Regional Household Spending

Using the Consumer Spending Microdata to Estimate Household Spending and Buying Power at Any Level of Regionality

ROS™

Households v Consumers

Households v Consumers

Consumer units include families, single persons living alone or <u>sharing a household</u> with others but who are financially independent, or two or more persons living together who share expenses.

Buying Power

Buying Power

Buying Power = Disposable Income

(= Income After Taxes)

Level of Regionality

Level of Regionality

Regional Hierarchy

U.S.

Level of Regionality

Regional Hierarchy

U.S.

Regions

Level of Regionality

Regional Hierarchy

U.S.

Regions

Divisions

Level of Regionality

Regional Hierarchy

U.S.

Regions

Divisions

States

Level of Regionality

Regional Hierarchy

U.S.

Regions

Divisions

States

Counties

Level of Regionality

Regional Hierarchy

U.S.

Regions

Divisions

States

Counties

Census Tracts

Level of Regionality

Regional Hierarchy

U.S.

Regions

Divisions

States

Counties

Census Tracts

Block Groups

Level of Regionality

Regional Hierarchy

U.S.
Regions
Divisions
States
Counties
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Blocks

The Original Purpose of the Consumer Expenditure Survey

To assist in constructing representative "market baskets" which are then "priced" to form the various Consumer Price Indexes (CPI-U being the best known) and its components.

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Additional Uses of the Consumer Expenditure Data

Provides data to the Internal Revenue Service to calculate average sales tax deductions on personal income tax forms.

Helps DOD in calculating Cost of Living allowances for military personnel living off military bases in metro areas around the country.

Used by Department of Agriculture to construct guidelines for nutritional benefits.

Used by government agencies and policy analysts to study the welfare of various groups such as the elderly and low-income families and the likely impact on these groups of various economic policies.

Yet More Uses

Used by the Department of Commerce to revise the national income accounts.

Used by market researchers in analyzing the demand for groups of goods and services.

Lets Take a Closer Look at These Purposes

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NB: Calculating market baskets requires data on the average expenditures of consumer units by commodity type (UCC).

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Each of these purposes require data on <u>average</u> expenditures of CUs by type of expenditure.

... and Lastly

Used by the Commerce Dep't to revise the national income accounts.

This requires data on <u>aggregate</u> expenditures of consumer units at the national level, a need which is <u>fully met by the published CE tables.</u>

Used by market researchers to analyze demand for groups of goods and services.

This typically requires data at the sub-national level, which is met for 20-25 <u>major metros only</u>.

Our Question

Can the PUMD data be used to estimate aggregate spending data for smaller levels of regionality?

Steps in Calculating the CE Tables
(greatly simplified)

Step 1: Select households to be surveyed.

Step 2: Gather spending data from Consumer Units (CUs) within households.

Step 3. Calculate a final weight for each CU.

Step 5. Multiply the measured expenditures of each CU by its final weight.

Step 6. Sum the weighted expenditures to get Total Spending.

Step 7. Divide Total Spending by the number of CUs to get average spending for the U.S., Regions and selected MSAs.

Our Methodology

Step 1

Identify breakouts from the American Community Survey to be used as the weights

B11001

HOUSEHOLD TYPE (INCLUDING LIVING ALONE)
: Households ℹ️
2012-2016 American Community Survey 5-Year Estimates

Table View ▦

This table is displayed with default geographies. ❓
Click Back to Search to select other geographies using the search options on the left.

📄 View Geography N...

Tell us what you think. Provide feedback to help make American Community Survey data more useful for you.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that pro...
official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

Versions of this table are available for the following years:

2016 ▶
2015
2014
2013
2012
2011
2010
2009

	United States	
	Estimate	**Margin of Error**
Total:	117,716,237	+/-222,078
Family households:	77,608,829	+/-218,458
Married-couple family	56,781,405	+/-282,234
Other family:	20,827,424	+/-68,376
Male householder, no wife present	5,681,312	+/-34,594
Female householder, no husband present	15,146,112	+/-40,842
Nonfamily households:	40,107,408	+/-32,057
Householder living alone	32,595,486	+/-46,684
Householder not living alone	7,511,922	+/-35,112

1 - 9 of 9

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

FAMILY TYPE BY PRESENCE AND AGE OF RELATED CHILDREN UNDER 18 YEARS
: Families ℹ️
2012-2016 American Community Survey 5-Year Estimates

Table View ▦

Actions: 📝 | 🔖 Add/Remove Geographies | 📄 Bookmark/Save | 🖨 Print | 📄 Download | 🐦 Create a Map

