

**Disaggregation of Personal Consumption
Expenditures: Extending the Input-Output
Accounts**

By

William Edmondson

And

Ken Hanson

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Introduction

The purpose of this paper is to describe a method and stimulate a discussion about, a new procedure for using Consumer Expenditure Survey to disaggregate Personal Consumption Expenditures in U.S. Input-Output accounts. The Input-Output accounts are at the core of many economic models used for policy analysis. The methodology used in this paper enhances and expands those models usefulness. A natural extension of the data would be to disaggregate personal consumption expenditures (pce) into household categories distinguished by various socio-demographic and income characteristics. In the United States, the Consumer Expenditure Survey (CES) gives us the detailed data needed to make estimations of household consumption functions. Unfortunately the input-output pce accounts and the CES expenditure categories are not strictly conformable. Reconciling these data accounts is a formidable and imperfect task. Under such circumstances it is important to develop acceptable procedures for using CES data in conjunction with and to enhance the published standard U.S. Department of Commerce, Bureau of Economic Analysis (BEA), Input-Output accounts.

Background

Personal Consumption Expenditures in an input-output framework are usually part of the exogenous final demands of the accounting system. PCE categories are estimated by two methods. The direct method i.e., gasoline and oil purchases by persons are based on unit sales and average prices. Or the commodity flow method which involves seven steps which include identifying commodities purchased by persons or businesses for investment, estimating the total output of such commodities, adding imports and trade margins which in effect converts the unit value of this supply into purchasers prices, excising the exports included in the output, adjusting for inventory change, and finally, deleting any government purchases of commodities.

PCE estimates are a component of the National Income and Product Accounts (NIPA) which are the official measure of the nation's Gross Domestic Product. PCE estimates of aggregate expenditures represent the market value of goods and services to all persons. The BEA conducts comprehensive revisions to the NIPA at approximately 5-year intervals to incorporate changes from the U.S. Census and the Benchmark Input-Output Accounts.

As its name implies, most CES expenditure estimates are obtained by direct household survey data. The CE Survey consists of two components--the Diary survey and the Interview survey. For the Diary survey, respondents complete a diary of expenses for two consecutive 1-week periods. The Diary survey is designed to obtain data on frequently purchased items, such as food or housekeeping supplies that respondents are less likely to recall over time. For the Interview survey, respondents report data to an interviewer. Respondents are interviewed five times over an 18 month time period--once every 3 months. This survey is designed to collect data on major items of expense, such as property purchases or vehicle purchases that respondents recall for 3 months or longer.

For the researchers looking for an annual measure (the most useful in an input-output framework) of consumption, the surveys must be combined to get a true level. Because there is a three-month lag, researchers must also be mindful of the need to combine quarterly observations across two years in order to get an accurate calendar year expenditure estimate.

The U.S. Department of Labor, Bureau of Labor Statistics (BLS), collects and publishes the results of the CE Survey. BLS also publishes an annual table: Table 8., Comparison of aggregate expenditures for selected expenditure categories: Consumer Expenditure (CE) Survey and Personal Consumption Expenditures, which gives an annual ratio of CE to PCE expenditures in the most conformable categories. The ratios in past tables indicate that for the major categories of consumption, CES estimates are lower than PCE. This ratio has remained generally constant over time. Two categories, which stand out on the comparison table, are, Alcoholic beverages and Vehicle purchases. Alcoholic beverages because the CE to PCE ratio is only .37 in 1997 and vehicle purchases because it is the only category in

which the CE to PCE ratio is greater than 1. Although it is not this simplistic, considering the differences in estimation methodology and given the populations tendency to underestimate that spent on alcohol and over estimate the actual value of ones car, this may not be surprising.

Text table 8. Comparison of aggregate expenditures for selected expenditure categories: Consumer Expenditure (CE) Survey and

