# Expenditure Weights in the Regional Price Parities

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Regional Price Parities (RPPs) are spatial price indexes that measure price level differences across regions, such as states or metropolitan areas (MSAs). RPP expenditure weights, an important component in RPP estimation, are based on Consumer Expenditure (CE) Survey data from the Bureau of Labor Statistics. To estimate RPP weights, CE-based data are allocated to counties in proportion to income. These results are adjusted to incorporate rents expenditures from the American Community Survey (ACS) of the Bureau of Census. Finally, the weights are balanced to reflect the commodity distribution of Personal Consumption Expenditures (PCE) of the Bureau of Economic Analysis.

This approach was implemented after a 2012 study in which alternative sets of weights were developed using distinct combinations of allocation method (either income or population-based), rents weights (either CE or ACS-based) and commodity distributions (either CE or PCE-based). The resulting RPPs, covering 2006-10, were compared to assess their sensitivity to the alternate specifications.

This paper describes the alternative estimation methods, their input data, and how the varied geographies of the inputs were reconciled. Resulting expenditure weights and RPPs are compared and the rationale for the current approach is discussed.

**CPI Cost Weights**

The estimation of RPP expenditure weights begins with weights from the Consumer Price Index (CPI) program, based on CE Survey data. These are provided for 42 areas specific to BLS. Of these, 31 are large metropolitan areas (Figure 1, top) and 11 combine areas of similar size class by region (Figure 1, bottom)[2]. Although they cover all U.S. counties, the boundaries of most BLS areas do not correspond to States or MSAs, the regions for which RPP weights are required[3]. To obtain such weights, the CPI data are allocated to counties so they can be re-aggregated to states and MSAs.

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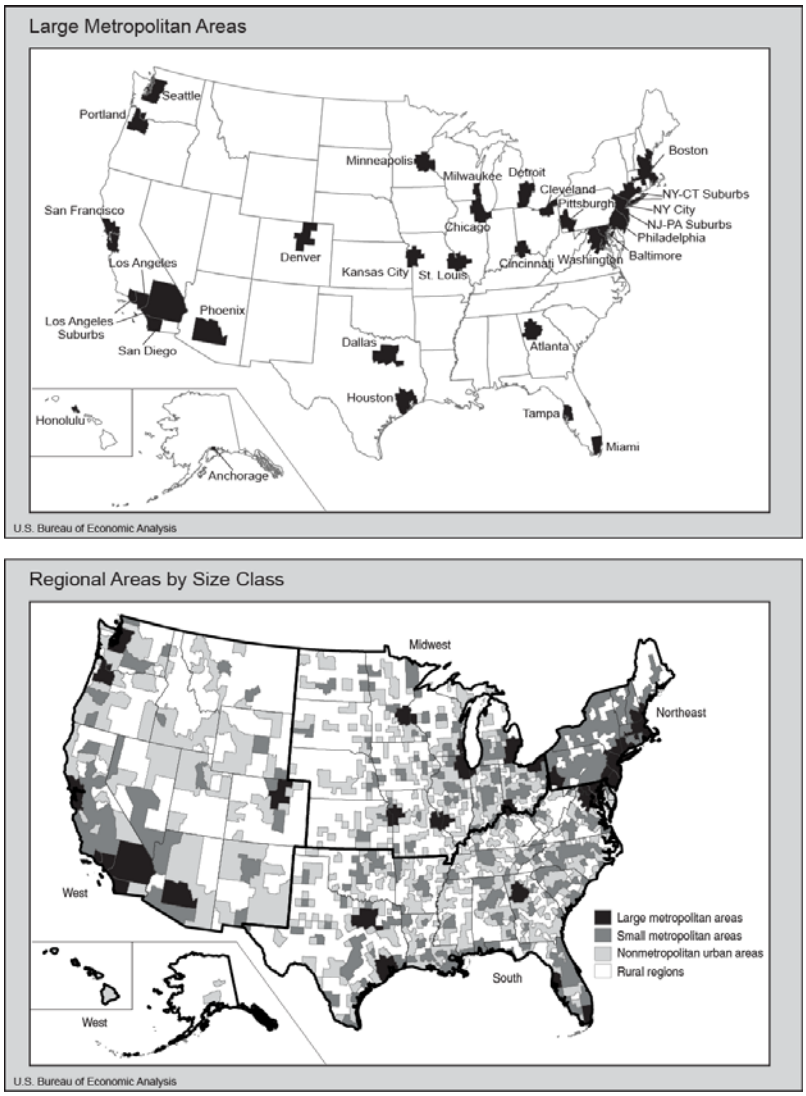
[2] For example, the West small metropolitan area combines all small metropolitan areas, shown in dark grey, within the West region. The West nonmetropolitan urban area and the West rural area combine all areas in the region shown in light grey and white, respectively. Three corresponding areas are found in the South and Midwest regions; the Northeast has no nonmetropolitan urban areas.

