



Consistency of Price Parities for Regions of the US in an Economic Approach Framework

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Background

- Need for inter-area price parities to adjust personal incomes of states and metro areas.
- BEA-BLS-Census collaborative agreements enable us to estimate item stratum level inter-area price indexes.
- From these we construct aggregate inter-area price parities that satisfy transitivity.
- Possible problem of inconsistency of changes in inter-area price parities with story told by area-specific CPIs.

2010 Paper on Time-Consistency of Methods to Measure Inter-area Price Parities

We experimented with alternative methods for constructing transitive sets of inter-area indexes:

1. Fisher-GEKS. Uses geometric average of all possible bases for comparisons.
2. Törnqvist-GEKS.
3. Weighted country-product dummy (CPD).
4. Geary(-Khamis or GK). Uses fixed “world” prices; has convenient property of additivity.
5. Geary-Allen (or GAIA). Uses world prices; substitutes predicted quantities implied by a demand model for observed quantities.

The slide features a blue header with the BEA logo in the top right corner. The logo includes the text 'BEA BUREAU OF ECONOMIC ANALYSIS U.S. DEPARTMENT OF COMMERCE'. The background of the header shows a stylized bar chart with various state names listed on the y-axis, including New Hampshire, Rhode Island, Vermont, West Virginia, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Louisiana, Mississippi, Arkansas, Missouri, Illinois, Indiana, Ohio, Pennsylvania, New York, New Jersey, Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire, and Maine. The title 'Problems to look for in results' is centered in the header in a large, white, serif font.

Problems to look for in results

- Sensitivity to outliers.
- Inconsistency of yearly changes in regional price parities (RPPs) with area-specific CPIs.
- *But even with best possible data and method, differences in weights and approach to quality adjustment could cause time inconsistency.*
- GK is susceptible to Gershenkron effect, but GAIA avoids this problem.
- GAIA expected to have fewer inexplicable inconsistencies in yearly changes in RPPs.



