

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

**Federal Economic Statistics Advisory Committee Meeting
Bureau of Labor Statistics
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Outline

- ◆ Overview
- ◆ Recent Developments
- ◆ Current/Future Research
- ◆ Data Comparisons

Overview of the Consumer Expenditure Survey

- ◆ The CE produces annual information on the buying habits of consumers living in the US; including data on their expenditures, income, and socio-demographic characteristics.

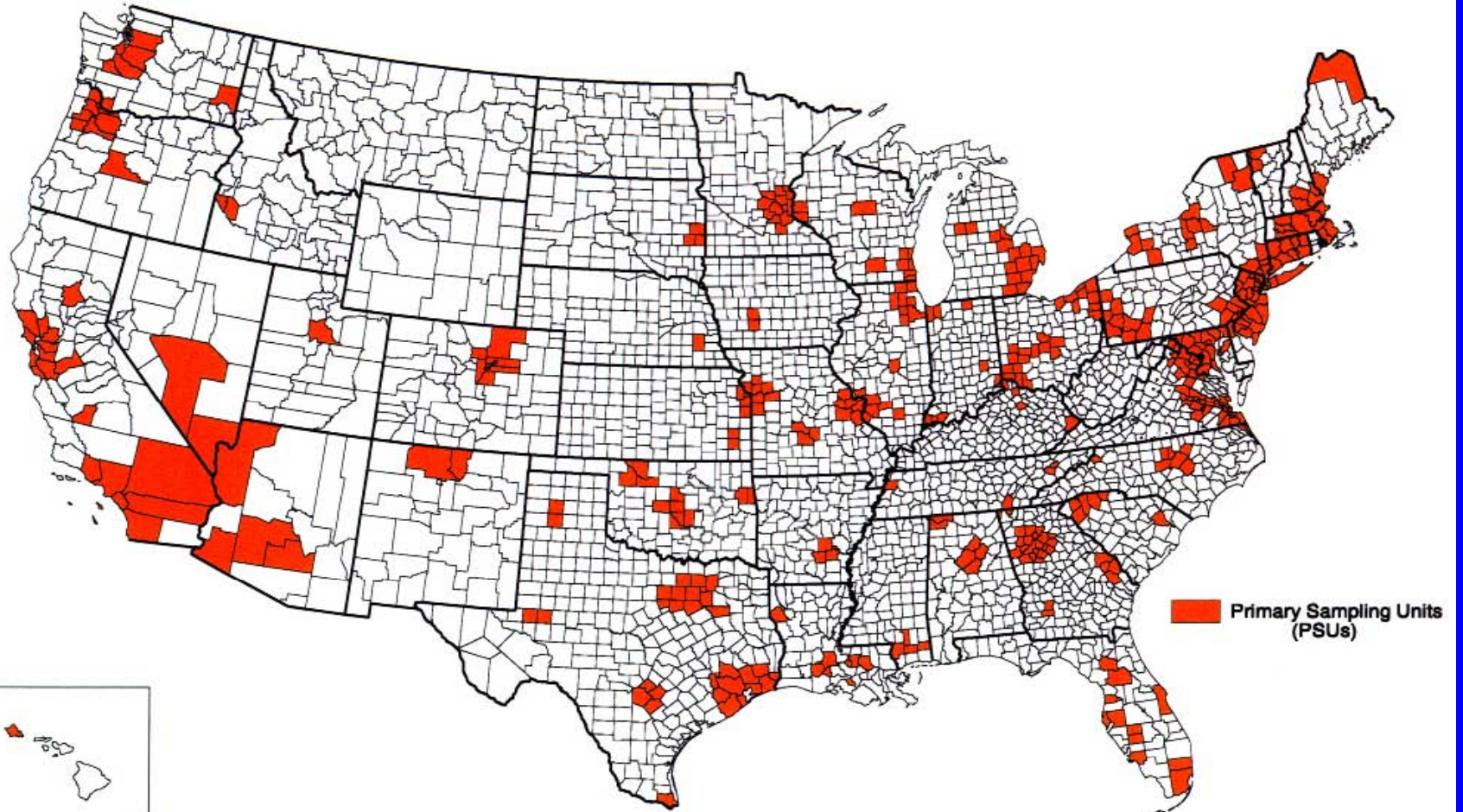
Sample Size

- ◆ The data are collected in independent quarterly Interview and weekly Diary surveys.
- ◆ Interview Survey information is obtained from approximately 7,500 households (5,000 prior to 1999) each quarter.
- ◆ Diary Survey information is collected from an annual sample of another 7,500 households who each fill out two weekly diaries.
- ◆ This is an effective annual sample size for publication purposes of 30,000 cases for Interview and 15,000 cases for Diary.

Population Coverage

- ◆ The survey uses a national probability sample based on decennial census data augmented by new construction permits.
- ◆ The survey targets the total urban and rural noninstitutionalized US population (also excluding those living on military bases).

SAMPLE PSUs FOR THE CONSUMER EXPENDITURE SURVEYS 1990 Design



Prepared by the Geography Division

U.S. Department of Commerce Economics and Statistics Administration Bureau of the Census

Issues we need to consider when improving data quality:

- ◆ Respondent burden and confidentiality
- ◆ Consumer non-response
 - Recall
 - Non-response to specific questions
 - Proxi reporting
- ◆ Uses and Customers
- ◆ Cost

Recent Developments

Introduction of income brackets - 2002.

Introduction of the Computer Assisted Personal Interview instrument – April 2003.

Redesign of the Diary Instrument with implementation scheduled for January 2004.