[3] Out of 366 OMB-defined MSAs in the 2006-10 period, only six have county definitions matching those of BLS areas. These are shown in Appendix Table 1. No BLS area definitions match state boundaries.

BLS area weights are subdivided into 211 goods and services categories known as item strata[4,5]. For RPP estimation, these are collapsed to 16 expenditure classes (shown in Appendix Table3). These include a goods and services class for 7 groups: education, food, housing, medical, recreation, transportation and other goods and services. The two remaining classes are apparel goods and rents services (hereafter, "rents"). Rents weights are the largest of the 16 classes, reflecting the large share of household budgets spent on shelter. This is all the more important because rents price levels have the largest range of all classes[6]. As discussed below, an alternative set of rents weights can be derived from the American Community Survey (ACS) and are available at finer levels of geographic detail than the CE-based weights.

Figure 1: The BLS areas consist of 31 large metropolitan areas and 11 regional areas defined by size class.




[4] Due to revisions over 2006-10, a total of 218 distinct item strata are used over the five year period.

[5] Cost weights for some item strata are excluded from the RPP weights. Four health insurance item strata (ME01-ME04) are excluded because no price observations are available. Two additional strata are excluded when redistributing RPP weights to a PCE-commodity basis, because they have no comparable PCE line items. These are Gardening and Lawn Care Services (HP02) and State Vehicle Registration and Driver's License (TF01).

[6] Aten, Figueroa, Martin, 2012, page 231.

**Allocation to Counties: Income vs. Population**

To obtain RPP weights, CPI cost weights are allocated from the BLS areas to counties so they can be re-aggregated to states and MSAs. Two alternative allocation methods were compared. The first assumes that each county's share of area weights is equal to its share of area income, based on ACS money income.[7] The second method assumes that each county's share of area weights is equal to its share of area population, based on Census population data.[8] County weights are the product of the area weight and the county share of area income or area population.

For example, Table 1 shows weight shares for the BLS area containing Boston and nearby counties. Columns 4 and 5 show shares using income-allocation and population-allocation, respectively. For most counties the share of area income is lower than the share of area population, and therefore the allocated weights are also lower.

Table 1: County Allocation of 2006-10 Weights for BLS Area A103, Boston-Brockton-Nashua, MA-NH-ME-CT

| BLS Area A103 | | | Income-Allocation | Population-Allocation |
|---|---|---|---|---|
| County FIPS (1) | Title (2) | State (3) | Share of Area Income (4) | Share of Area Population (5) |
| 9015 | Windham | CT | 0.1 | 0.2 |
| 23031 | York | ME | 0.6 | 0.7 |
| 25005 | Bristol | MA | 4.0 | 5.1 |
| 25009 | Essex | | 11.8 | 12.3 |
| 25013 | Hampden | | 0.0 | 0.0 |
| 25017 | Middlesex | | 28.4 | 24.7 |
| 25021 | Norfolk | | 13.5 | 11.1 |
| 25023 | Plymouth | | 7.8 | 8.2 |
| 25025 | Suffolk | | 10.1 | 11.8 |
| 25027 | Worcester | | 11.1 | 12.8 |
| 33011 | Hillsborough | NH | 5.8 | 6.2 |
| 33013 | Merrimack | | 0.2 | 0.3 |
| 33015 | Rockingham | | 4.9 | 4.7 |
| 33017 | Strafford | | 1.5 | 1.9 |
| Totals | | | 100.0 | 100.0 |

Shares in columns 5 and 6 are for the 2006-10 sum. For population-allocation, annual shares (not shown) were applied to annual area weights.

Within each county, the distribution of weights across the 16 expenditure classes is assumed equal to that of the BLS area in which the county is located.

[7] Income allocation uses county-level ACS Money Income data for the 5 year period from 2006 to 2010. Money income is defined as income regularly received before payments for items such as personal income taxes, social security, and Medicare deductions. Money income does not reflect that some families receive part of their income in the form of noncash benefits.

[8] Population allocation uses annual intercensal population from the Bureau of the Census for 2006 through 2010.

