households, such as alimony and child support payments, are not captured in PCE because they are offsetting among households, since payments by one household are receipts by another household. In the CE, payments are part of expenditures and receipts are part of income. Social Security contributions are treated in the NIPAs as contributions for government social insurance and are not in PCE. Private pension and retirement plan contributions are part of personal saving rather than personal outlays in the NIPAs. Motor vehicle license and registration fees and similar fees imposed by government are not purchases of goods and services, but are treated in the NIPAs as personal current taxes, which are subtracted from personal income to derive disposable personal income. Medicare premiums are paid for enrollment in Medicare Part B medical insurance and Part D prescription drug coverage. These are treated as contributions for government social insurance in the NIPAs and are not part of PCE.

6.2.3 Measurement

After removing coverage and comparability differences, remaining differences between CE and PCE are due to measurement differences for comparable items. Differences are to be expected, because the estimates are based on different sources: surveys of households for CE and reports by businesses that sell goods and services to households for PCE.¹¹ What is noteworthy is that CE expenditures are below PCE by significant amounts, that such differences have been observed consistently across time, that the CE understatement is observed across almost all expenditure categories, and that these differences have increased significantly over time. Based on the BEA reconciliation described above, the aggregate CE value of comparable items decreased from 75 percent of PCE comparables in 1992 to 62 percent in 2010, when the CE comparable value of \$3,971.2 billion was \$2,408.4 billion less than the PCE value of \$6,379.6 billion. Most of the decrease in CE relative to PCE occurred from 1992 to 2003, during which the percentage decreased in 9 of the 11 years to 64 percent, 11 percentage points below its 1992 level. There was a small increase to 66 percent in 2009 before decreasing by 4 percentage points in 2010.

Explanations of the understatement of CE values relative to PCE have centered on the tendency to understatement of expenditures reported by households. Expenditure data reported by households are prone to under-

11. The PCE estimates make very limited use of CE values, accounting for about 0.5 percent of total PCE and 0.9 percent of comparable PCE.

statement because of difficulties in recalling expenditures, the deliberate underreporting or nonreporting of certain types of expenditures such as “sin” commodities (e.g., alcohol, tobacco, gambling), and what is believed to be less than full compliance with the requirements of the diary survey, which asks for the daily recording of expenditures for small, frequently purchased items for two one-week periods. In addition, there may be a tendency to underreport expenditures of household members who are not the interview respondent. The PCE estimates are also subject to error, because of sampling and nonsampling errors in the source data, which come from Census Bureau surveys and censuses and from other public and private sources, as well as in some instances the lack of complete data for deriving estimates.

The understatement of CE expenditures for this exercise is consistent with observed differences, but what is not as clear is why there would be a significant widening of the gap between CE and PCE over time. One possibility is related to the significant decline in the response rate during the period in which the gap widened. The response rate for the CE interview survey declined by from 86 percent in 1990 to 74 percent in 2010. If the decline in the response rate were “randomly distributed” with respect to income and consumption, it would have little effect on measured expenditures. However, if the increased nonresponses were accounted for disproportionately by higher income and consumption households, this could help explain the widening disparities. No direct information bears on this question, but it is clear in breaking down the differences by category that the growth in the gap has varied considerably by commodity. By broad category, the largest contributor to the widening of the disparity between CE and PCE was expenditures for recreation and entertainment, which accounted for 22 percent of the increase in the CE-PCE disparity from 1992 to 2010.¹² Within this category, major contributors were video and audio equipment, computers and peripheral equipment, and gambling. Also contributing significantly to the increased disparity, with contributions of about 10 percent each were food purchased for off-premise consumption, food services and accommodations, health care, and transportation. “Other goods and services,” including personal care, personal items, social services, professional and other services, and tobacco, accounted for about 10 percent of the increased disparity. Clothing, footwear, and related services accounted for about 6 percent of the increased disparity. Together, the cited categories accounted for more than 80 percent of the increase in the CE-PCE disparity.