Ongoing Work

- ◆ Comparison of CE and PCE aggregate expenditures
- ◆ Global vs. detailed questions
- ◆ AC Nielsen research – household scanner data
- ◆ Future Diary research and a study of individual member spending
- ◆ Issues of income non-response

Primary Interest in PCE

- ◆ Used for source selection for integrated published data (Diary or Interview)
- ◆ Publish comparisons in biennial publications
- ◆ Monitor consistency of results
- ◆ Help identify areas where CE data collection and methods might be improved by understanding the differences

Comparing CE Expenditure Estimates with Data from Other Sources

Focus:

Personal Consumption Expenditures
of the National Income and Product
Accounts

Data Comparisons

- ◆ **Health Care Financing Administration**
 - **National Health Expenditures**
- ◆ **Department of Energy**
 - **Residential Energy Consumption Survey**
 - **Residential Transportation Energy Consumption Survey**
- ◆ **Progressive Grocer/Supermarket Business**
- ◆ **Health Care Quality and Research Agency**
 - **Medical Expenditure Panel Survey (Household)**
- ◆ **Bureau of Economic Analysis (BEA)**
 - **Personal Consumption Expenditures (PCE)**

Since the Start of the Ongoing CE...

“What was expected from these comparisons was a sense of degree and direction of possible survey errors, rather than an exact measure of bias, because the specific estimates from other sources are not necessarily the ‘true’ values”

(Gieseeman 1987, p. 9)

PCE: Primary Source of Independent Data for Comparison Over Time

- ◆ Used for source selection for integrated published data (Diary or Interview)
- ◆ Publish comparisons in biennial publications
- ◆ Monitor consistency of results
- ◆ Help identify areas where CE data collection and methods might be improved

CE and PCE Compared

- ◆ Current methodology (Gieseeman 1987; Branch 1994; CE bulletins and reports beginning in 1990)
 - Type by expenditure (food, apparel, housing, etc.)
 - Trends over time in ratios
 - » 1984-2000

- ◆ Re-examination and evaluation (April 2000 to present)
 - Type by product (durables, non-durables, services)
 - CE and PCE aggregates and ratios
 - » 1992, 1997, 2000
 - Concerns and issues
 - Detailed example: Apparel

Major Findings from Re-evaluation

- After adjustments for comparability, CE/PCE ratio
 - » 0.89 for 1992 (vs. 0.66 unadjusted)
 - » 0.80 for 1997 and 2000 (vs. 0.64 and 0.60 unadjusted)
- Rental value of dwellings and new autos CE expenditure aggregates greater than PCE
- For most other items, CE aggregates lower than PCE and ratios decreasing over time
- Explanations
 - » some can be explained
 - » others need more work to understand

Making Comparisons: Issues to Consider

- ◆ Populations
- ◆ Expenditures (publication vs. “comparable”)
 - Underlying conceptual framework (scope)
 - Definition
- ◆ Sources of data
 - Censuses
 - Surveys
 - Administrative records
 - Trade association publications
- ◆ Periodicity
 - Collection, reference, production

Populations

◆ CE: *consumer units and persons*

- Civilian non-institutional population and some institutional
- Continental U.S., Alaska, and Hawaii
- Urban and Rural

Numbers of persons 2.1% less than represented by PCE

◆ PCE: *persons resident*

- Individuals
 - » Persons resident in U.S. and those who physically located in U.S. and have resided, or expect to reside in U.S. for 1 year or more
 - » Employees of U.S. businesses abroad for 1 year or less
 - » U.S. government civilian and military personnel stationed abroad regardless of time
- Nonprofit institutions serving individuals

Definition: CE Publication

- ◆ What consumers spend: transaction costs including excise and sales taxes of goods and services acquired during reference period
 - Primarily out-of-pocket expenditures (OOP) reported by consumers plus value of in-kind food and rent as pay, and food stamps
- ◆ In scope for CE, out of scope for PCE
 - Transactions between households (includes person to person sales such as for used vehicles, apparel, etc.)
 - Life and personal insurance, and pensions

Definition: PCE

- ◆ Value of goods and services purchased by the personal sector (excludes intra-sector transactions) including excise and sales taxes
 - Spent by individuals
 - Operating expenses of nonprofit institutions serving individuals
 - Value of food, fuel, clothing, rent of dwellings, and financial services received in kind by individuals; and net purchases of used goods

- ◆ In scope for PCE, out of scope for CE publication
 - Rental value of owner occupied dwellings and owned appliances
 - Value of home production for own consumption on farms
 - Standard clothing issued to military
 - Services furnished without payment by financial intermediaries except life insurance carriers

Scope/Definition

- ◆ Partly Out Of Scope For CE / Partly Defined Quite Differently
 - Medicare Care Expenditures
 - Religious and Welfare

- ◆ Defined Quite Differently
 - Education Expenditures
 - Life and Personal Insurance and Pension Plans
 - Owner-Occupied Housing Expenditures