Personal Consumption Expenditures (PCE), 1994-97

Expenditure category	Consumer Expenditure Survey (in billions)				Ratio of CE to PCE			
	1994	1995	1996	1997	1994	1995	1996	1997
Food, total	\$ 437	\$ 450	\$ 475	\$ 491	0.73	0.73	0.75	0.75
Food at home	272	283	294	298	.71	.73	.73	.72
Food away from home ¹	165	167	181	194	.76	.75	.79	.82
Alcoholic beverages	28	28	32	33	.35	.34	.37	.37
Rent, utilities, and public services ²	358	357	382	398	.97	.92	.94	.95
Rented dwellings, total	205	204	218	229	1.00	.94	.95	.96
Utilities, fuels, and public services	153	153	164	169	.94	.91	.93	.95
Telephone	71	73	81	85	.85	.83	.83	.82
Household operations ³	26	25	27	29	.81	.73	.76	.78
Household supplies	36	38	41	42	.48	.49	.51	.50
Household furnishings and equipment	140	149	145	163	.66	.66	.60	.63
Apparel and services	168	176	184	184	.55	.56	.55	.53
Men and boys	40	44	44	43	.56	.59	.56	.52
Women and girls	67	68	75	72	.58	.58	.62	.57
Children under 2	8	8	9	8	.52	.50	.49	.43
Footwear	26	29	31	33	.72	.77	.81	.83
Other apparel products and services	28	27	26	28	.40	.38	.33	.35
Transportation	477	461	516	518	.89	.81	.86	.83
Vehicle purchases ⁴	246	226	258	250	1.14	1.01	1.12	1.06
Gasoline and motor oil	101	104	113	116	.94	.92	.92	.94
Other vehicle expenses	95	98	103	114	.60	.56	.54	.56
Maintenance and repairs, total	69	68	67	71	.56	.52	.48	.50
Vehicle rental and other charges	26	30	35	42	.72	.71	.68	.70
Public transportation :	36	34	42	39	.67	.60	.72	.60
Entertainment	155	161	178	185	.57	.55	.57	.56
Fees and admissions	45	45	48	50	.68	.61	.62	.61
Televisions, radios, sound equipment	57	58	61	65	.60	.56	.56	.57
Pets, toys, and playground equipment	30	33	35	34	.59	.63	.61	.57
Other entertainment supplies, equipment	23	25	34	36	.39	.38	.49	.47
Personal care products and services	41	42	53	56	.60	.58	.72	.71
Reading	22	22	23	24	.49	.45	.44	.44
Tobacco products and smoking supplies	26	28	27	28	.56	.57	.53	.54
Miscellaneous ⁵	37	36	40	42	.25	.23	.23	.23

¹Excludes school lunches and meals as pay.

²Includes rent for tenant-occupied dwelling units and lodging away from home and at school. Rent in the CE is contract rent, which includes utilities for some renters. The CE covers direct costs of utilities and fuels by homeowners and renters. In PCE, data are for space rent,

which excludes charges for utilities. PCE data cover total expenditures for utilities and fuels, even if paid by landlords.

³Excludes amounts for baby-sitting, daycare centers, and care of invalids or the elderly.

⁴PCE estimates are derived, using estimates of dealer margin and wholesale value of net transactions between persons and government, foreigners, and non-dealer businesses. CE data on vehicle purchases and trade-ins were combined to approximate total value of new

vehicle purchases. CE data on used vehicle purchases, trade-ins, sales, and losses were combined to approximate the value of net transactions of used vehicles.

⁵Includes vehicle rentals, maintenance and repairs, and other vehicle charges. The estimates exclude aircraft rentals, vehicle licenses, vehicle inspection, and vehicle registration.

gCE estimates exclude expenditures for other properties.

NOTE: Sums may not equal totals, due to rounding. Expenditure estimates for home ownership, insurance, capital improvements, health care, finance charges, education, and cash contributions are excluded from comparisons.

SOURCE: PCE estimates are shown in U.S. Department of Commerce, Bureau of Economic Analysis, "National Income and Product

Accounts;" Survey of Current *Business*, August 1998. Detailed PCE estimates used in comparisons are from unpublished annual PCE data as of November 1998.

Consumer Expenditure Survey, 1996-97

According to the General Accounting Office (GAO) 1996 publication, “Alternative Poverty Measures,” GAO/GGD-96-183r, “Differences between estimates of consumer spending in the PCE and CEX [CES] data cannot be fully reconciled”, and “BEA’s analysis showed that of the \$1,151.7 billion difference in 1992 between the PCE and CEX measures of consumer spending more than half was traceable to coverage and definitional differences, with the remainder due to statistical differences.” Also noted was that underreporting in the CES “undoubtedly contributes to some differences”. Given that the differences in the series are so great, it would be foolhardy to try and replace PCE values in an input/output model directly with observations from the CE survey. One must derive a way to use the CES as a proxy for change in the PCE accounts.