6.3 Motivation for a Joint CE-to-PCE Concordance

The Bureau of Economic Analysis (BEA) introduced a new classification system for PCE in July 2009 with the 13th comprehensive, or benchmark,

12. The categories used are PCE-functional categories shown in NIPA table 2.5.5, modified in some instances for better CE-PCE alignment.

revision of the National Income and Product Accounts (NIPAs).¹³ The new system is based on the Classification of Individual Consumption According to Purpose (COICOP), a United Nations standard used in many countries. The new PCE classification system included the separation of PCE into household consumption expenditures and final consumption expenditures of nonprofit institutions serving households (NPISHs) and the reclassification of many categories of expenditures, including food and financial services and insurance. With the new system, CE-to-PCE-comparisons would be affected as well as alternative weighting schemes that were based on PCE. This change offered a unique opportunity to review the assignment of CE classification codes, UCCs, and PCE line categories in the underlying detail tables used previously for CE-to-PCE comparisons, and thereby to deconstruct the CE and PCE to assess the general assumption that CE estimates should match PCE estimates both in magnitude and trend.

Over many years, reconciliations of CE and PCE have been produced, but most of these have been the products of BEA and BLS working independently; thus, the assignment of CE and PCE item codes to expenditure categories for CE-to-PCE comparisons lacked the corroboration of the other agency. With the introduction of the new classification system, staff within the BLS and BEA decided to join together to validate the assignment of UCCs for future CE-to-PCE comparisons. The major output from this joint work is the development of a new concordance of CE and PCE expenditure groups that is supported by both the BEA and BLS. A comparison of CE and PCE estimates employing this new concordance is presented in tables 6.2A, 6.2B, and 6.2C. In developing this concordance it was necessary to review the features of both the CE and PCE. These are outlined in the next section and are presented with regard to the work conducted by the BEA to reconcile the published CE and PCE regarding coverage, definitions, and measurement.

6.4 Joint CE-to-PCE Concordance

The new classification system for PCE introduced in 2009 forced BLS to revise the concordance it had established between UCCs and PCE line categories in BEA underlying detail tables that had been used to produce tables comparing aggregate estimates between the two sources. This too provided an opportunity for the BEA and BLS to develop a joint concordance. One of the features of the CE-PCE comparison tables is to show aggregate estimates for all expenditure categories and for comparable categories.

The new concordance reflects the addition of UCCs and the deletion of UCCs from previous concordances. In addition, approximately seventy UCCs exist whose expenditures should be allocated between PCE categories.

13. See Kunze and McCulla (2008), McCully and Payson (2009), and McCully and Teensma (2008).

Allocation proportions have been estimated for some of these UCCs and are reflected in the results presented in this chapter. More research is needed to determine the appropriate proportions for the remaining UCCs, and going forward, the frequency with which all these UCCs should be adjusted in producing a time series of comparison tables. Examples of comparables and noncomparables are presented below (see table 6.3).

The impact of this new joint concordance on CE and PCE estimates can be seen by examining tables 6.2A, 6.2B, and 6.2C, which show results for 1992 and 2010. Overall results are shown in each table with table 6.2A including those for durables, table 6.2B those for nondurables, and table 6.2C those for services. Overall, CE-to-PCE-ratios decreased from 70 percent to 58 percent for all goods and services; the ratios for comparables from 84 to 74 percent. The largest decrease was for comparable durables with a 1992 CE-to-PCE ratio of 82 percent followed by a CE-to-PCE ratio of 62 percent for 2010. Among the largest declines in CE-to-PCE ratios in the durables category are for furniture and furnishings, sporting equipment and supplies, and jewelry and watches. Increases in the ratios are present for household appliances and photographic equipment; thus, there appears to be better reporting of expenditures in the CE for these by 2010 compared to 1992.

Aggregate CE expenditures as a share of PCE expenditures fell also for nondurables. Comparable CE nondurables represented about 70 percent of PCE expenditures in 1992 compared to 63 percent by 2010. Some of the most important declines are for food purchased for off-premises consumption, alcoholic and nonalcoholic beverages for off-premises consumption, apparel, tobacco, and newspapers and periodicals. On the other hand, CE-to-PCE-ratios increased from 1992 to 2010 for pharmaceutical products and pets and related products.