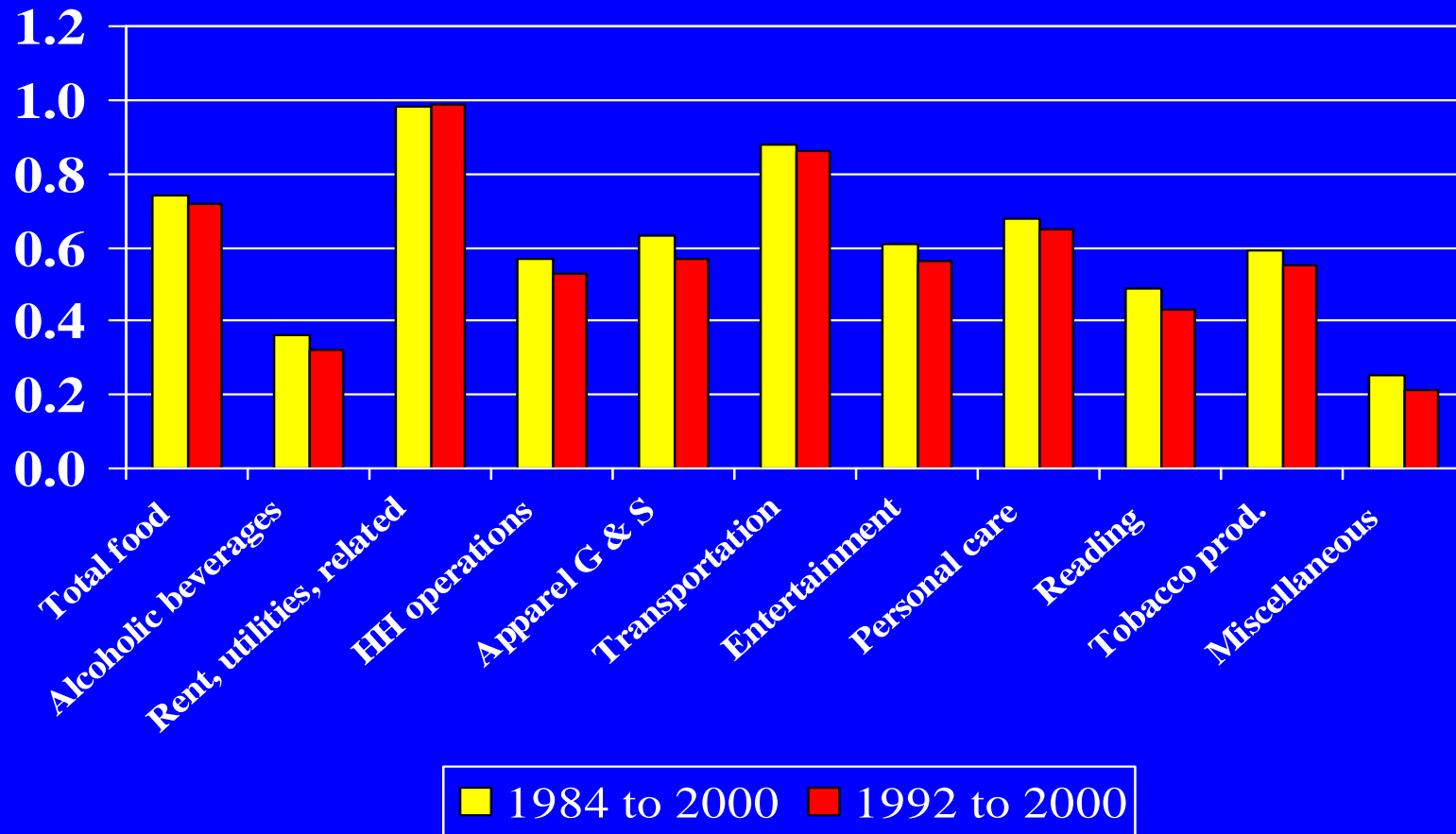
Data Sources and Periodicity

- ◆ CE: direct
 - Household Surveys
 - » Interview
 - » Diary
 - Periodicity
 - » Annual
 - » Quarterly
 - » Monthly
 - » Weekly
 - Sampling and non-sampling errors
 - Imputation/allocation
- ◆ PCE: indirect (commodity flow; mostly residual)
 - Sources
 - » Government statistical reports
 - » Government administrative and regulatory agency reports
 - » Reports from private organizations
 - » CE (motor vehicle leasing and rental, taxis, nursery schools, child care)
 - Periodicity
 - » 5-year Benchmark (detailed)
 - » Annual
 - » Quarterly
 - » Monthly
 - Interpolation/extrapolation
 - Expert judgment
 - Revisions

Current Methodology: CE to PCE Published Ratios

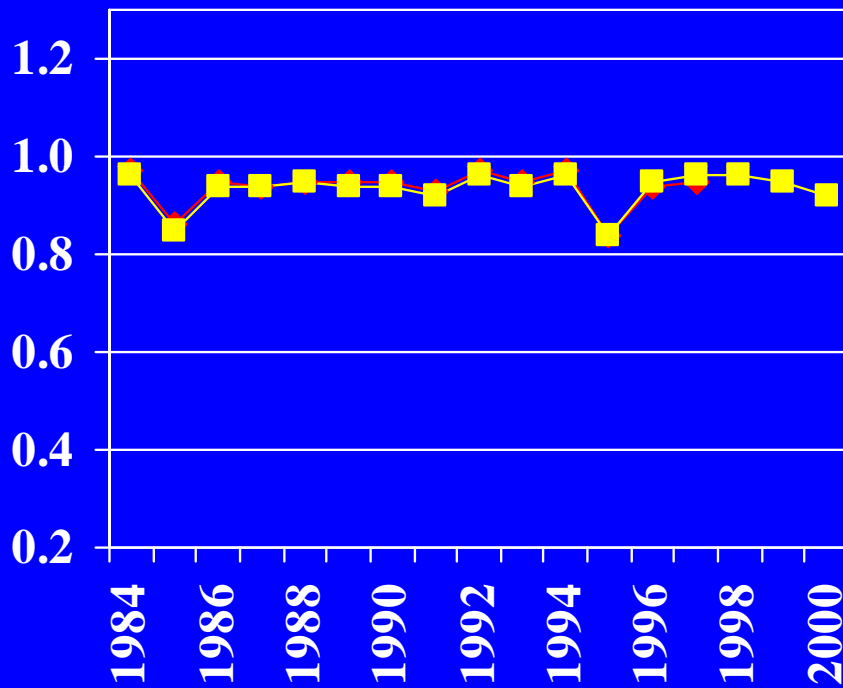
- ◆ Classification scheme:
 - *Type by expenditure*
 - *CE into PCE*
- ◆ Benchmark: *1992 PCE*
- ◆ Categories: *selected*
- ◆ Years: *1984 to 2000*