We use the CES data as a proxy for aggregating PCE Accounts to households and income classes because of the differences in the definitions of expenditure categories, the level of reported spending in those categories and the difficulty in bridging directly to input-output categories. Most CES household data is collected and published already classified by nine income groups. Those are less than \$5,000, \$5,000 to \$9,999, \$10,000 to \$14,999, \$15,000 to \$19,999, \$20,000 to \$29,999, \$30,000 to \$39,999, \$40,000 to \$49,999, \$50,000 to \$69,999, and \$70,000 and over. The usefulness of the lower end of income delineation in an expanding economy is debatable. CES expenditures are published as average annual expenditures by a household in their income class. In order for this information to be useful in apportioning total PCE, one must find the number of consumer units in the income class and derive the total expenditures in the nine income classes. We then apply that ratio of all nine income categories to the sum of all expenditures to total PCE. BLS publishes this information on its website and in CES Table 2. Income before taxes: Average annual expenditures and characteristics, Consumer Expenditure Survey, 1997. Applying these total CES expenditure ratios to total PCE is straightforward. Applying a CES expenditure data set which is in essence a subset

of the total, for instance, those below the poverty line or only households which receive food stamps, would require developing a set of PCE data to reflect the CES composition.

Codifying Expenditure Categories

Ken Hanson of USDA's Economic Research Service started the process of building a bridge between CES and PCE categories for this paper. We were able to find 48 expenditure categories, directly from CES Table 2., which we then bridged to 87 of the published PCE categories in the NIPA table 2.5, "Personal Consumption Expenditures by Type of Expenditure". The rest of the 113 lines in table 2.5 represented sub and control totals. There is a relationship between the NIPA table 2.5 and the input-output sectors but it is not a direct link. In other words, two concurrences must be developed before CES data can be useful in an I/O model. One, a bridge from the CE survey to table 2.5 and a second from the table to 136 PCE codes which are map to the benchmark I/O sectors. There are five lines on the NIPA-PCE table where we were unable to bridge to a similar CES category. Those are Food Produced and Consumed on Farms, Expenditures for Travel, Expenses while on Foreign Travel, Consumption by Foreigners while in the U.S., and Remittances to Relatives in Foreign lands.

Income ratios for the category, Food Produced and Consumed on Farms, in the CES all households data set [See Table 2.] were derived from the U.S. Agricultural Census, by the distribution of marketing receipts of dairy farms. Although, there is more consumption of meat animals on farms than milk, the size of cattle and hog operations is heavily skewed towards the highest incomes. The four net international flows represented in the last four lines of the PCE table were distributed to income groups by an average of all the previous expenditures.

Table 2. shows the published CES categories that were used to prorate PCE values. The first nine items of Table 2 are demands of the Food and Fiber System [1,2]. These demands were already bridged to the input output

sectors and did not have to be reclassified or pro rated by this procedure. Only non-food PCE was bridged in this exercise. The CES categories in Table 2, in this text, in bold print represent categories we were unable to get directly from BLS, CES Table2.

TABLE 2.

Item	Consumer Expenditure Survey Table 2.	Category	Line #s	Personal Consumption Expenditures Table 2.5 Category	1997
				(1996 Chained \$Billions)	
1		Food at home	3 - 9	Food at home	423.1
2		Alcoholic beverages	9	Alcoholic beverages at home	57.4
3		Food away from home	4	Food away from home	309.8
4		Food furnished to employees	5	Food furnished to employees	8.3
5		1992 Ag. Census(Dairy farms)	6	Food Consumed on Farms	0.5
6		Footwear	12	Shoes	40.1
7		Clothing	13	Clothing	225.1
8		Tobacco products and smoking	7	Tobacco (Cigarettes)	47.1
9		Flowers/indoor plants	95	Flowers/indoor plants	16.1
<hr style="border-top: 1px dashed black;"/>					
10		Women and girls apparel	14	luggage (in clothes)	3.6
11		Men and boys apparel	15	luggage (in clothes)	2
12		Other apparel products and services	17	Clothes clean repair	13.2
13		Other apparel products and services	18	Jewelry	42.8
14		Other apparel products and services and other entertain, Supplies,equipment and services	19	Other	21.8
15		Personal care products and services	21	toilet preps	50.5
16		Personal care products and services	22	Barbershops	24.6
17		Mortgage interest and charges	24	Mortgage	569
18		Rented dwellings	25	Rent	180.9
19		Rented dwellings	26	farm rent	6
20		Other lodging	27	Other	30.6
21		Furniture	29	Furniture	54.2
22		Major appliances	30	Kitchens	31
		Small appliances, miscellaneous			
23		Small appliances, miscellaneous equipment	31	Glass	27.3
24		Household furnishings and equipment	32	durable house	53.1
25		Household textiles	33	semi-durable house	33.3
26		Housekeeping supplies	34	cleaning solutions	51
27		Housekeeping supplies	35	Stationary	19.1
28		Electricity	37	Electric	93.3
29		Natural gas	38	Gas	34.2
30		Water and other public services.	39	Water	42