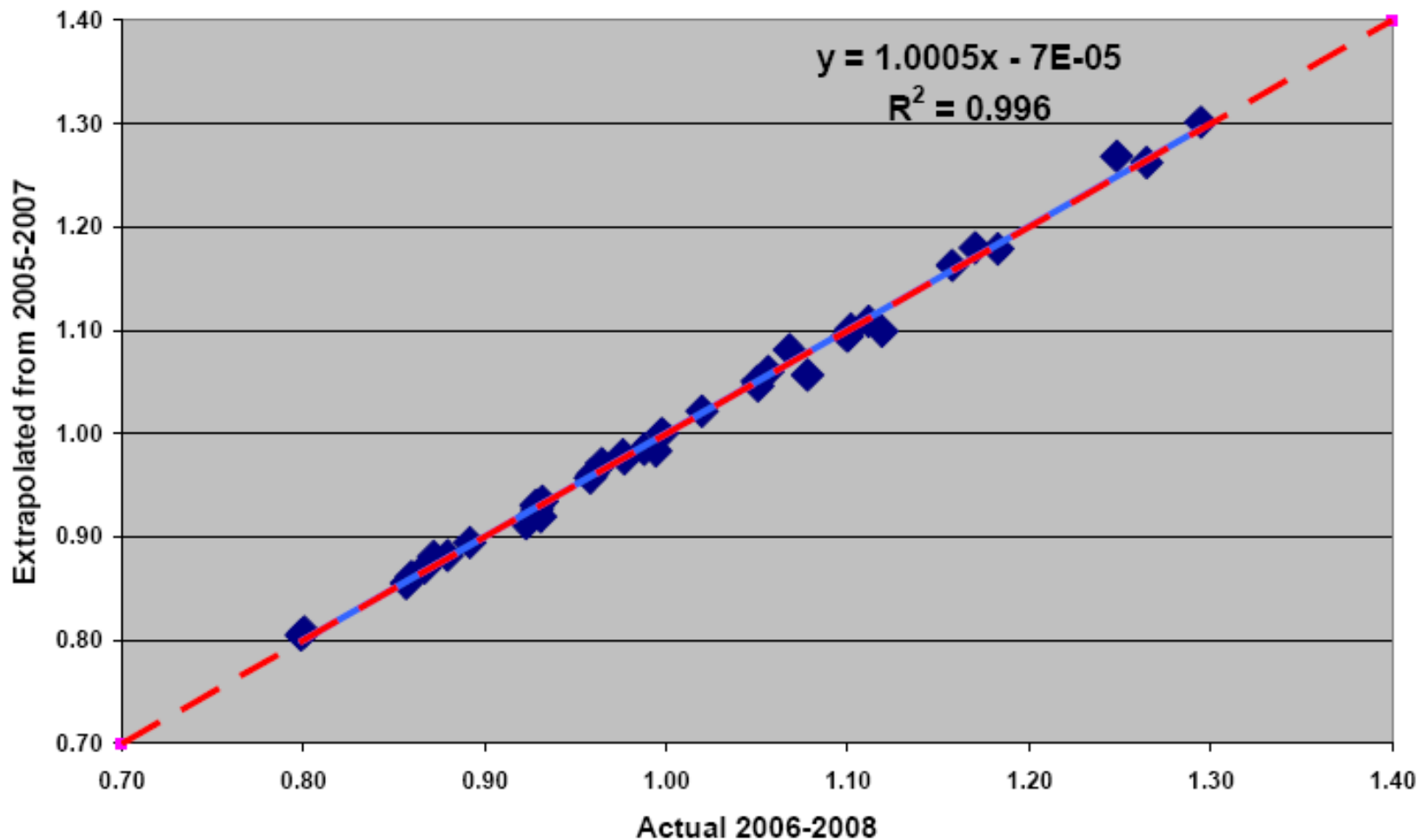
What the results suggest

- Fisher-GEKS more sensitive to outliers and more likely to be inconsistent with area CPIs.
- Although GAIA closer to Törnqvist-GEKS than GK, the difference is small. (NB: this result may change when we use improved data.)
- Convenient properties of GK don't seem to come at a cost of much worse performance.
- Good results for time consistency achieved with multi-year averaging of AHS shelter cost data.