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Versions of this table are available for the following years:

2016 ▶
2015
2014
2013
2012
2011
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	United States	
	Estimate	Margin of Error
Total:	77,608,829	+/-218,458
Married-couple family:	56,781,405	+/-282,234
With related children of the householder under 18 years:	24,231,476	+/-206,196
Under 6 years only	5,537,304	+/-71,661
Under 6 years and 6 to 17 years	5,236,797	+/-24,301
6 to 17 years only	13,457,375	+/-117,173
No related children of the householder under 18 years	32,549,929	+/-80,658
Other family:	20,827,424	+/-68,376
Male householder, no wife present:	5,681,312	+/-34,594
With related children of the householder under 18 years:	3,163,617	+/-19,281
Under 6 years only	832,914	+/-7,683
Under 6 years and 6 to 17 years	518,408	+/-7,098
6 to 17 years only	1,812,295	+/-12,408
No related children of the householder under 18 years	2,517,695	+/-18,454
Female householder, no husband present:	15,146,112	+/-40,842
With related children of the householder under 18 years:	9,754,343	+/-26,576
Under 6 years only	2,027,008	+/-10,875
Under 6 years and 6 to 17 years	1,980,378	+/-18,489
6 to 17 years only	5,746,957	+/-17,098
No related children of the householder under 18 years	5,391,769	+/-21,187

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates

(N.B. Using the 5-year ACS data, these breakouts are available down to the census tract level)

Our Methodology

Step 2

Compile PUMD Interview and Diary Datasets together for years 2006-2016
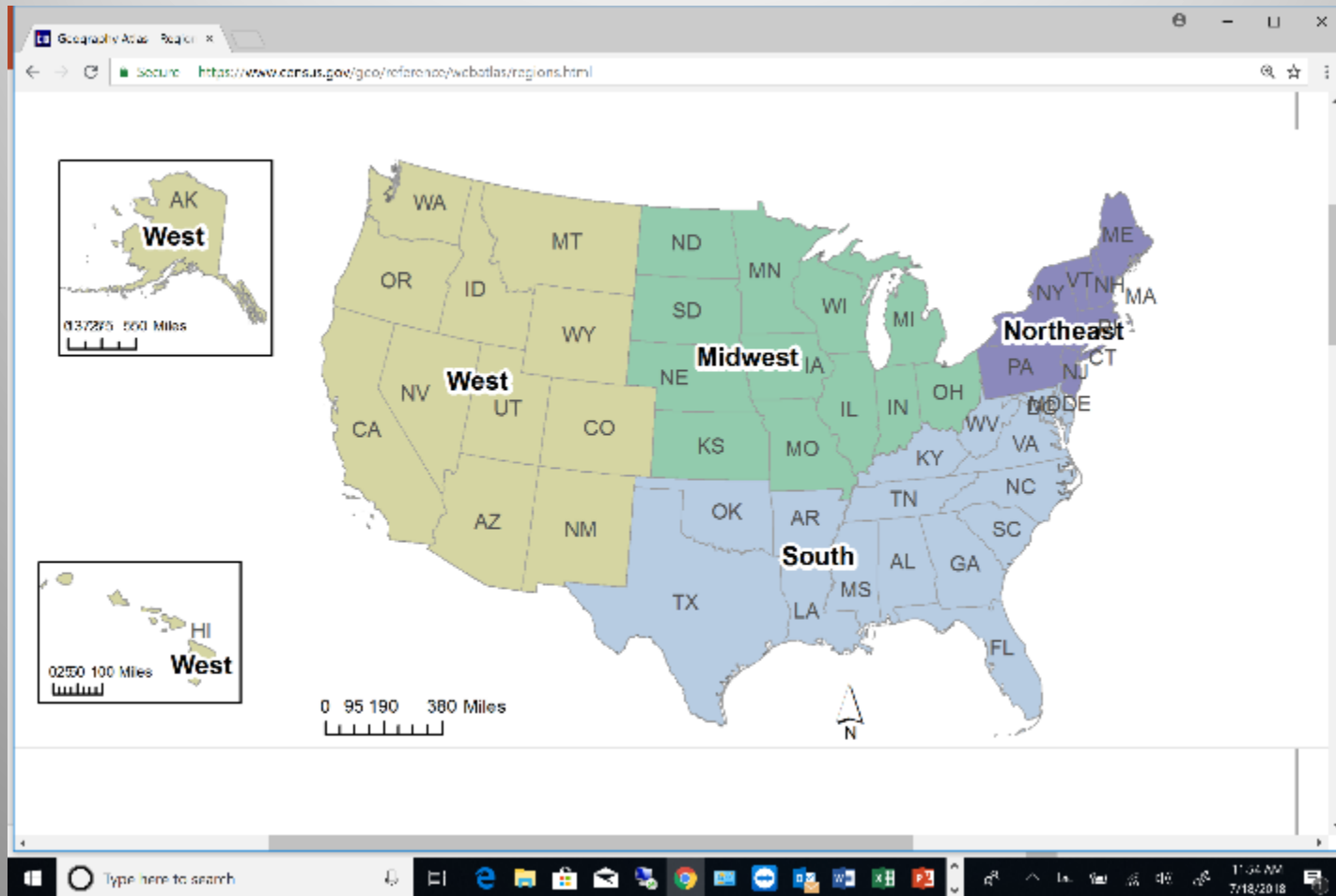
Our Methodology