Aggregate comparable CE and PCE service expenditures are the most similar in magnitude of the three categories of expenditures. For this analysis, reported rental equivalence from the CE is used rather than the shelter expenditures for owners; shelter expenditures are used in section 6.2 for the comparison of published CE aggregates to PCE aggregates. Aggregate expenditures for comparable CE services in 1992 accounted for 95 percent of PCE aggregates. However, by 2010 the ratio falls to 86 percent; the CE-to-PCE ratio is still high, but falling. The CE and PCE services that are most comparable also have comparable aggregate expenditures; these include rents and utilities and imputed rents of owner-occupied nonfarm housing. Among the CE aggregate expenditures that have decreased over time relative to PCE expenditures are those for gambling, veterinary and other services for pets, purchased meals and beverages, and personal care services. Increases in CE-to-PCE expenditures, based on ratios, have resulted for services related to audio-video, photographic, and information processing.

A major factor affecting the analysis of these results over the 1992–2010 period is the sharp drop in CE-to-PCE ratios that occurred between 2009

Table 6.3 Examples of Consumer Expenditure Survey and personal consumption expenditures (PCE); Categories by comparability

UCC description	PCE title	Notes/comments
Mattress and springs	Furniture	CE and PCE comparable
Other bedroom furniture	Furniture	CE and PCE comparable
Sofas	Furniture	CE and PCE comparable
Refrigerators, freezers (owned home)	Major household appliances	PCE comparable with CE estimate adjusted to account for movable appliances included with new homes
Washing machines (owned home)	Major household appliances	PCE comparable with CE estimate adjusted to account for movable appliances included with new homes
Tenant's insurance	Net household insurance	CE and PCE not comparable. Measured as premiums plus premium supplements less expected (normal) losses.
School books/supplies & equip. for elementary/high school	Stationery and miscellaneous printed materials	CE and PCE not comparable. Contains items that can be assigned to four other PCE categories. Candidate for allocation in the future.

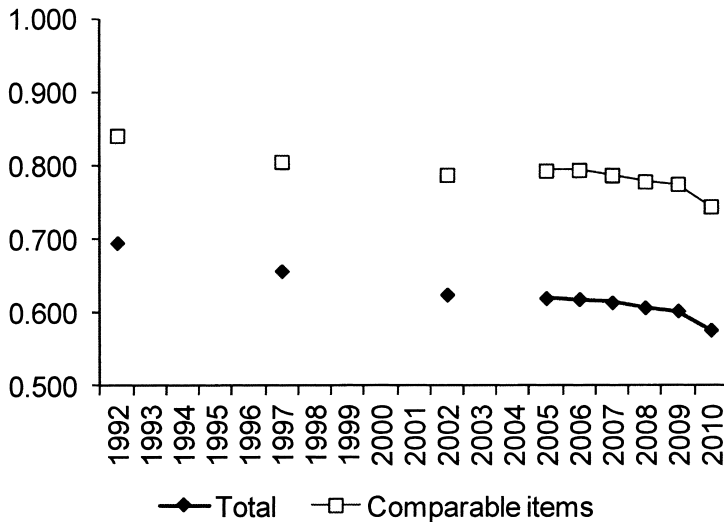


Fig. 6.1 Ratios of CE to PCE by year: Total

and 2010. The CE shows a drop in total expenditures from 2009 to 2010 of about \$33 billion, while PCE shows an increase of over \$379 billion. Based on recent history, there is reason to believe the PCE estimates for 2010 may be revised, leading to a change in the CE-to-PCE ratios.

The PCE data are typically revised as updated source data are received by the BEA. The 2010 PCE estimates used in the comparison came from the underlying detail table (table 2.4.5U from the BEA website) as of August 29, 2011. Based on that table, the total durables, nondurables, and services estimate was \$9.965 trillion. When the 2010 PCE data were first reported in the February 2011 *Survey of Current Business*, the estimate was \$10.086 trillion, about \$120 billion higher than the August estimate.

If one looks at the course of PCE estimates for 2009, the first PCE estimate for total durables, nondurables, and services reported in the February 2010 *Survey of Current Business* was \$9.827 trillion, a decline of about \$24 billion from 2008. This estimate then declined as of March 1, 2010, to \$9.823 trillion, on August 3, 2010, the estimate had dropped to \$9.742 trillion, and on October 28, 2011, it had fallen to \$9.586 trillion, the estimate used in deriving these ratios. In addition, these revisions increased the drop in PCE estimates between 2008 and 2009 from \$24 billion to \$165 billion.