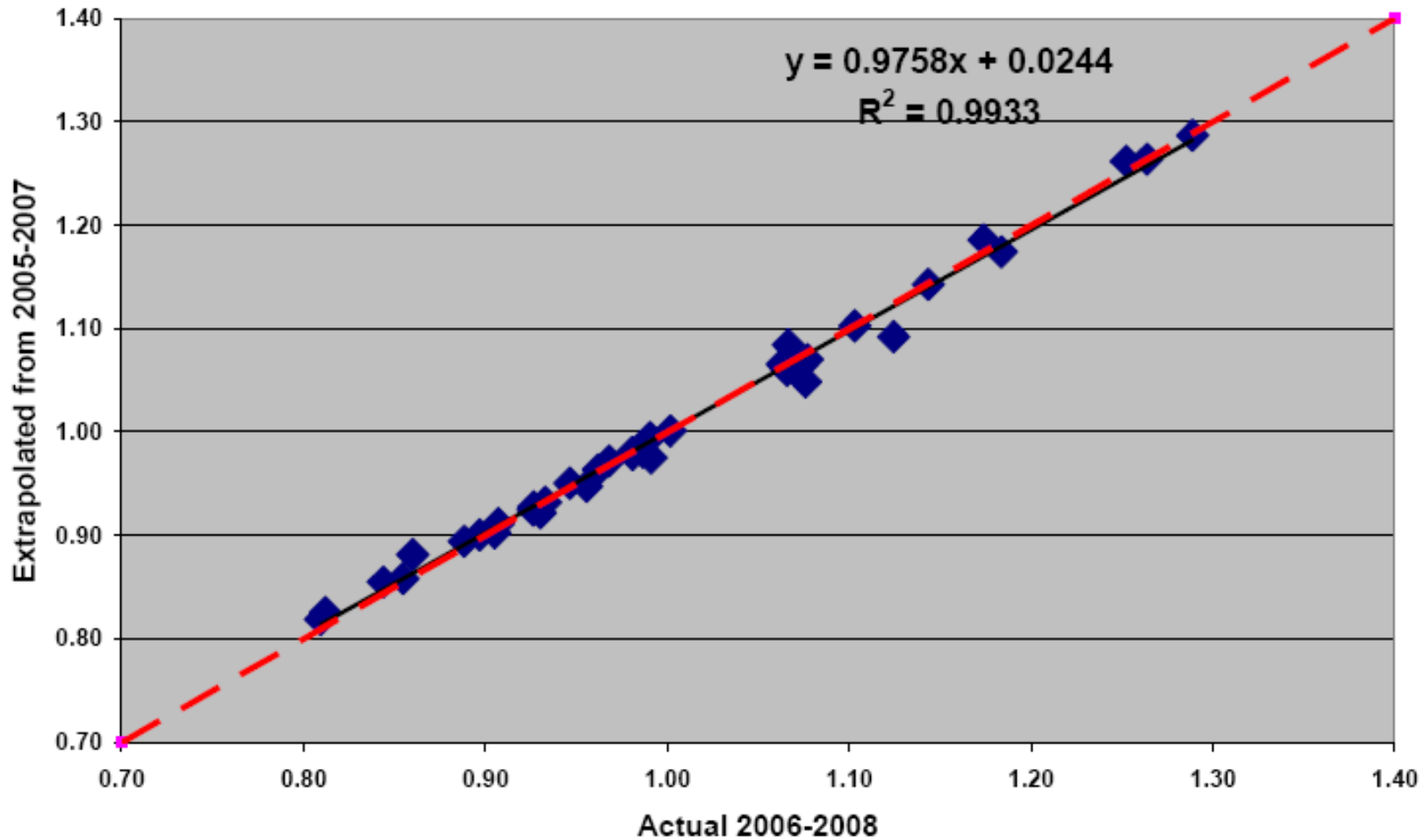
Single-Year Time Inconsistencies

	Törnqvist GEKS	Fisher GEKS	Geary	GAIA
Houston, 2006				
Actual	97.6	103.4	95.8	95.4
Predicted	95.0	96.2	94.8	94.4
Difference	2.6	7.2	1.0	1.0
NY suburbs, 2007				
Actual	129.3	127.3	128.3	129.4
Predicted	135.8	137.5	132.8	133.2
Difference	-6.5	-10.2	-4.5	-3.8

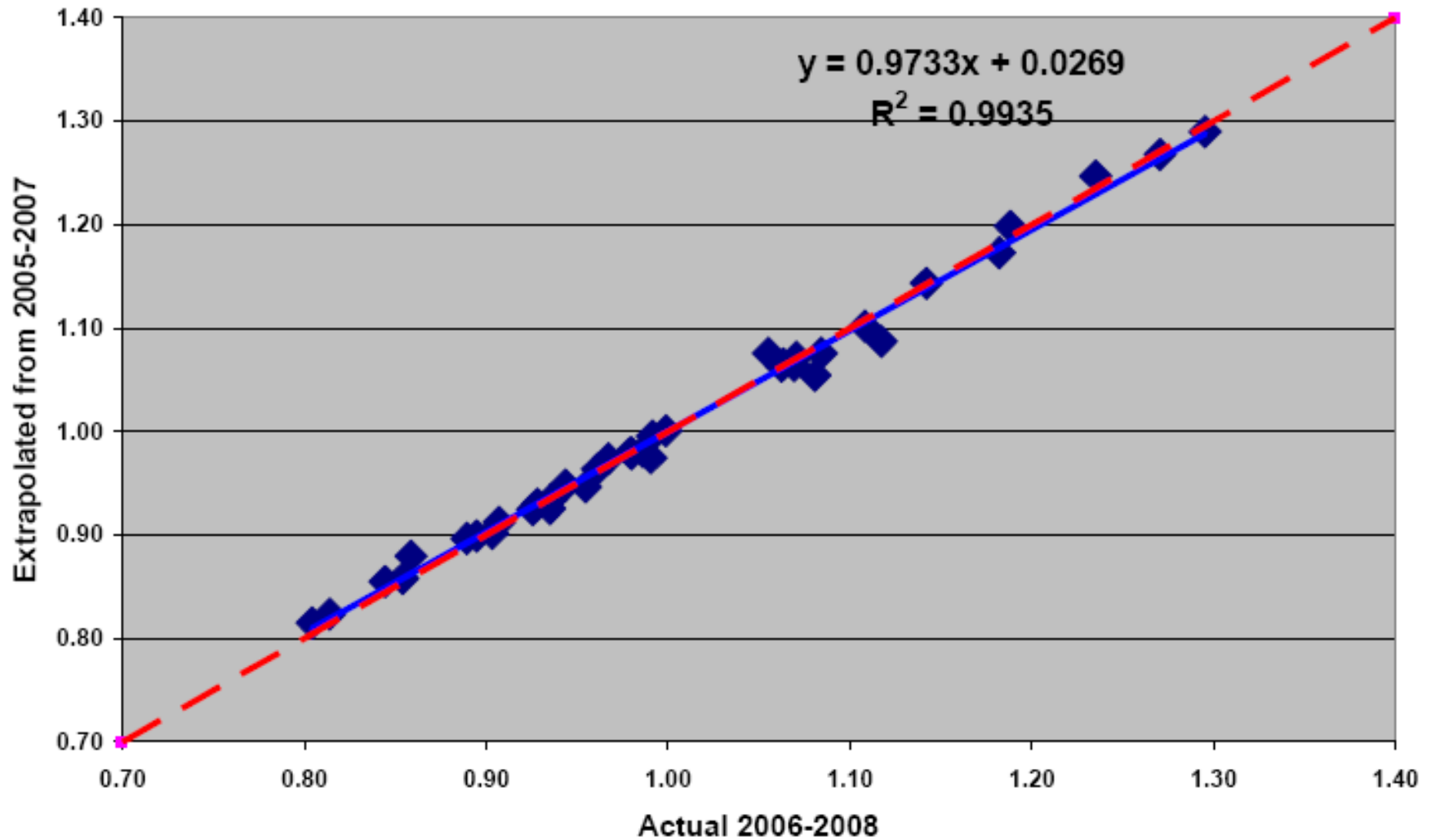
Time consistency: Multi-year Törnqvist-GEKS