Step 3

Assign all CUs in the PUMD to one of the ACS household types by Census Division and Urban/Rural
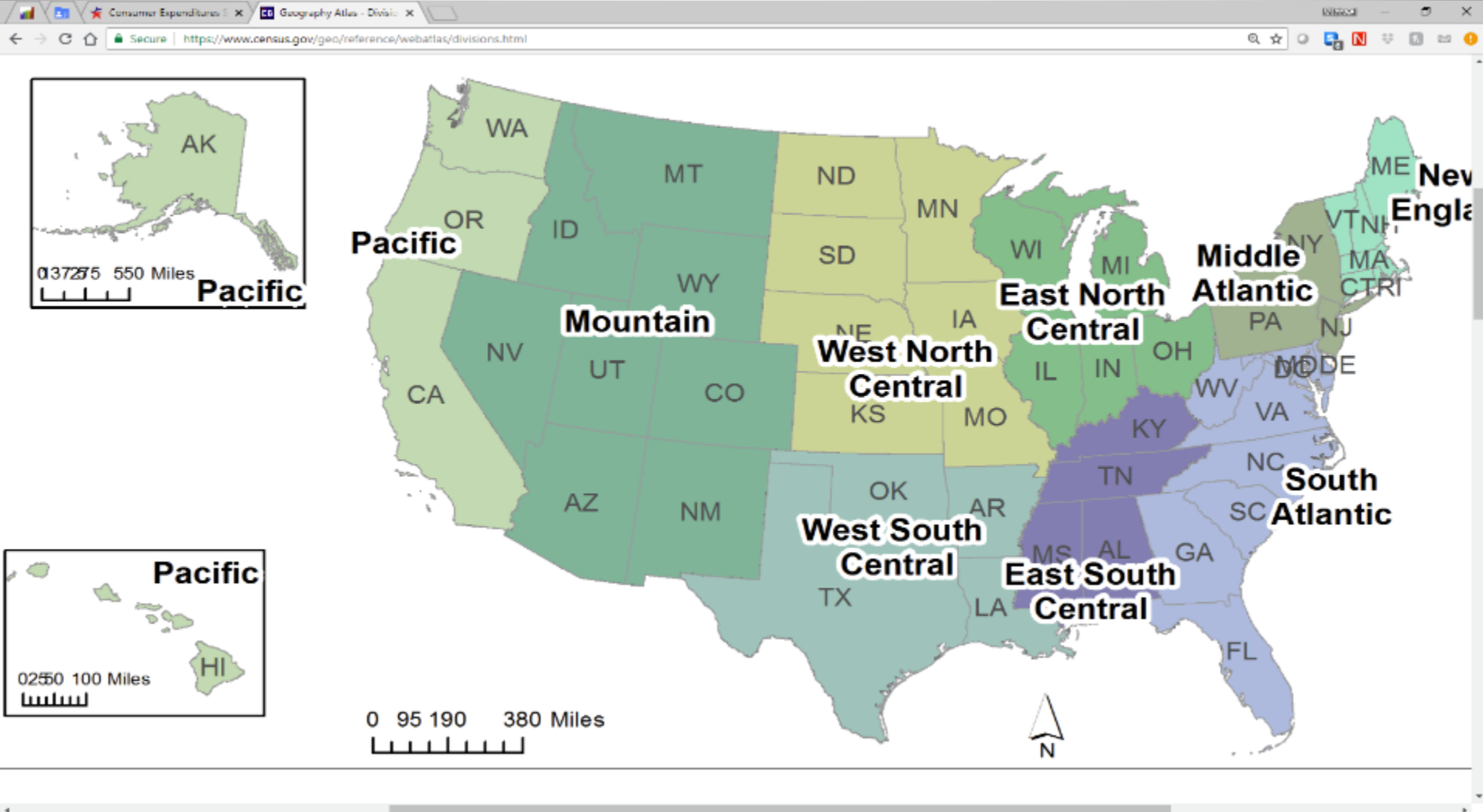
Our Methodology