CE to PCE Ratios: Averages Over Time

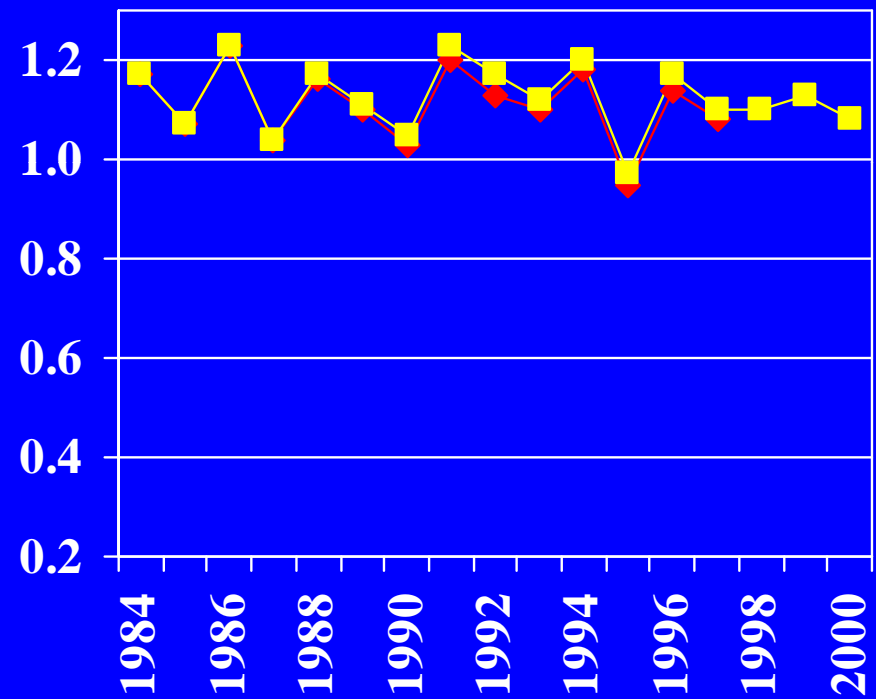


Stable, Higher Ratios

Rent, Utilities, and Public Services



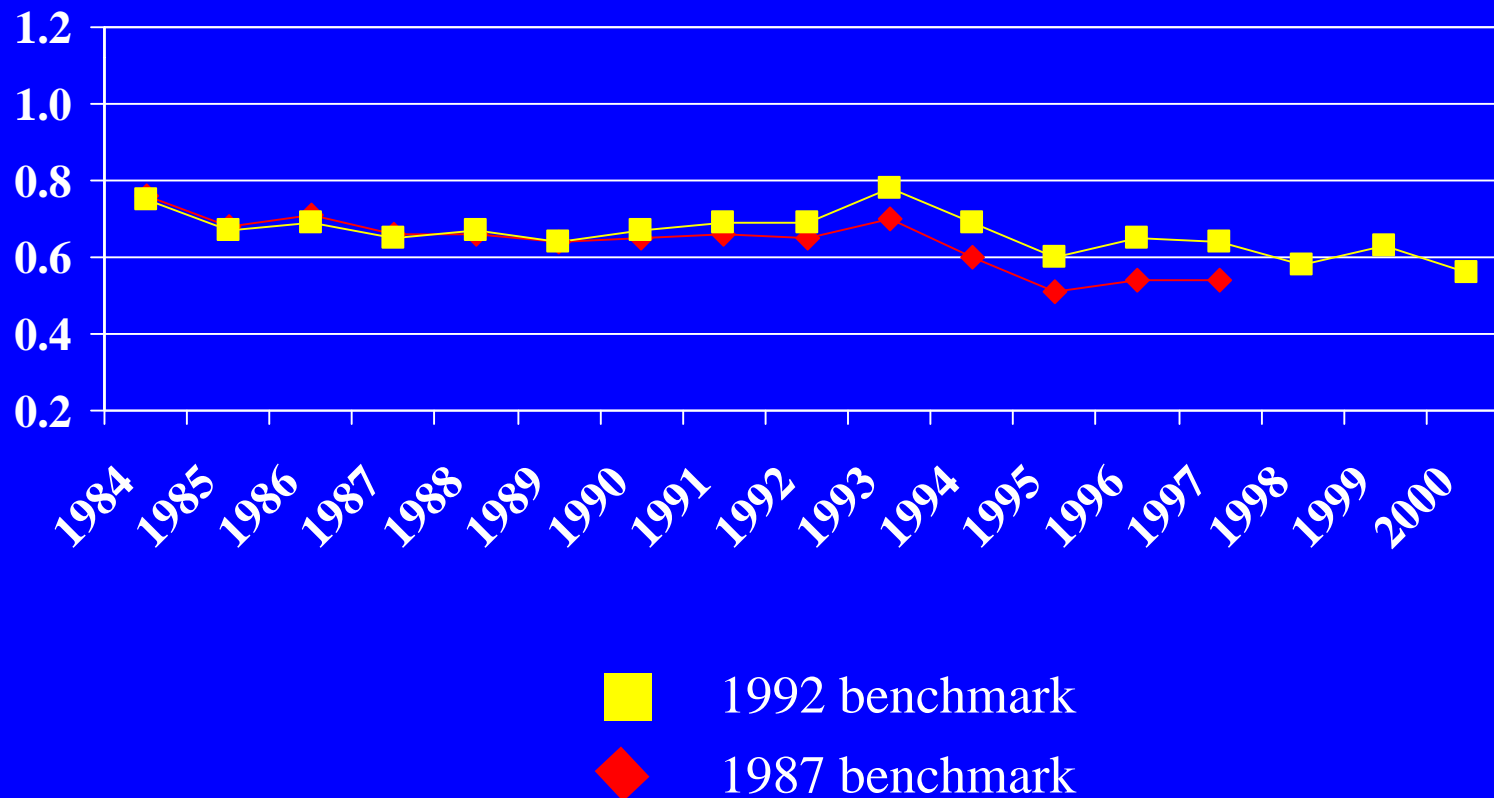
Vehicle Purchases



■ 1992 benchmark
◆ 1987 benchmark

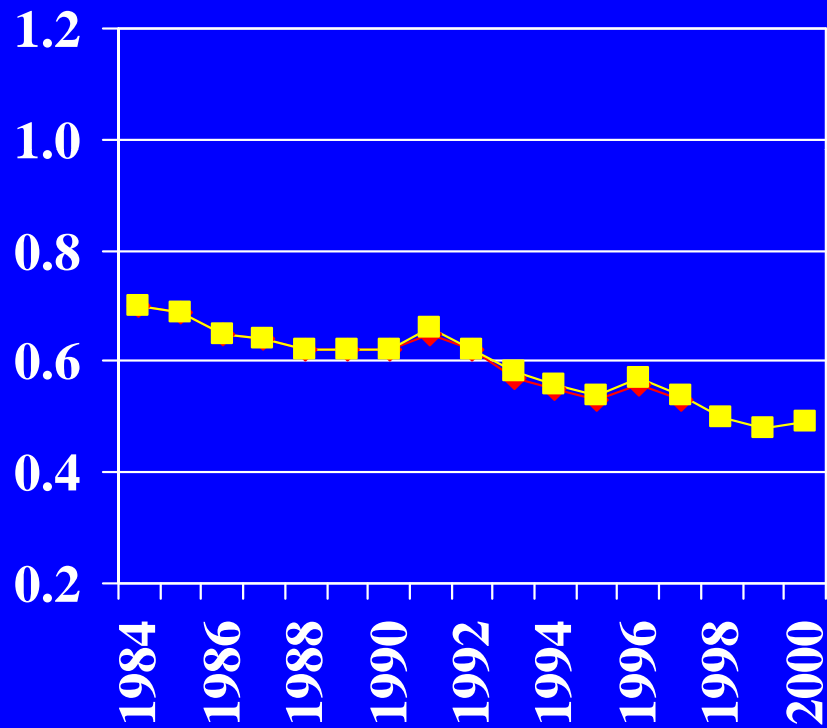
Stable/Decreasing, Mid Ratio

Entertainment
Televisions, Radios, Sound Equipment

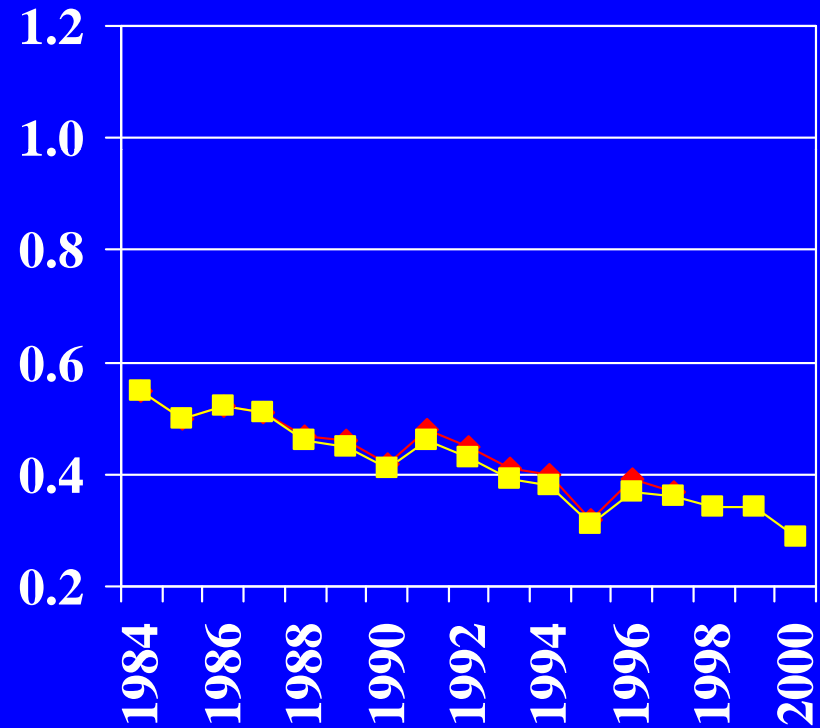


Decreasing, Lower Ratios

Apparel and Services



Other Apparel P & S



■ 1992 benchmark
◆ 1987 benchmark

Others Have Been Watching and Using...

- ◆ Economic Growth
 - Slesnick (1992, 1998)
 - Triplett (1997)
- ◆ Consumption based measure of poverty
 - GAO (1996) report on Slesnick (1993)
- ◆ CE in the production of the CPI
 - Fixler and Jaditz (2002)
 - Johnson and Greenlees (2003)
 - Lebow and Rudd (2003)
 - National Research Council (2002)

Calls for Further Examination with Caution...

- ◆ Slesnick (1992)
 - *remaining differences “is a mystery that can only be resolved by future investigation.”*
 - *“...suggest caution is in order before one assigns full blame ... to underreporting in the CEX.”* [due to magnitude of PCE revisions]
- ◆ Triplett (1997)
 - *“...individual components of PCE and CE have been studied too little to permit conclusions about which is better ...”*
- ◆ GAO report (1996) referring to 1994 BEA study
 - *“...more than half [of the differences in the aggregate expenditures] was traceable to coverage and definitional differences, with the remainder due to statistical differences.”*

Call For Further Examination

◆ National Research Council (2002)

- *“On the basis of available evidence, it is unclear whether the PCE or CEX weights are superior...It is an open question as to how accurately expenditure categories can be mapped from the PCE to CEX. We are not in a position to advocate one set of weights over the other, but the question certainly warrants further investigation”*