31 Fuel oil and other fuels.	40 Fuel	15.1
32 Telephone services	41 Telephone	103.7
33 Housekeeping supplies and other household expenses	42 home services	13.5
34 Household operations	43 Other	40.4
35 Drugs and medical supplies	45 Drugs	106.5
36 Medical supplies	46 Eyeglasses	19.1
37 Medical services	47 Doctors	204.1
38 Medical services	48 Dentists	49.7
39 Medical services	49 other medical	120.4
40 Medical services	52 hospital non profit	216.9
41 Medical services	53 hospital profit	41.3
42 Medical services	54 hospital government	78.3
43 Medical services	55 nursing home	64.3
44 Health insurance	56 health insurance	56
45 Miscellaneous	61 Brokerages	51.1
46 Miscellaneous and Vehicle insurance	62 bank services	45.7
47 Miscellaneous	63 business services	186.3
48 Life and other personal insurance	64 life in s. pensions	84.5
49 Miscellaneous	65 legal service	52.9
50 Miscellaneous	66 burial service	14.6
51 Fees and admissions	67 Other	26
52 Cars and trucks, new	70 new cars	82.7
53 Cars and trucks, used	71 used cars	54.8
54 Cars and trucks, new and other vehicles	72 other vehicles	86.4
55 Maintenance and repairs	73 tires, etc.	39.9
56 Maintenance and repairs and rent and lease	74 car repair	143.9
57 Gasoline and motor oil	75 gas and oil	126.2
58 Public transportation	76 Tolls	3.9
59 Vehicle insurance	77 car insurance	32.5
60 Public transportation	79 mass transit	8
61 Public transportation	80 Taxi	3.6
62 Public transportation	82 Trains	0.7
63 Public transportation	83 business services	1.8
64 Public transportation	84 Airline	27.4
65 Public transportation	85 Other	4.6
66 Reading	87 Books	26.3
67 Reading	88 Magazines	29.2
68 Pets, toys, and playground	89 Toys	54.2
69 Other entertainment supplies,	90 boats planes camera	43.4
70 Television, radios, sound	92 Audio Video	60.3
71 Television, radios, sound and Misc Household equipment	93 Computers	38.1
72 Television, radios, sound	94 TV repair	3.8
73 Fees and admissions	97 Movies	6.2
74 Fees and admissions	98 Theatre	8.4
75 Fees and admissions	99 spectator sports	6.9
76 Fees and admissions	100 Clubs	14.1

77 Fees and admissions	101 Amusements	51.1
78 Fees and admissions	102 para mutual	3.5
79 Fees and admissions and TV, Radio and Sound	103 Other amuse	105.1
80 Education	105 College	66.7
81 Education	106 high school	28.1
82 Education and Reading	107 grade and nurse school	31.4
83 Cash contributions and Reading	108 Religion	145.9
84 Average CES Expenditures	110 Travel	62.3
85 Average CES Expenditures	111 spend abroad by citizs	3.3
86 Average CES Expenditures	112 spend here by foreign	-84.7
87 Average CES Expenditures	113 Sent abroad to relativs	-1.6

Once, through this procedure, we have rationed the 87 PCE categories in nine income classes, the second bridge to the 497-sector ERS/EDMONDSON partially closed input–output model must be built. The Bureau of Economic Analysis has provided me with PCE category codes that should bridge to all lines in the NIPA table 2.5. Unfortunately, since the publication of the benchmark 1992 I/O tables, table 2.5 has revised some content, most importantly, made a new category to reflect the growing importance of PCE for computers, and some codes have to be combined to equal one Table 2.5 line number.