Figures 6.1, 6.2, 6.3, and 6.4 show the trends in CE-to-PCE ratios from 1992 to 2010. Ratios for all goods and services and those that are comparable based on the joint concordance are presented. The declines in CE-to-PCE expenditures are clearly visible in these. The ratios for nondurables are the most level over the time period (figure 6.4).

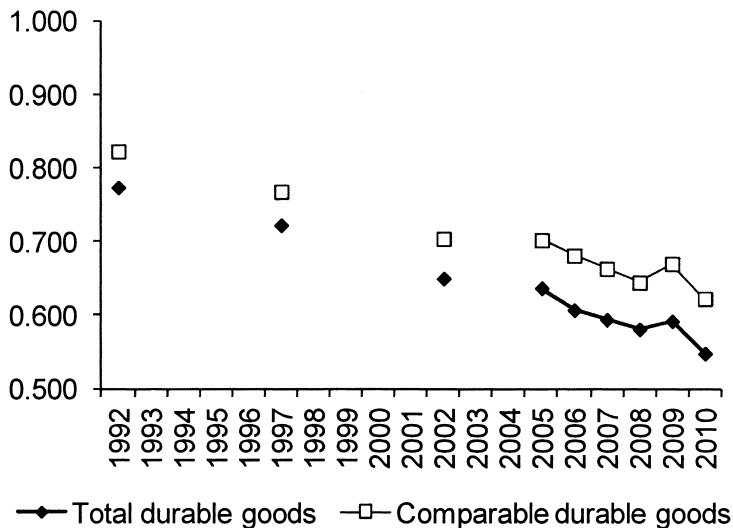


Fig. 6.2 Ratios of CE to PCE by year: Durables

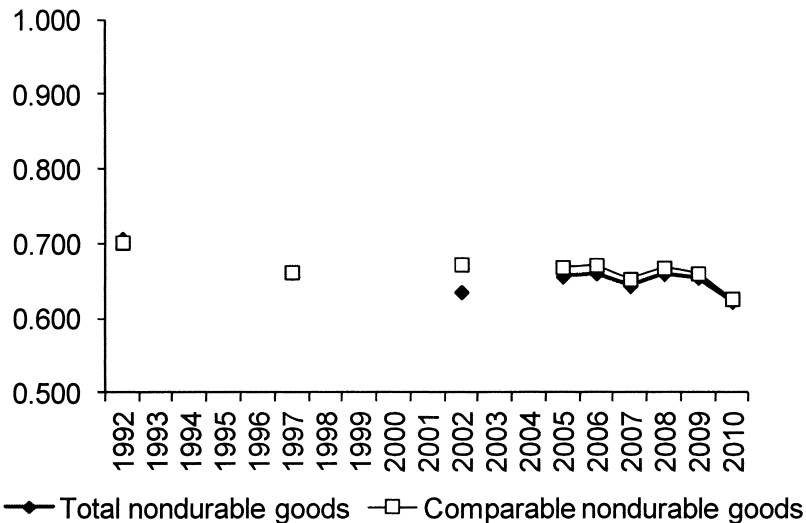


Fig. 6.3 Ratios of CE to PCE by year: Nondurables

6.5 Summary and Future Directions

The joint CE and PCE concordance, developed recently by staff within the BEA and BLS, results in a comparison of CE and PCE aggregates that are more meaningful than concordances used in the past. Results show declines in CE survey expenditures compared to PCE aggregates, even while accounting