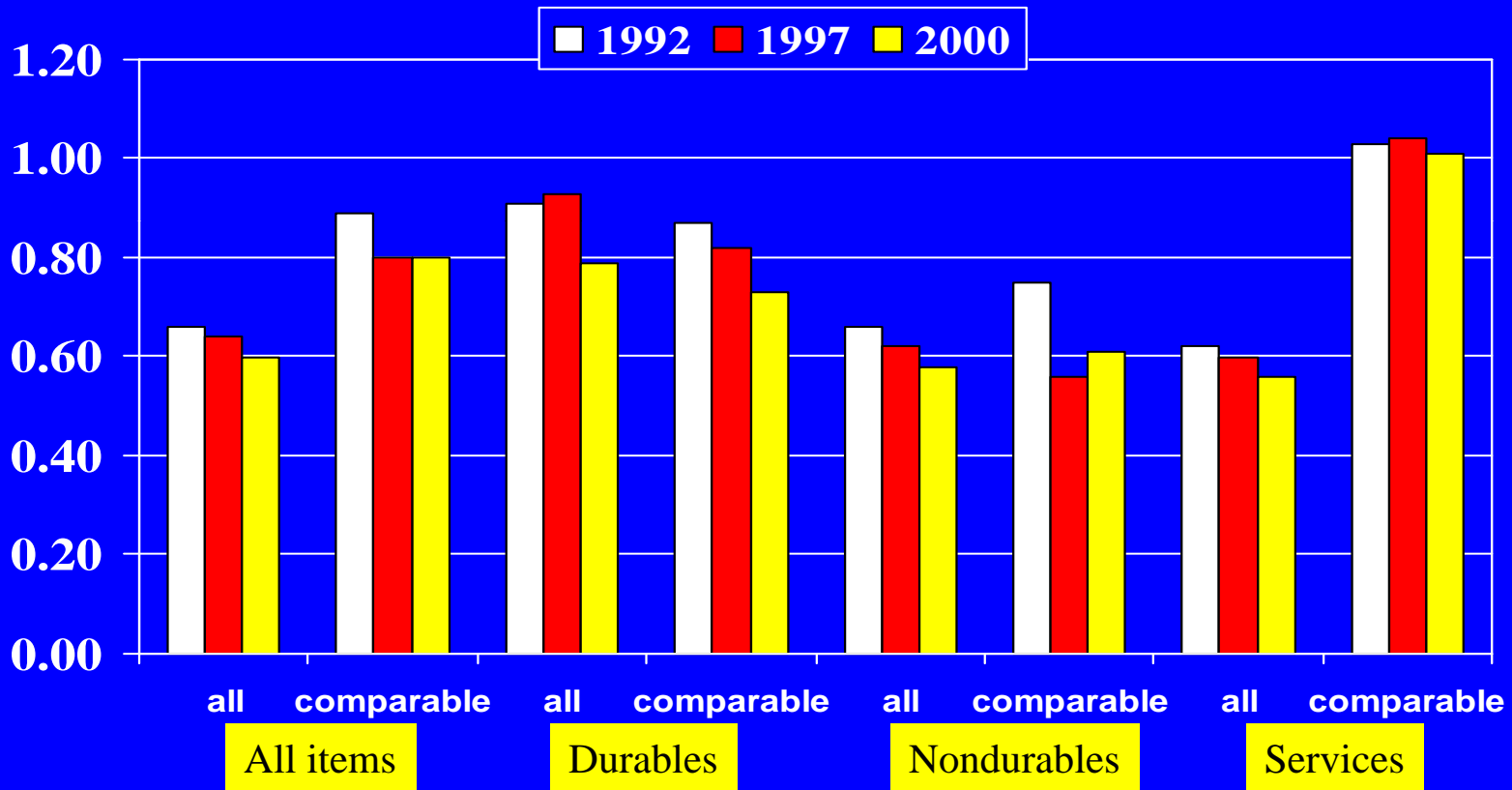
But then go on to say...

- *“The panel concluded that it is likely that the CEX estimates of consumer expenditure shares are biased, perhaps seriously.”*

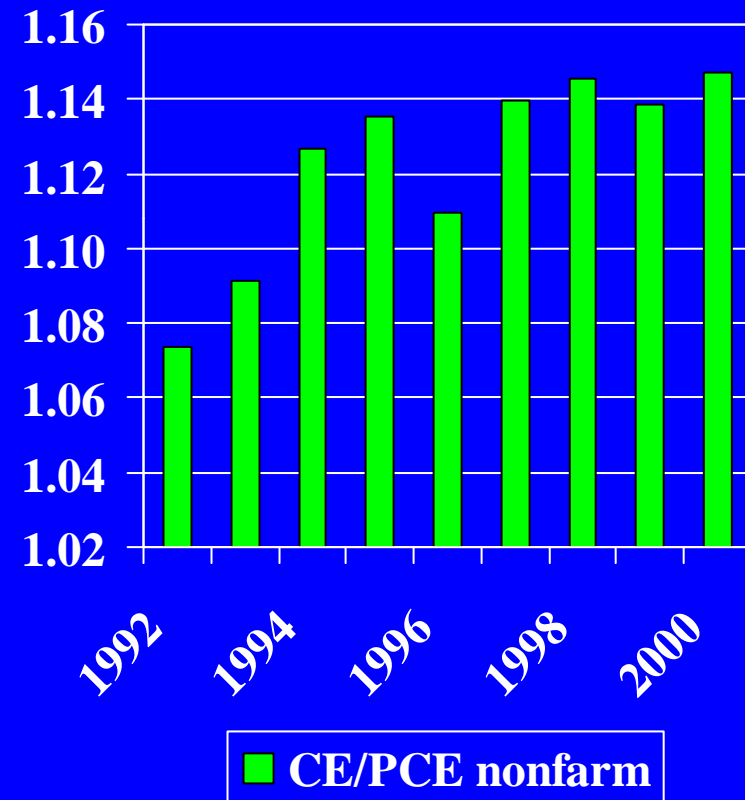
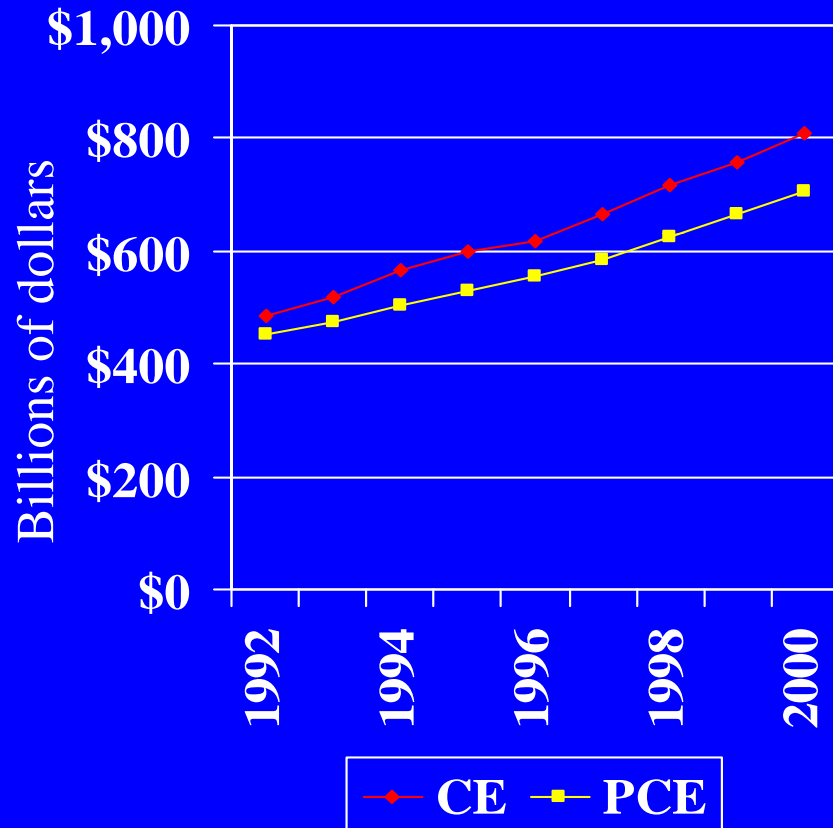
Re-examination