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Assign all CUs in the PUMD to one of the ACS household types by Census Division and Urban/Rural

Census Regions

Census Divisions

Table 1800. Region of residence: Average annual expenditures and characteristics, Consumer Expenditure Survey, 2015-2016

Item	All consumer units	Northeast	Midwest	South	West
Average annual expenditures	$56,648	$59,876	$54,989	$52,350	$63,045
Food	7,113	7,018	7,076	6,671	7,978
Food at home	4,032	4,031	4,052	3,776	4,447
Cereals and bakery products	521	550	529	483	556
Cereals and cereal products	172	191	170	155	188
Bakery products	349	359	359	328	368
Meats, poultry, fish, and eggs	893	902	883	866	940
Beef	244	220	274	237	249
Pork	167	164	167	171	163
Other meats	122	141	130	109	121
Poultry	172	184	153	170	183
Fish and seafood	128	137	106	120	154
Eggs	60	57	52	59	70
Dairy products	411	433	429	363	458
Fresh milk and cream	139	144	139	130	152
Other dairy products	272	289	290	234	306
Fruits and vegetables	776	826	747	700	890
Fresh fruits	286	306	281	247	340
Fresh vegetables	250	275	233	217	304
Processed fruits	108	118	100	101	120
Processed vegetables	131	127	133	136	126
Other food at home	1,431	1,320	1,465	1,363	1,603
Sugar and other sweets	152	130	162	138	181
Fats and oils	111	118	106	108	117
Miscellaneous foods	730	646	778	681	836
Nonalcoholic beverages	384	369	372	394	389
Food prepared by consumer unit on out-of-town trips	54	56	47	41	80
Food away from home	3,081	2,986	3,024	2,894	3,531
Alcoholic beverages	499	564	507	404	602

Table 1800

Our Methodology

Step 3

Assign all CUs in the PUMD to one of the ACS household types by Census Division and Urban/Rural

Figure 2.
Graphic Depiction of Urban/Rural Classification
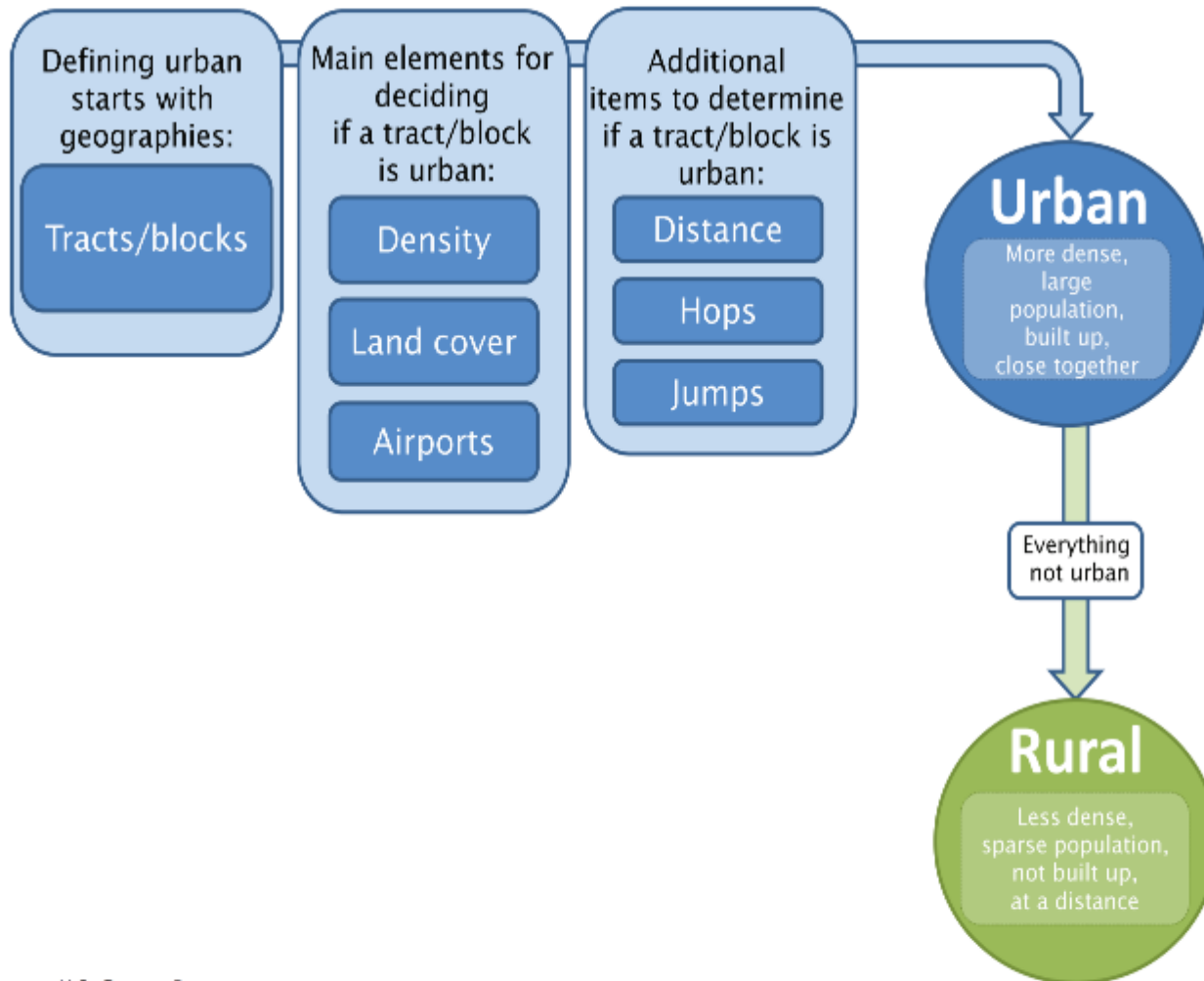
Source: U.S. Census Bureau.