Time consistency: Multi-year GK



Time consistency: Multi-year GAIA



Update 2005-2009

with Eric Figueroa and Troy Martin

1. New BLS data

- Mapping of BLS index areas to all counties in the U.S.
- Annualized costs weights from expenditure survey
- Additional weights for rural regions

2. New Census data

- Rents: 5-year rolling average for all counties, including rural areas



Overview of Data

Consumer Price Index (CPI) micro data on prices from BLS

- 205 item strata, 38 urban and metropolitan areas (1 million observations per year)
- 2 other item strata: Rents and Owners' Equivalent Rents (34,000 observations per year)

Consumer Expenditure Survey (CE) from BLS

- 207 x 38 area-item level observations
- 207 x 4 rural regions

American Community Survey (ACS) rents and owner costs of housing from Census

- 5 year rolling average for all counties
- 10 million observations

Methodology

1. First Stage (only *BLS* data)
 - Hedonic regressions
 - 38 index areas, 207 item prices
 - Multilateral aggregation to 16 expenditure classes
 - Allocation to counties and averaging to states and metro areas

2. Second Stage (adding *ACS Census* data)
 - Use ACS observed rents instead of BLS allocated rents
 - 51 states ,366 metro areas, micro and rural areas, 16 expenditure classes
 - Multilateral aggregation to overall RPP