- ◆ Classification:
 - Type by product (durables, non-durables, services)
 - CE into PCE
 - PCE Bridge to 1992 Input-Output Table
- ◆ Benchmark: 1992
- ◆ Categories
 - All
 - Redefined “comparable”
 - » e.g., drop used vehicles; include owned dwellings
- ◆ Years: 1992, 1997, 2000

CE Integrated/Personal Consumption Expenditures Ratios: Comparables



Comparable Non-farm Owner-Occupied Dwellings



With adjustment for the implicit rental value of appliances

CE to PCE Aggregate Expenditures

	1992 (billions)	1992 (billions)	1992 (billions)
Total CE	\$2,788	\$3,553	\$4,020
Total PCE	\$4,210	\$5,529	\$6,728
% Total	66%	64%	60%
Total CE Comparable	\$2,107	\$2,490	\$2,982
Total PCE Comparable	\$2,369	\$3,117	\$3,723
% Comparable	89%	80%	80%
<i>CE Comparable as % of CE Total</i>	<i>76%</i>	<i>70%</i>	<i>74%</i>
<i>PCE Comparable as % of PCE Total</i>	<i>56%</i>	<i>56%</i>	<i>55%</i>

Issues to Consider: CE vs. PCE

- ◆ Populations differ
- ◆ Expenditures: concept / scope, definition
- ◆ Collection / Sources of data
- ◆ Sources of error
 - CE
 - » Measurement errors associated with surveys
 - » Processing imputation / allocation
 - PCE
 - » Expert judgment
 - » Interpolation / extrapolation
 - » Measurement errors associated with surveys (non-benchmark)
- ◆ PCE revisions

Analytical Example

1992 Expenditures for Apparel
in the CE and PCE

Rationale for Year and Expenditure Category

◆ Why 1992?

- Data represent latest benchmark year at time of study
- Benchmark data are available at finer level of item detail

◆ Why apparel?

- The difference between aggregate CE and PCE estimates is relatively large
- The trend in the ratio of CE to PCE estimates has demonstrated a continuous decline over time

Expenditures for apparel, total and by major item category, 1992 CE and PCE

Item category	Annual expenditures (<i>millions of dollars</i>)		
CE Total Men's & boys' apparel Women's & girls' apparel Apparel for children under 2 Footwear	\$143,970	 \$45,018 68,056 7,772 23,124	
PCE Total Clothing for males Clothing for females Clothing for infants Shoes		\$212,259	 \$63,645 107,474 8,237 32,903

Derivation of CE Estimates

- ◆ Diary survey is the source for about 63 percent of aggregate apparel expenditures, while the Interview survey accounts for the remaining 37 percent
- ◆ Individual expenditure reports originate in three ways.
 - Directly reported by respondent
 - Allocation of expenditures where respondent reports expenditure for a combination of items
 - Imputation of expenditures where respondent acknowledges purchase, but does not provide value

Derivation of PCE Estimates

- ◆ Process uses data created for preparation of input-output accounts for U. S.
- ◆ The benchmark purchasers' value of goods and services is calculated to determine allocable output.
- ◆ Total purchasers' value is allocated among intermediate and end users.

Amount of value added to total apparel estimate by factor, 1992 PCE

Factor	Value added <i>(millions of dollars)</i>	
Total	\$238,843	
Basic value		\$119,114
Wholesale margin		21,286
Transportation cost		3,369
Wholesale taxes		163
Retail margin		84,860
Retail taxes		10,051

Production and allocation of apparel, 1992 I/O Accounts *(millions of dollars)*

Production	Basic value	Whole. margin	Trans. cost	Comm & whole. taxes	Retail margin	Retail taxes	Purchasers' value
Shipments 65,605							
Adjustments:							
Secondary production 103							
Nonemployer receipts 394							
Filer misreporting receipts 68							
Nonemployer misreporting receipts 35 600							
Adjusted shipments 66,205							
Handling charges of mail order houses and mailing of gifts 174							
Allocable shipments	66,379	21,286	3,369	163	84,860	10,051	186,108
Imports 51,778							
Adjustments:							
Census re-exports -183							
NIPA territorial adj. to imports 1,140							
Allocable imports	52,735						52,735
Allocable shipments & imports	119,114	21,286	3,369	163	84,860	10,051	238,843

Production and allocation of apparel, 1992 I/O Accounts – cont. (millions of dollars)

Allocation of Production	Basic value	Whole. margin	Trans. cost	Comm & whole. taxes	Retail margin	Retail taxes	Purchasers' value
Exports	5,422	1,257	356	2			7,037
Intermediate production	4,934	3,609	1,937	27			10,507
Government purchases & sales – Federal	625	111	17	1			754
Government purchases & sales – State & local	1,607	295	53	4			1,959
Change in intermediate goods inventories	44	11	9	1			65
Unspecified costs	1,768	253	27	2			2,050
Change in wholesale inventories	841	148	28	3			1,020
Change in retail inventories	3,260	460	36	4			3,760
Gross private fixed investment	-337	151	54	6			-126
Unallocated output	290	35	18	2			345

Production and allocation of apparel, 1992 I/O

Accounts – cont. (millions of dollars)