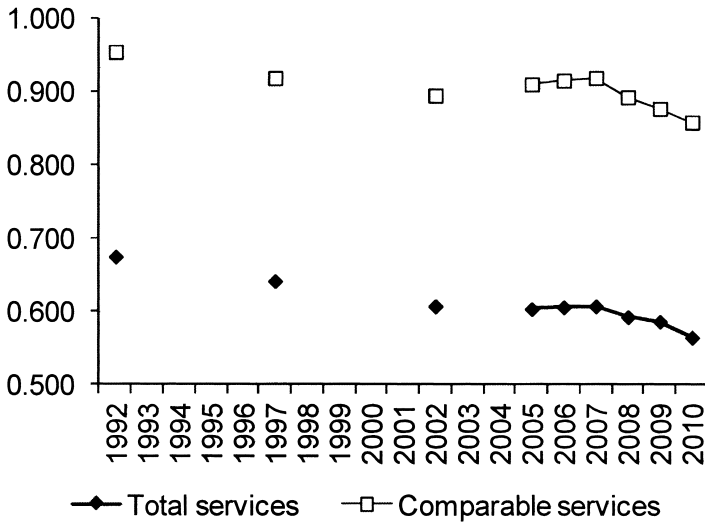


Fig. 6.4 Ratios of CE to PCE by year: Services

for comparability. The good news is that CE-to-PCE ratios for nondurables are fairly consistent over time. The bad news is that expenditures for durables are diverging at a greater rate each year, though this assumes PCE estimates will not undergo future revisions. While services have been made more similar through the concordance, the trend in CE expenditures, relative to PCE, is declining.

Future research, focused on the PCE, includes delving into the decision-making process to allocate expenditures to PCE and examining in detail the quality of the underlying data. Within the BLS, attention to allocations of expenditures across PCE categories and methods to increase data quality will continue. Although the BLS program that produces the CE is noted for the quality of its customer outreach, planning tools and its willingness to assess its products critically, studies conducted inside and outside of the BLS indicate that underreporting remains a problem for some categories of expenditures. Updated comparisons with the PCE indicate that expenditures as measured in the CE are still less than similar expenditures in the PCE. The CE program is actively working to address underreporting problems. For example, the underreporting problem with income essentially was solved through the use of imputation (see Passero 2009). Other research on methods to reduce underreporting and nonresponse is discussed in Goldenberg and Ryan (2009), Fricker, Kopp, and To (chapter 12, this volume), and in documents available on the BLS Gemini website.¹⁴

14. Bureau of Labor Statistics, Gemini Project website, <http://stats.bls.gov/cex/geminiproject.htm>.

References

- Attanasio, Orazio P., Erich Battistin, and Andrew Leicester. 2006. "From Micro to Macro, from Poor to Rich: Consumption and Income in the UK and the US." Paper presented at National Poverty Center conference "Consumption, Income, and the Well-Being of Families and Children," Washington, DC, April 20.
- Attanasio, Orazio P., and Guglielmo Weber. 1995. "Is Consumption Growth Consistent with Intertemporal Optimization? Evidence from the Consumer Expenditure Survey." *Journal of Political Economy* 103 (6): 1121–57.
- Battistin, Erich, and Mario Padula. 2008. "Errors in Survey Reports of Consumption Expenditures." http://www.cide.info/conf/2009/iceee2009_submission_174.pdf.
- Bee, Adam, Bruce D. Meyer, and James X. Sullivan. 2012. "Micro and Macro Validation of the Consumer Expenditure Survey." http://harrisschool.uchicago.edu/faculty/articles/Bee_Meyer_Sullivan_March2012.pdf.
- Bosworth, Barry, Gary Burtless, and John Sabelhaus. 1991. "The Decline in Saving: Evidence from Household Surveys." *Brookings Papers on Economic Activity* 1991 (1): 183–241.
- Bureau of Labor Statistics. 2008. "Consumer Expenditure Survey Compared with Personal Consumption Expenditures." *Consumer Expenditure Survey, 2004–2005*, Report 1008, 6–11. October.
- Fernandez-Villaverde, Jesus, and Dirk Krueger. 2007. "Consumption over the Life Cycle: Facts from Consumer Expenditure Survey Data." *Review of Economics and Statistics* 89:552–65.
- Garner, Thesia I., George Janini, William Passero, Laura Paszkiewicz, and Mark Vendemia. 2006. "The CE and the PCE: A Comparison." *Monthly Labor Review* 129 (9): 20–46. <http://stats.bls.gov/opub/mlr/2006/09/art3full.pdf>.
- Garner, Thesia I., Robert McClelland, and William Passero. 2009. "Strengths and Weaknesses of the Consumer Expenditure Survey from a BLS Perspective." Paper presented at the NBER Summer Institute, Conference on Research on Income and Wealth, July. http://www.bls.gov/cex/pce_compare_199207.pdf.
- Garner, Thesia I., and Kathleen Short. 2009. "Accounting for Owner-Occupied Dwelling Services: Aggregates and Distributions." *Journal of Housing Economics* 18 (3): 233–48.
- Goldenberg, Karen, and Jay Ryan. 2009. "Evolution and Change in the Consumer Expenditure Surveys: Adapting Methodologies to Meet Changing Needs." National Bureau of Economic Research, Conference on Research in Income and Wealth, Summer Institute 2009, Cambridge Massachusetts, July 13–14.
- Houthakker, Henrik S., and Lester D. Taylor. 1970. *Consumer Demand in the United States: Analyses and Projections*, 2nd ed. Cambridge, MA: Harvard University Press.
- Kunze, Kurt, and Stephanie H. McCulla. 2008. "Preview of Revised NIPA Estimates for 2002: Effects of Incorporating the 2002 Benchmark I-O Accounts Proposed Definition and Statistical Changes." *Survey of Current Business* March:10–17.
- Maki, Atsushi, and Thesia I. Garner. 2010. "Estimation of the Misreporting Models Using Micro-Data Sets Derived from the Consumer Expenditure Survey: The Gap between Macro and Micro Economic Statistics on Consumer Durables." *Journal of Mathematical Sciences: Advances and Applications* 4:123–52.
- McCully, Clinton. 2011. "Trends in Consumer Spending and Personal Saving, 1959–2009." *Survey of Current Business* 91 (6): 14.
- McCully, Clinton P., Brian C. Moore, and Kenneth J. Stewart. 2007. "A Reconciliation between the Consumer Price Index and the Personal Consumption Expendi-