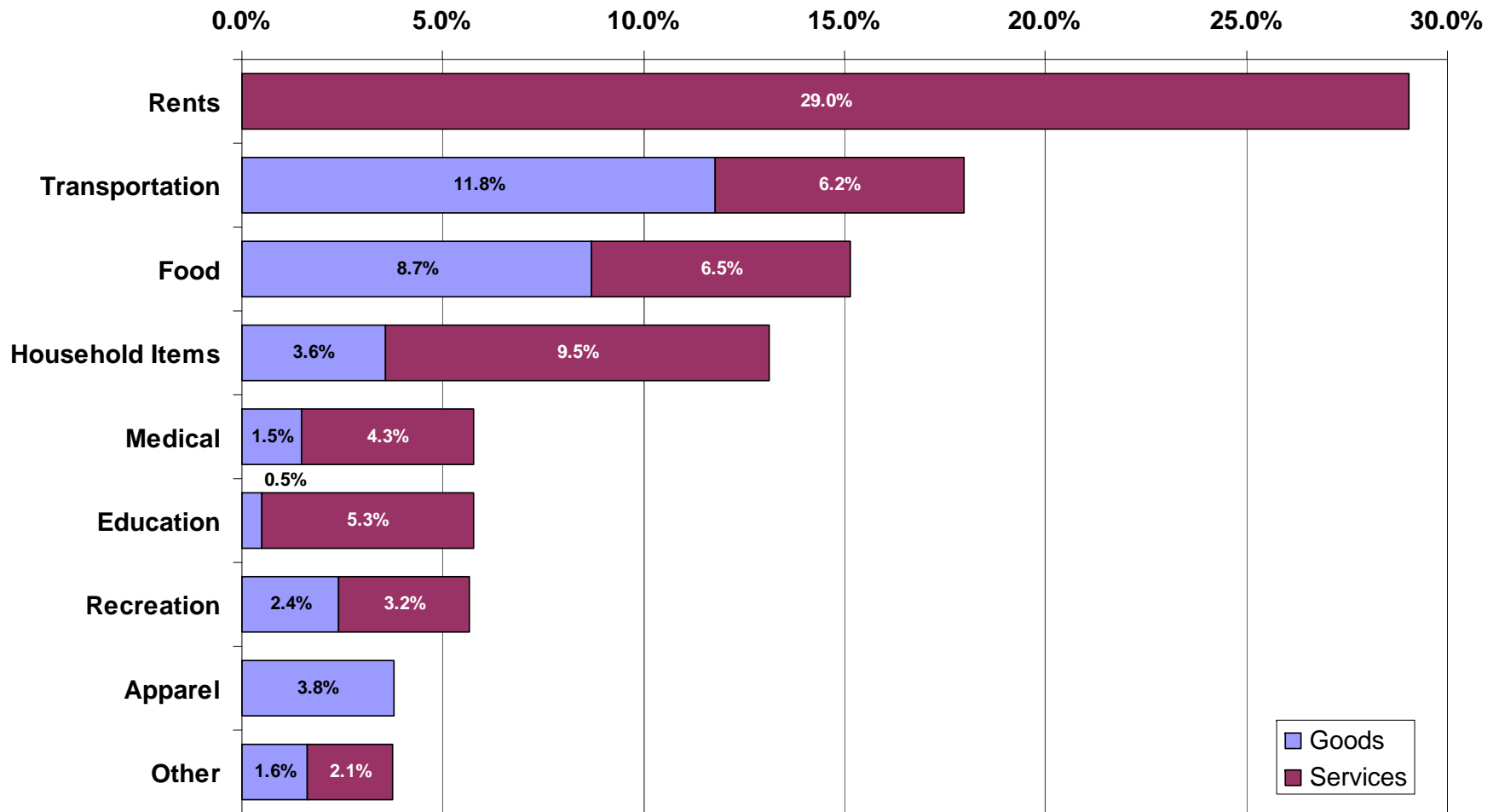
First stage: BLS data

1. Hedonic regressions on 207 items
2. Multilateral (Geary) price levels for 38 index areas and 16 expenditure classes
3. Allocate price levels to counties within index areas
 - Assume price levels for each of the expenditure classes *except* Rents are the same as average of the index area

Example: Index Area A312: Washington DC-MD-VA-WV

- 26 counties, 2 Metro areas (24 counties), 1 Micro area, 1 Rural area

Expenditure Classes



Averaging to States and Metro Areas

Find weighted average of price levels for all expenditure classes *except* rents by 51 states and 366 metro areas

For example:

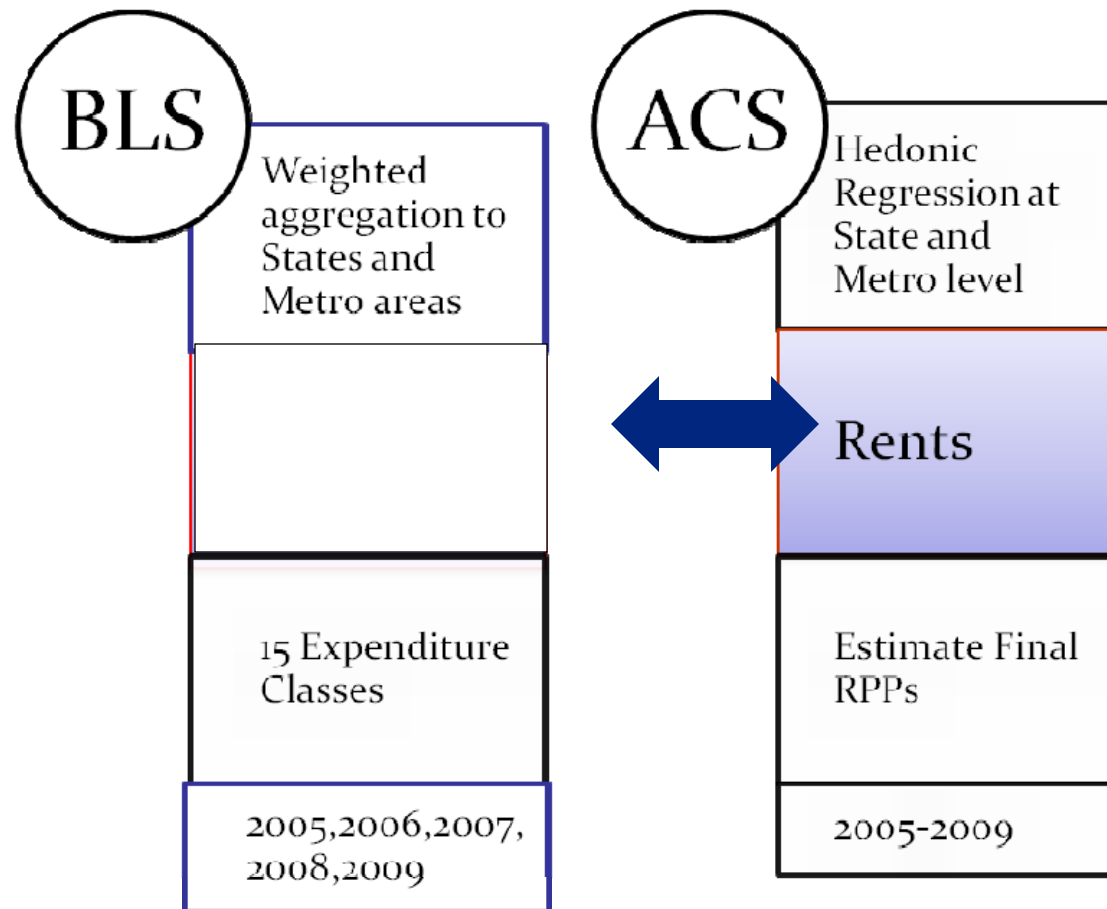
1. DC: 1 county
2. MD: 24 counties in 6 different BLS index areas
 - 6 counties in A312 (Washington-Arlington-Alexandria)
 - 1 county in A102 (Philadelphia-Camden-Wilmington)
 - 7 in A313 (Baltimore-Towson)
 - 1 in X300 (South small metro: Cumberland MD-WV)
 - 6 in D300 (South non-metro urban: *Cambridge, Lexington Park, Salisbury, Easton, Ocean Pines*)
 - 3 Rural (*Caroline, Garrett, Kent*)
3. WV: 55 counties
 - Only 2 in A312, 19 in other metro, 8 in micro areas, 26 rural