Urban vs. Rural Consumers
Gross Comparisons

	Urban CU's	Rural CU's
Pretax Income	$71,578	$49,841
Total Spending	$57,059	$45,031
Avg. Propensity to Consume	79.7%	90.3%
Avg. Propensity to Save	20.3%	9.7%
Home Ownership Rate	61%	79%
% Spent on Housing	33.4%	26.8%

Percent distribution of average expenditures of urban and rural households, 2015

Item	Urban	Rural	% Difference
Rented dwellings	7.1	2.4	**195.8%**
Education	2.4	1.1	**118.2%**
Public and other transportation	1.2	0.6	**100.0%**
Reading	0.2	0.1	**100.0%**
Vehicle rental, leases, licenses, and other charges	1.1	0.7	**57.1%**
Household operations	2.4	1.6	**50.0%**
Owned dwellings	11.3	8.2	**37.8%**
Apparel and services	3.4	2.6	**30.8%**
Other lodging	1.3	1	**30.0%**
Alcoholic beverages	0.9	0.7	**28.6%**
Pensions and Social Security	10.9	8.5	**28.2%**
Personal care products and services	1.2	1	**20.0%**
Food away from home	5.4	4.8	**12.5%**
Cash contributions	3.3	3.1	**6.5%**
Life and other personal insurance	0.6	0.6	**0.0%**
Medical supplies	0.3	0.3	**0.0%**
Household furnishings and equipment	3.2	3.4	**-5.9%**
Vehicle insurance	1.9	2.2	**-13.6%**
Food at home	7.1	8.3	**-14.5%**
Entertainment	5	6.1	**-18.0%**
Vehicle finance charges	0.4	0.5	**-20.0%**
Utilities, fuels, and public services	6.8	8.6	**-20.9%**
Vehicle maintenance and repairs	1.5	1.9	**-21.1%**
Miscellaneous	1.5	1.9	**-21.1%**
Health insurance	5.2	6.8	**-23.5%**
Housekeeping supplies	1.1	1.5	**-26.7%**
Gasoline and motor oil	3.6	5.1	**-29.4%**
Medical services	1.4	2.1	**-33.3%**
Drugs	0.7	1.1	**-36.4%**
Vehicle purchases (net outlay)	6.8	11.8	**-42.4%**
Tobacco products and smoking supplies	0.6	1.2	**-50.0%**

Proposed Benefits of These Assignments

- Within-division tastes/spending patterns are assumed to be relatively homogeneous

- Between-division differences in tastes/spending patterns are assumed to be significant

- Differences in spending patterns between urban and rural CUs within each division are known to be "significant"

Question:
Do Divisions Provide Enough Observations for Multivariate Analysis with this many groups?