Each PCE code represents one of 136 separate PCE vectors of final demand in the benchmark tables. These PCE codes are then aggregated to the 87 vectors which represent each line of NIPA table 2.5. Each vector is bridged to the appropriate producing sectors from which the final demand is purchased. The model being employed here is a 497 sector “full blown” household model, the most highly disaggregated, employing all benchmark industries. In the base year the trade margins for PCE codes are also mapped to the appropriate trade and transportation sectors. Table 3. is an example of a few of the PCE codes.

Methodology and Data

After we have aggregated the 136 PCE codes and have built consumption functions of all expenditures by 9 income classes using CES ratios, we turn the PCE vectors into a 497 by 87 share matrix. We then multiply the share matrix by the 87 by 9 PCE expenditure matrix, resulting in a 497 by 9 matrix of all PCE expenditures.

TABLE 3.

Line #	PCE CODE	ITEM
14	CWCO	Women's clothing without luggage
14	CWUG	Women's luggage
15	CMCO	Men's clothing without luggage
15	CMUG	Men's luggage
16	CMIC	Standard clothing issued to military personnel
17	CLAU	Cleaning, laundering, dyeing, pressing and alterations
17	CSCL	Shoe cleaning and repair
18	CJRY	Jewelry & watches
19	CCOT	Miscellaneous personal, clothing and jewelry services
21	CTLG	Toilet articles and preparations
22	CBBB	Barbershops, beauty parlors, and health clubs
24	COWN	Owner-occupied nonfarm dwellings - space rent
24	CFDV	Film development
25	CTEN	Tenant-occupied nonfarm dwellings - rent
26	CFAR	Rental value of farm dwellings
27	COHO	Other housing
29	CFNR	Furniture, including mattresses & bedsprings
30	CAPP	Kitchen and other household appliances
31	CCHN	China, glassware, tableware and utensils
32	CTOO	Hand tools
32	CDHF	Durable house furnishings nec
32	CFLR	Floor coverings
32	CWTR	Writing equipment
33	CSDH	Semidurable house furnishings
34	CPAP	Household paper products
34	CCLE	Cleaning preparations
35	CSTS	Stationery and school supplies
35	CGRE	Greeting cards
37	CELC	Electricity
38	CNGS	Gas
39	CWAT	Water and other sanitary services
40	COIL	Fuel oil
40	CLPF	LP gas and other fuel
41	CTEL	Telephone & telegraph
42	CDMS	Domestic service
43	CRCL	Rug and furniture cleaning
43	CFRE	Upholstery and furniture repair
43	CFIN	Household insurance
43	CERE	Electrical repair
43	CPST	Postage
43	CMHO	Household operation nec
43	CMSE	Moving and storage

$$\{1\} P=D*N$$

where P is an $n * 9$ matrix of expenditures shared to the producing industries by income class; D is an $n * m$ share matrix of input-output sectors and PCE final demands; N is an $m * 9$ matrix of NIPA categories of personal consumption expenditures; m is the number of PCE final demand categories, 87 for this analysis; and n is the number of economic sectors, 497, for this analysis.

In order to accurately and completely measure the impact of changes in policies which affect consumer spending differently across household groups, such as a change in food stamp benefits, and to measure that change on the general economy and incomes of specific households, one must employ new and complex tools. To successfully measure these activities one must first build a model that has that capability.

From the 1992 Input-Output accounts we build a “partially closed” I/O model. We endogenize both household income rows and personal consumption expenditure (PCE) columns. By endogenizing these vectors I make household incomes and expenditures part of the transactions or technology matrix which defines the intermediate cost structure of the U.S. domestic economy. The final demands columns of the base year Input- Output Accounts contain the PCE values by industrial sector. These are split into 9 income classes as described above using CES data. The other final demand columns in the I/O accounts are summed and become a new exogenous Other Final Demand column.

Defining the household income or value-added row is a much larger task. There are three value-added rows in the base I/O accounts. The first, compensation of employees is included in its entirety in the new household row. To this must be added net interest, business transfer payments, farm and real estate rental income, corporate dividends, and nonfarm proprietors income. These values are then subtracted from the value-added I/O rows of Indirect Business Taxes and Property Type Income. The residual sectoral value-added makes up the new exogenous, ‘other value added’ row. All of this data must be disaggregated to the 497 appropriate input-output industrial sectors. The majority share of this data is provided by USDC-BEA in unpublished data supporting the National Income and Product Accounts. Some farm data is from USDA-ERS farm income accounts. Once this data is collected it must be made to “balance” for one dollar worth of final demand is worth one dollar of value added. PCE for Domestic Help and Interest Paid By Consumers becomes the diagonal element of the endogenized household sector row and column. The household row is split into 9 income groups in a procedure similar to the methodology employed for PCE but which used Current Population Survey data as a source for income classification and type of household demographics.