Allocation of Production	Basic value	Whole. margin	Trans. cost	Comm & whole. taxes	Retail margin	Retail taxes	Purchasers' value
PCE Clocks, Lamps & Artwork	45	0	0	0	1	0	46
PCE Sporting Equipment	3	1	0	0	2	0	6
PCE Vehicle Accessories & Parts	-65	-54	-29	0	0	0	-148
PCE Jewelry & Watches	-765	0	0	0	0	0	-765
PCE Lighting Supplies	47	17	6	1	43	6	120
PCE Other Personal Hygiene Products	43	15	5	1	30	3	97
PCE Food in Off-Premise Food Purchases	-721	0	0	0	0	0	-721
PCE Magazines	-295	0	0	0	0	0	-295
PCE Laundry & Garment Repair	562	0	0	9	0	0	571
PCE Semi-durable Housefurnishings	22	7	2	0	15	2	48
PCE Military Clothing	205	25	0	0	0	0	230
PCE Sewing Goods for Men	10	4	1	0	9	1	25
<i>PCE Apparel</i>	101,570	14,941	849	100	84,760	10,039	212,259
	119,115	21,286	3,369	163	84,860	10,051	238,844

Evaluation of CE and PCE Estimates

- ◆ Standard errors and confidence intervals
- ◆ Expert judgment
- ◆ Content difference in component categories

Standard error and 95% confidence interval for total apparel expenditures, 1992 CE

Item	Value <i>(millions of dollars)</i>
Total apparel	\$143,970
Standard error	\$4,598
95% confidence intervals	
Upper limit	\$152,982
Lower limit	\$134,958

Quality identifier in PCE

- ◆ Since PCE is compiled from numerous sources, calculating standard errors and confidence intervals is not feasible.
- ◆ The basic value for each transaction contributing to PCE is assigned a quality ID of 1, 2, or 3, in decreasing order of quality or level of confidence.

Quality identifier in PCE – cont.

- ◆ Quality ID of 1 - basic value taken directly from data source, such as published table in Census of Manufactures
- ◆ Quality ID of 2 - misreporting adjustments and estimates of non-employer receipts from IRS data
- ◆ Quality ID of 3 - secondary production adjustments and handling charges for catalog and mail-order houses
- ◆ Ninety-eight percent of basic value for apparel derived from Quality ID 1 transactions

Expert Judgment

- ◆ Data adjustment in CE
 - Allocation procedures
 - Imputation procedures

- ◆ Trade margin calculation in PCE
 - Wholesale
 - Retail

Impact of data adjustment procedures on apparel estimates, 1992 CE *(millions of dollars)*

Item	Total expenditure	Allocated expenditure	% Allocated	Imputed expenditure*	% Imputed*
Total apparel	\$143,970	\$21,022	14.6%	\$172	0.1%
Men's & boys'	45,018	7,901	17.6%	53	0.2%
Women's & girls'	68,056	9,412	13.8%	105	0.2%
Children under 2	7,772	1,092	14.1%	15	0.2%
Footwear	23,124	2,617	11.3%	0	0.0%

* Imputed expenditures include both strictly imputed and imputed and allocated expenditures

Calculation of Wholesale Trade Margin in PCE Estimates

- ◆ Initial margin estimate is computed for wholesalers whose primary business is apparel.
 - Total sales receipts and the cost of purchases of apparel are obtained from Census of Wholesale Trade (CWT).
 - Misreporting adjustments are made to sales receipts and the cost of purchases from IRS and other data.
 - Changes in the value of inventories held at beginning and end of year are added from CWT and Annual Trade Survey.

Calculation of Wholesale Trade Margin in PCE Estimates – cont.

- ◆ Margin estimate for wholesalers whose primary business is apparel is adjusted to account for two factors.
 - These wholesalers may also trade in other businesses.
 - Wholesalers whose primary business is not apparel may also have apparel operations.
- ◆ CWT data do not distinguish between apparel and non-apparel operations in either case.

Calculation of Wholesale Trade Margin in PCE Estimates – cont.

- ◆ A harmonization procedure is used based on sales receipt data which is available for all businesses engaged in apparel trade.
 - Trade margin rate (wholesale trade margin / sales receipts) is calculated for wholesalers whose primary business is apparel.
 - The trade margin rate is applied to apparel sales receipts of all wholesalers of apparel.
 - Trade margin rates for other commodities handled by apparel wholesalers are computed.
 - These rates are applied to non-apparel sales receipts of apparel wholesalers.

Calculation of Wholesale Trade Margin in PCE Estimates – cont.

- ◆ *Ideally*, the trade margin generated by applying these rates to commodity lines handled by apparel wholesalers – the trade margin derived by evaluating purchases, costs, and inventory adjustments.
- ◆ *In practice*, the trade margins are not equal, so adjustments are made to the margin rates for commodity lines and kinds of businesses until the margins are harmonized.

Calculation of Wholesale Trade Margin in PCE Estimates – cont.

- ◆ Effect of this harmonization procedure
 - Margin based on purchases, costs and inventory adjustments is \$17,341 million
 - Harmonized margin calculated by harmonization procedure is \$21,286 million
 - Procedure results in 22.7% increase in apparel margin.

Examples of content differences in component categories of apparel

- ◆ PCE includes athletic footwear for participant sports in apparel. CE includes such footwear in recreation expenditures. (Currently we cannot isolate these expenditures in either PCE or CE to make an adjustment to the aggregates.)
- ◆ PCE includes boot and shoe cut stock and findings in apparel. CE does not include such a category in apparel. It is likely such expenditures are included in shoe repair services.

Examples of content differences in component categories of apparel - cont.

- ◆ PCE includes umbrellas in apparel. CE can assign umbrellas to apparel if reported as clothing accessory, to outdoor equipment if reported as patio umbrella, or to general sports equipment if reported as golf umbrella.

Summary of Evaluation

- ◆ Differential between 1992 CE and PCE estimates - \$68 billion
 - If true CE estimate at upper end of confidence interval - \$9 billion
 - If true PCE wholesale and retail trade margins were based on the lower of pre- and post-harmonized estimates - \$2.8 billion
 - Though we have no estimates of effects, it is unlikely that BLS allocation/imputation procedures or differences in the content of component categories has appreciable impact on expenditure differential
- ◆ Remaining differential - approx. \$56 billion
- ◆ Change in ratio of CE-PCE apparel estimates - 68% → 73%

Questions for FESAC Committee

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