Population of Regions and Divisions

Region/Division	2017 Region Population	2017 Division Population
REGION I: NORTHEAST	56,470,581	
Division I: New England		14,810,001
Division 2: Middle Atlantic		41,660,580
REGION 2: MIDWEST*	68,179,351	
Division 3: East North Central		46,885,244
Division 4: West North Central		21,294,107
REGION 3: SOUTH	123,658,624	
Division 5: South Atlantic		64,705,532
Division 6: East South Central		19,029,020
Division 7: West South Central		39,924,072
REGION 4: WEST	77,410,622	
Division 8: Mountain		24,158,117
Division 9: Pacific		53,252,505

Metro Areas for Which Average Data is Published

Rank	Metropolitan Statistical Area	2017 Pop Estimate
1	New York-Newark-Jersey City, NY-NJ-PA MSA	20,320,876
2	Los Angeles-Long Beach-Anaheim, CA MSA	13,353,907
3	Chicago-Naperville-Elgin, IL-IN-WI MSA	9,533,040
4	Dallas-Fort Worth-Arlington, TX MSA	7,399,662
5	Houston-The Woodlands-Sugar Land, TX MSA	6,892,427
6	Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	6,216,589
7	Miami-Fort Lauderdale-West Palm Beach, FL MSA	6,158,824
8	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	6,096,120
9	Atlanta-Sandy Springs-Roswell, GA MSA	5,884,736
10	Boston-Cambridge-Newton, MA-NH MSA	4,836,531
11	Phoenix-Mesa-Scottsdale, AZ MSA	4,737,270
12	San Francisco-Oakland-Hayward, CA MSA	4,727,357
13	Riverside-San Bernardino-Ontario, CA MSA	4,580,670
14	Detroit-Warren-Dearborn, MI MSA	4,313,002
15	Seattle-Tacoma-Bellevue, WA MSA	3,867,046
16	Minneapolis-St. Paul-Bloomington, MN-WI MSA	3,600,618
17	San Diego-Carlsbad, CA MSA	3,337,685
18	Tampa-St. Petersburg-Clearwater, FL MSA	3,091,399
20	Baltimore-Columbia-Towson, MD MSA	2,808,175
21	St. Louis, MO-IL MSA	2,807,338
25	Portland-Vancouver-Hillsboro, OR-WA MSA	2,453,168
26	Pittsburgh, PA MSA	2,333,367
33	Cleveland-Elyria, OH MSA	2,058,844
56	Urban Honolulu, HI MSA	988,650
134	Anchorage, AK MSA	400,888

Our Methodology

Step 4

Estimate Log-Log Regression of Spending on Income within the 11-year PUMD dataset using fixed effects for the Urban/Rural divide and Year

Our Methodology

Step 4

This provides an estimate of spending by the median income household in urban and rural areas in each Census Division