The method used here is an I/O analysis, similar to the methodology used to analyze income and employment generation in the food and fiber system [Edmondson, Petrulis, and Somwaru, 1995 and Lee, Schluter, Edmondson, and Wills, 1987]. For this analysis, we use the 1992 U.S. I/O tables [USDC/BEA, 1998], the latest available. An I/O table provides an economy-wide environment in which to analyze the corresponding levels of sectoral output, income and employment needed to meet differing levels of household consumption. Specifically, I will examine the effect of 1997 household consumption on these three variables. The focus will be on estimating the changes to household personal incomes.

First, sectoral income for the base year (1992) is derived as:

$$\{2\} \text{ Income} = \sum_{j=1}^n V_j$$

where V_j is value added in sector j . In the U.S. I/O tables, $n=497$ sectors.

Sectoral output for the base year is derived as:

$$\{3\} X = [I-A]^{-1} * f$$

where,

X = an $n \times 1$ vector of sector outputs

$[I-A]^{-1}$ = an $n \times n$ I/O total requirements matrix, and

f = an $n \times 1$ vector of other final demands.

Under an I/O structure, value added is a fixed proportion of output, so that income can be written in a matrix form as:

$$\{4\} \text{ Income} = v * X = v * [I-A]^{-1} * f$$

where, v = an $n \times n$ diagonal matrix of value added per dollar of sector output coefficients.

Using the above notation, employment in each sector can be derived as:

$$\{5\} E = l * [I-A]^{-1} * f$$

Where, l = an $n \times n$ diagonal matrix of civilian employment coefficients per dollar of sector output.

E = an $n \times 1$ vector of sector employment needs, e_j , for meeting the total output required to satisfy other final demands.

To estimate nonbase year (such as 1997) income, we have to incorporate the new information contained in P , the result of equation 1, into the endogenous household expenditure column. We then, add new information on household incomes derived from the Current Population Survey (CPS) to replace the base year endogenous household value-added row, and apply sectoral price deflators to make the "constant dollar" measures of other final

demands and adjustments to incomes for the base year (1992) prices. A new “partially closed” household model is built upon completion of the Leontief inverse of the new partitioned matrix.

Future Directions and Results

Three measures of economic activity associated with changes in food demands or policies are available for analysis through this model: direct plus indirect plus induced total output or business activity; the employment required by this level of output, and the personal income generated by personal consumption expenditures.

While this paper concentrated on the procedure for disaggregating Personal Consumption Expenditures, a future manuscript will showcase the results of modeling such a real or imagined change in household consumption levels. Of necessity this paper concentrated on total household expenditures. The same procedure should work on data sets defined a delimiting demographic such as poverty level, particular occupation or other household circumstance. This type of data is much more difficult to obtain than the total households’ data set, requiring the services of an experienced computer programmer. Given a month of lead-time and the help of a programmer we were unable to secure a partial/demographic data set I could write about confidently for this paper. Sampling errors and incomplete information abound in data sets that are less than the total expenditures reported in CES Table 2. The totals are a combination of both the interview and the diary surveys, but not additive. BLS analysts often decide which survey to use and extrapolate from to report average household consumption. It is impossible to know intuitively which value was used and BLS does not provide a program or method to replicate CES Table 2. Therefore any data set which

contains only information on expenditures by people on food stamps or below poverty or any other demographic will not be additive to the published total.

BLS has decided to publish, along with the 1999 CES dataset, a corrected set of poverty level variables. Currently the poverty level data has many sampling, collection and organizational errors. A future paper will contrast and compare results from the total households' data set and the food stamp recipient or poverty level households' data set.

Ken Hanson of ERS's original intent was to bridge PCE data into 3 income classes, low, medium, and high, instead of the 9 categories I use, and also into bridge to households classified by occupations and other demographic variables. Ken's Computable General Equilibrium (CGE) models with an Input-output model at its core, given the limitations of CES data, might be better equipped to handle aggregated demographic information. But, no matter the starting point, CGE or I/O, ultimately, one must map PCE information to Input-Output sectors no matter what the level of aggregation. Hopefully this manuscript has provided a starting point and a procedure for accomplishing this goal.

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