- tures Price Index.” Bureau of Economic Analysis, Washington, DC. http://www.bea.gov/papers/pdf/cpi_pce.pdf.
- McCully, Clinton P., and Steven Payson. 2009. “Preview of the 2009 Comprehensive Revision of the NIPAs: Statistical Changes.” *Survey of Current Business* May:6–16.
- McCully, Clinton P., and Teresita D. Teensma. 2008. “Preview of the 2009 Comprehensive Revision of the National Income and Product Accounts: New Classifications for Personal Consumption Expenditures.” *Survey of Current Business* May:6–17.
- Meyer, Bruce D., and James X. Sullivan. 2009. “Five Decades of Consumption and Income Poverty.” NBER Working Paper no. 14827, Cambridge, MA.
- . 2010. “Consumption and Income Inequality in the US since the 1960s.” Working Paper, University of Notre Dame.
- Meyer, Bruce D., and James X. Sullivan. 2011. “Viewpoint: Further Results on Measuring the Well-Being of the Poor Using Income and Consumption.” *Canadian Journal of Economics* 44 (1): 52–87.
- Parker, Jonathan A., and Bruce Preston. 2005. “Precautionary Saving and Consumption Fluctuations.” *American Economic Review* 95 (4): 1119–43.
- Passero, William. 2009. “The Impact of Income Imputation in the Consumer Expenditure Survey.” *Monthly Labor Review* 132 (8): 25–42. <http://stats.bls.gov/opub/mlr/2009/08/art3full.pdf>.
- Passero, William, Thesia I. Garner, Clinton McCully, and Caitlin Blair. 2011. “Understanding the Relationship: CE Survey, the CPI, and PCE.” Presentation at the conference on Improving the Measurement of Consumer Expenditures, Washington, DC, December 2–3.
- Slesnick, Daniel T. 1992. “Aggregate Consumption and Saving in the Postwar United States.” *Review of Economics and Statistics* 74 (4): 585–97.
- . 1998. “Are Our Data Relevant to the Theory? The Case of Aggregate Consumption.” *Journal of Business and Economic Statistics* 16 (1): 52–61.
- . 2000. *Consumption and Social Welfare: Living Standards and their Distribution in the United States*. Cambridge: Cambridge University Press.
- Tucker, Clyde, Paul Biemer, and Brian Meekins. 2005. “Estimating the Level of Underreporting of Expenditures among Expenditure Reporters: A Micro-Level Latent Class Analysis.” American Statistical Association, 2005 Proceedings of the Section on Survey Research Methods, Washington, DC.