Our Methodology

Note: The ACS provides estimates of median income in each census tract in the country by household type
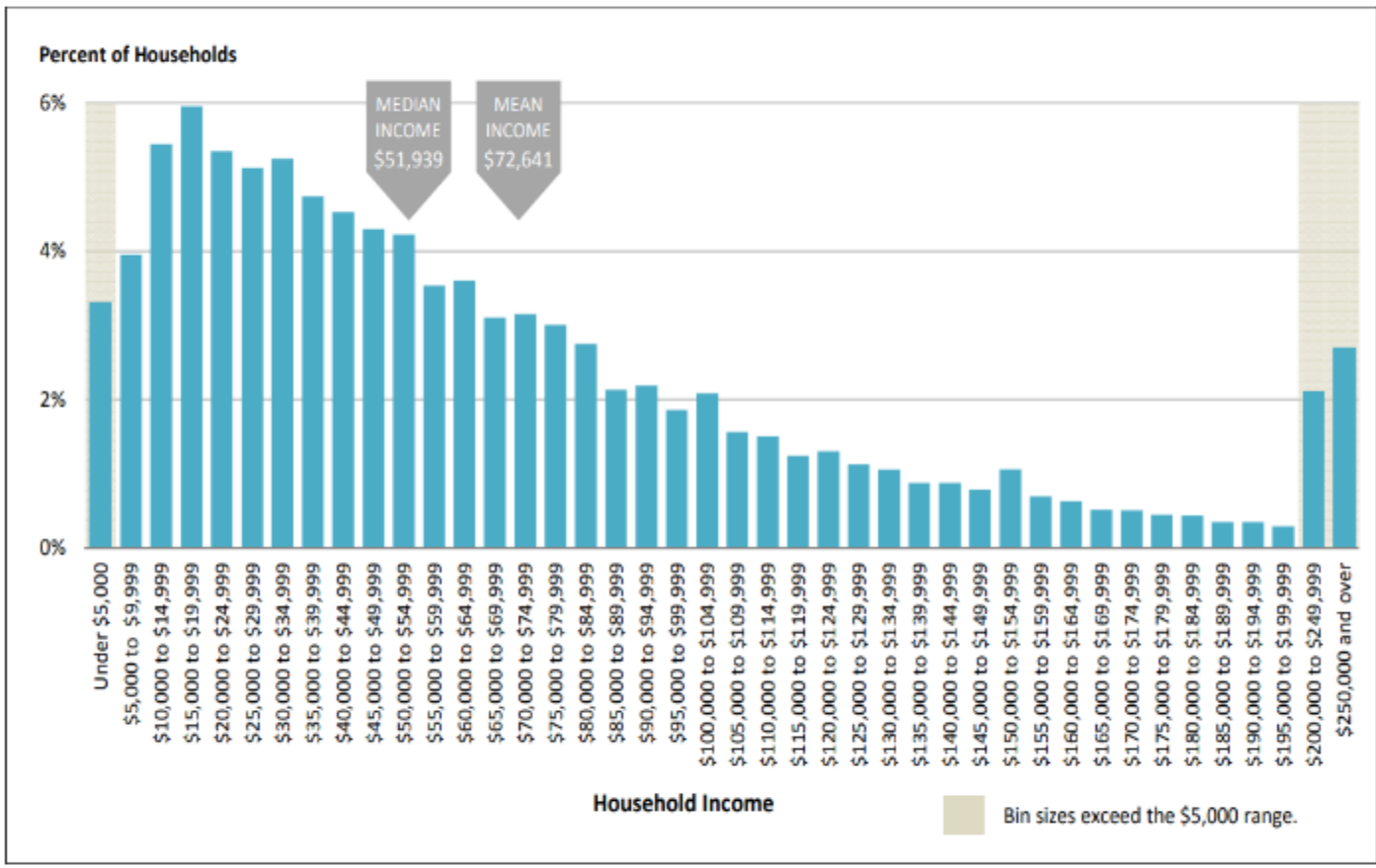
Our Methodology

Step 5

Apply the regression results to the median income member of each household type in each Census Tract that lies within the respective Division

One Drawback of this Approach

Assumes that all households in each type have the same (median) income.

Figure 3. Distribution of Household Income, 2013

Percent of Households

MEDIAN INCOME $51,939

MEAN INCOME $72,641

Household Income

Bin sizes exceed the $5,000 range.

(x-axis categories: Under $5,000; $5,000 to $9,999; $10,000 to $14,999; $15,000 to $19,999; $20,000 to $24,999; $25,000 to $29,999; $30,000 to $34,999; $35,000 to $39,999; $40,000 to $44,999; $45,000 to $49,999; $50,000 to $54,999; $55,000 to $59,999; $60,000 to $64,999; $65,000 to $69,999; $70,000 to $74,999; $75,000 to $79,999; $80,000 to $84,999; $85,000 to $89,999; $90,000 to $94,999; $95,000 to $99,999; $100,000 to $104,999; $105,000 to $109,999; $110,000 to $114,999; $115,000 to $119,999; $120,000 to $124,999; $125,000 to $129,999; $130,000 to $134,999; $135,000 to $139,999; $140,000 to $144,999; $145,000 to $149,999; $150,000 to $154,999; $155,000 to $159,999; $160,000 to $164,999; $165,000 to $169,999; $170,000 to $174,999; $175,000 to $179,999; $180,000 to $184,999; $185,000 to $189,999; $190,000 to $194,999; $195,000 to $199,999; $200,000 to $249,999; $250,000 and over)

Source: U.S. Census Bureau, Annual Social and Economic Supplement, available at http://www.census.gov/hhes/www/cpstables/032014/hhinc/toc.htm.

Notes: Income in this figure refers to household *money income* as defined by the Census Bureau: pre-tax cash income received by households on a regular basis from market and nonmarket sources. Money income excludes periodic income, such as capital gains, and in-kind transfers. Due to the way the Census Bureau aggregates incomes at the top of the distribution, the top two income groups—"$200,000 to $249,000" and "$250,000 and over"—represent wider income ranges than the groups that categorize the majority of the distribution. The "Under $5,000" group includes households earning zero or negative money income.