Second stage: ACS Census data

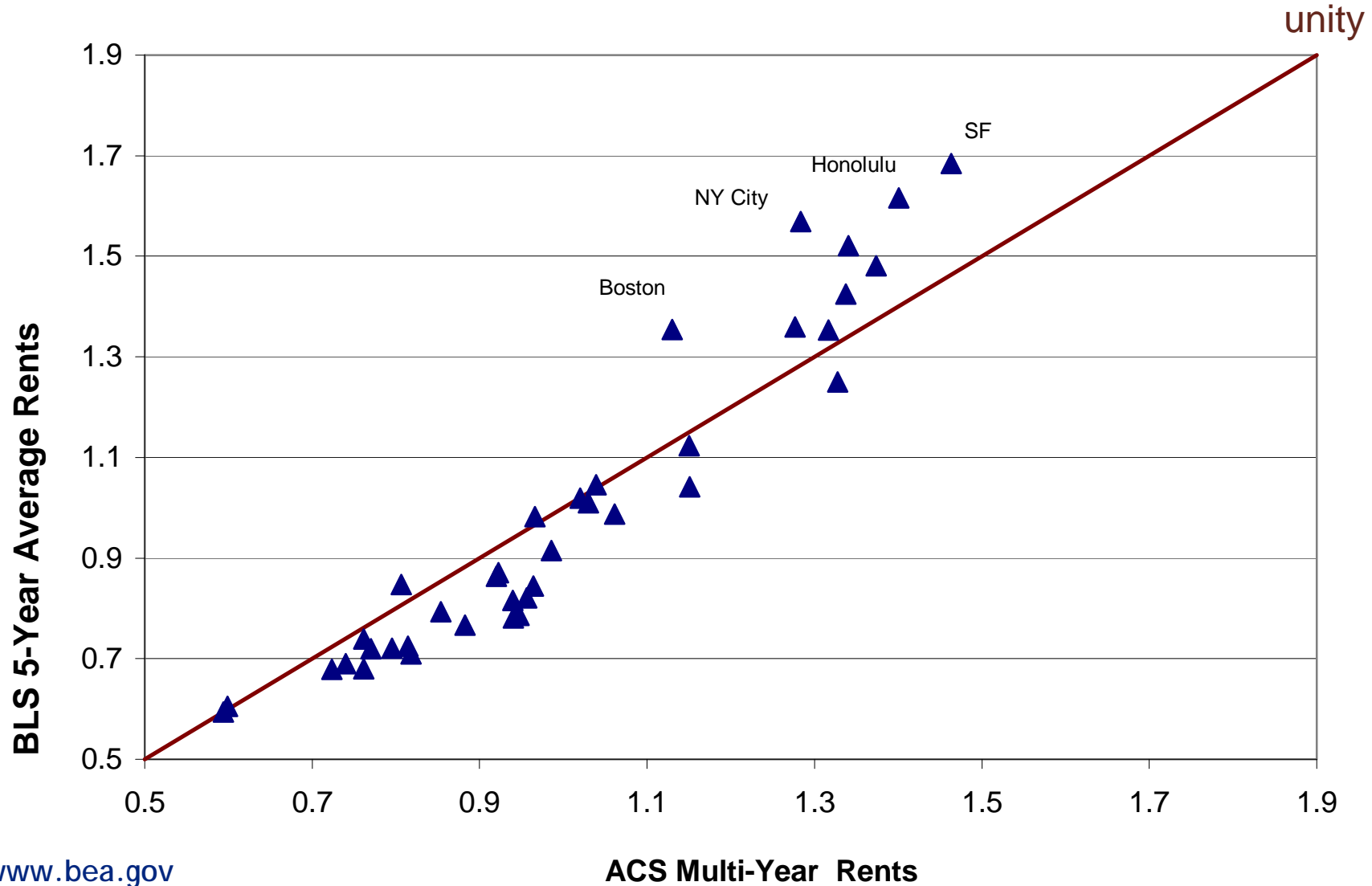
- Repeat for each year between 2005-2009
- For Rents, use direct estimates from ACS instead of allocated averages
- Multilateral (Geary) price levels for all geographies and overall RPP across five years

Second stage: ACS Rent data



Rents: BLS and ACS

ACS vs BLS Rents Only



Results by Expenditure Class

RPPs by Expenditure Class		Rural 10%	Micro 7%	Metro 83%	All 100%
Apparel	Goods	84	89	103	100.1
Food	Goods	95	97	101	99.7
Food	Services	92	94	101	100.0
Housing	Goods	88	92	102	99.8
Housing	Services	88	91	102	99.9
Rents	Services	67	75	106	100.6
Transport	Goods	98	98	100	99.3
Transport	Services	90	92	102	100.2
Overall		84.7	88.1	102.8	100.0