Alpha and beta define the shape of the graph. Although they both have an effect on the shape, a change in β will show a sharp change, as shown by the pink and blue lines in this graph:
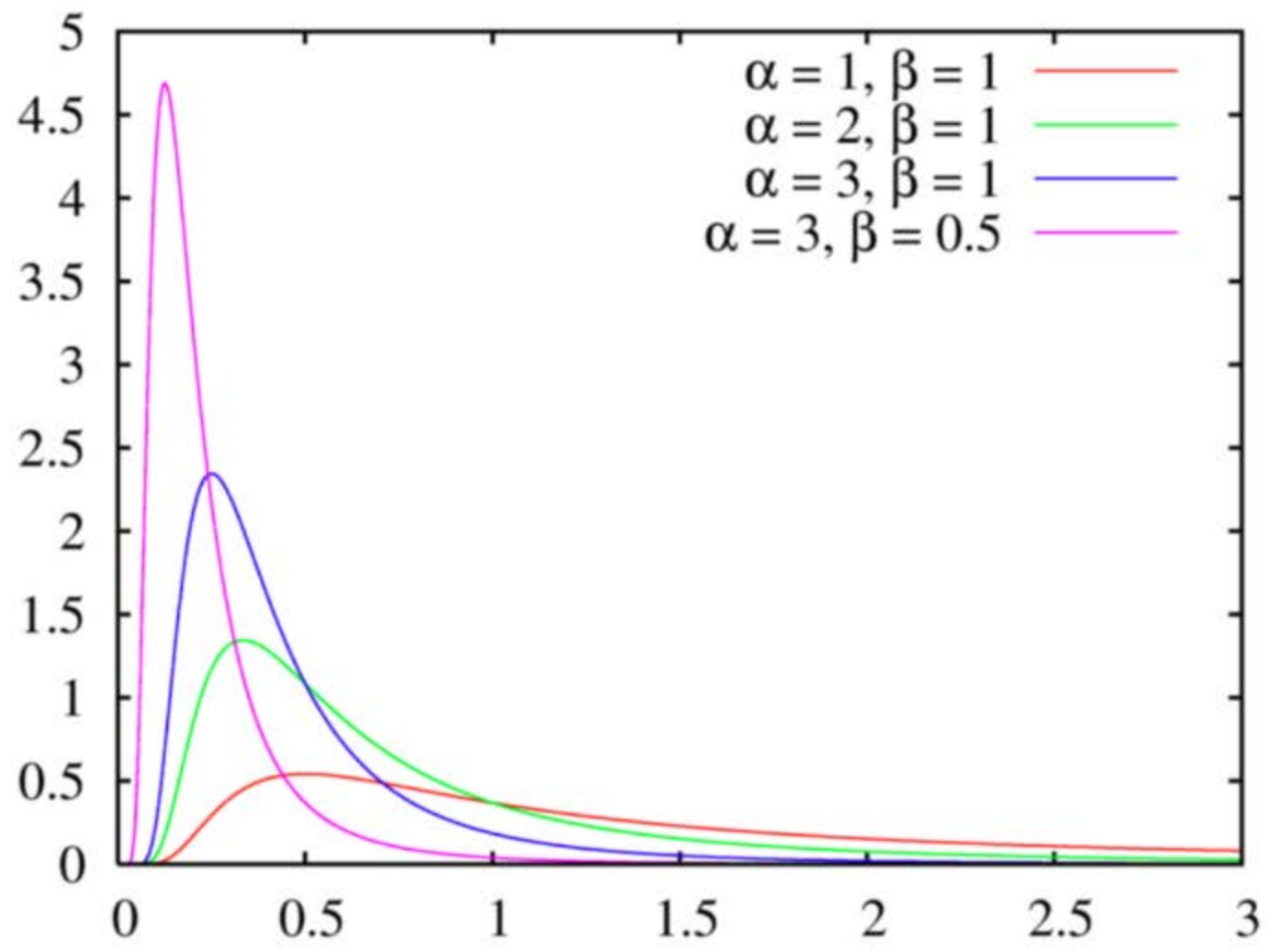
The effect of changing alpha and beta on the shape of the gamma distribution.

Alternate Step 5

Simulate the income distribution in each census tract using a gamma distribution with the given median and then apply the regression equation to each member of the distribution

Step 6

Sum the estimated spending across all household types to obtain an estimate of aggregate spending at the census tract level. This can be done for each category of spending – or for each UCC.

Result

Estimates of aggregate spending on each estimated expenditure group (or UCC) by households in every census tract in the U.S.

Implication

Aggregate Spending can be calculated for all counties, metros and states, as well as for radii around a selected point on a map.

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