Results by Expenditure Class

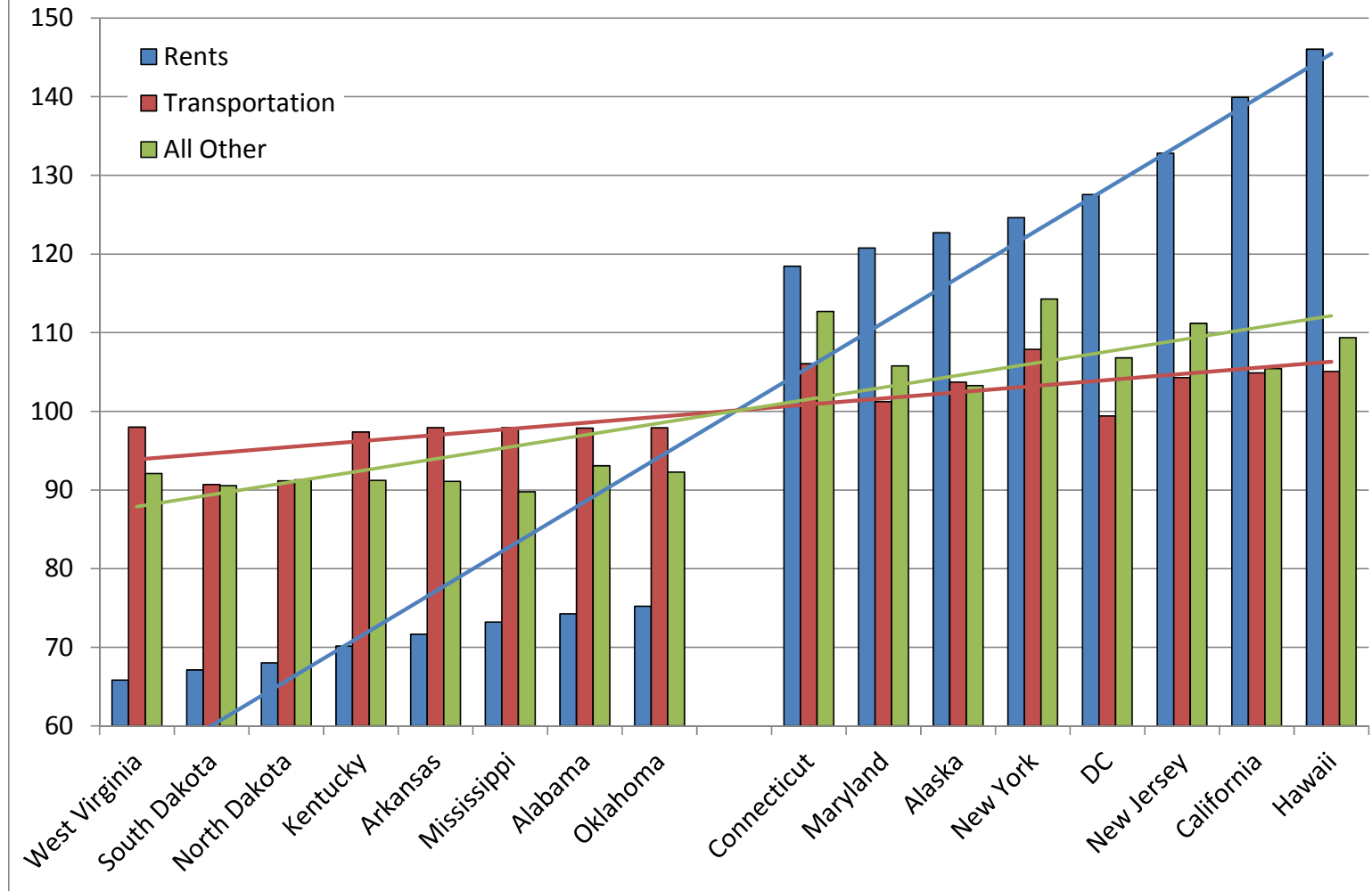
RPPs by Expenditure Class		Rural 10%	Micro 7%	Metro 83%	All 100%
Rental costs are 1.6 times higher on average in Metro vs. Rural areas (106 / 67)			89	103	100.1
			97	101	99.7
			94	101	100.0
Housing	Goods	88	92	102	99.8
Housing	Services	88	91	102	99.9
Rents	Services	67	75	106	100.6
Transport	Goods	98	98	100	99.3
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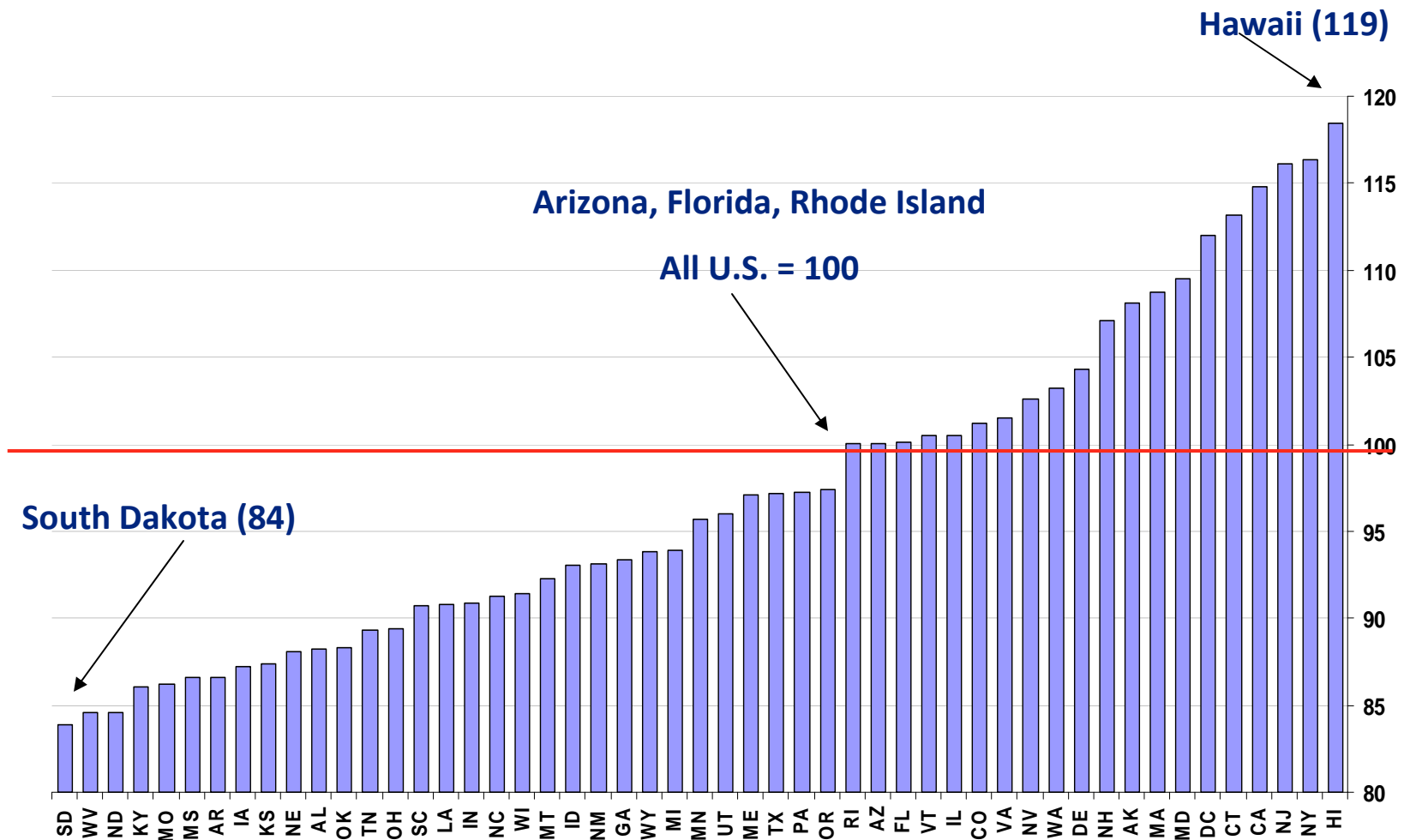
RPPs by Expenditure Class		Rural 10%	Micro 7%	Metro 83%	All 100%
Rural areas tend to have more inexpensive services relative to goods.			89	103	100.1
			97	101	99.7
Food	Services	92	94	101	100.0
Housing	Goods	88	92	102	99.8
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8 Lowest and 8 Highest Rents

RPPs for Rents, Transportation, and All Other Goods/Services by State
2005 - 2009



Overall RPPs by State

RPP Adjusted Personal Income

State Per Capita Personal Income (\$)			
	RPP	2009	
State		Unadjusted	Adjusted
California	114.8	42,395	36,975
DC	112.2	68,843	61,467
Maryland	109.7	48,247	44,034
New York	116.4	46,516	40,018
Ohio	89.4	35,408	39,679
Texas	97.1	38,609	39,803
Virginia	101.5	44,057	43,453
West Virginia	84.5	32,080	38,001
All U.S.	100	39,635	



Future Developments

- Evaluate consistency between 2005-2009 and 2006-2010
- Evaluate using expenditure weights from BEA's National Income and Product Accounts instead of the Consumer Expenditure survey