**Rents expenditure weights: CE vs. ACS**

As mentioned above, there exists an alternative set of county-level rents expenditures that can be derived from the ACS. This alternative set of weights is created by replacing the county distribution of the rents expenditure class with an estimate derived from the 5-year ACS file, broken down into several types of housing units: from one bedroom apartments to detached houses with three or more bedrooms. These estimates model the relationship of monthly tenants' rents to owner-equivalent rents in the BLS CPI housing file and apply it to the monthly tenants' rents data in the ACS file. The resulting imputed owner-equivalent rents are then multiplied by the number of owner-occupied units in each county and summed across the housing units. The total expenditure weight on rents by county is calculated as the sum of the estimated owner-occupied rent expenditures plus the directly observed tenant rent expenditures.

Replacing the BLS rents distribution with one derived from the ACS changes the county rents weights, total county weights and expenditure class shares. For example, Table 2 show two sets of income-allocated weight shares for Suffolk County MA, one using CE-based rents, the other using ACS-based rents. The ACS-based rents estimate is lower, decreasing the rents weight, rents share, and total county weights; and changing the distribution of all other expenditure class weights.

Table 2: Weight Shares for Suffolk County, MA using CE and ACS-based rents

| Expenditure Type | 2006-10 income-allocated weight shares using: | |
|---|---|---|
| | CE-based rents share | ACS-based rents share |
| Goods | 31.1 | 31.3 |
| Services | 68.9 | 68.7 |
| Rents | 32.2 | 31.7 |
| Other Services | 36.7 | 37.0 |
| Total | 100.0 | 100.0 |

Across all counties, weights incorporating ACS-based rents still sum to the same expenditure class totals as CE-based weights, and therefore retain a CE-based commodity distribution at the national level.

**Redistribution to PCE-Based Expenditure Class Shares**

The final alternatives involve the redistribution of expenditure class weights at the national level from a CE-based commodity distribution to a PCE-basis. The redistribution uses a set of PCE-based shares for CPI item strata summed to the 16 expenditure classes[9]. The shares were developed at BLS using a PCE-CPI concordance to map PCE categories to CPI item strata that represent the same goods and services.

The PCE-based shares incorporate an adjustment that accounts for differences in expenditure definitions between the CPI and the PCE. For example, CPI only includes out-of-pocket expenditures for medical goods and services, whereas PCE includes all expenditures made by and on behalf of

[9]Blair, Caitlin. 2012. "Constructing a PCE-Weighted Consumer Price Index", Appendix B, page 25.

consumers, including employer and government contributions. The adjustment includes a factor to remove such payments yielding PCE shares that are consistent with CPI definitions.

The redistribution uses a RAS procedure[10], also known as bi-proportional balancing, to transform the CE-based class shares to a PCE-basis. The procedure iteratively balances county weights between two sets of controls: the 16 PCE-based expenditure class shares and the 3,143 county totals derived from comparable CE-based weights[11]. After several iterations, the sum of weights across expenditure classes shifts from a CE to a PCE-based distribution, while the county totals remain unchanged[12]. The adjustment shifts the distribution of weights across the classes, notably reducing the share of rents from 29.2 to 20.4 as shown below (Appendix Table 3 breaks out these data for 16 expenditure classes).

Table 3: CE and PCE-based weight shares by four expenditure types, 2006-10

| Expenditure Type | CE-based Distribution | PCE-Based Distribution |
|---|---|---|
| | Share | Share |
| Goods | 34.8 | 42.6 |
| Services | 65.2 | 57.4 |
| Rents | 29.2 | 20.4 |
| Other services | 36.1 | 37.0 |
| Total | 100.0 | 100.0 |

Weight shares are for the 2006-10 sum.

**Results: County Weights and MSA RPPs**

To demonstrate how the various methods impact county weights and RPPs, we discuss results for three alternatives. Each differs from the current method in one of three specifications: the first uses a CE-based commodity distribution, the second uses CE-based rents weights, and the third uses population for the county allocation. Within each, the remaining specifications are the same as the current method. The datasets are summarized below:

Table 4: Current Method and Alternatives for Comparison

| Dataset | Label | Allocation | Rents | Commodity Distribution |
|---|---|---|---|---|
| Current Method | INC-ACS-PCE | Income | ACS | PCE |
| Alternative 1 | POP-ACS-PCE | **Population** | ACS | PCE |
| Alternative 2 | INC-CE-PCE | Income | **CE** | PCE |
| Alternative 3 | INC-ACS-CE | Income | ACS | **CE** |

Comparisons below show the difference between current method's results and those of the specified alternative. Because of the importance of the rents class to RPP estimation, the tables also include the rents RPPs and weight-shares.

[10] Bacharach, Michael. 1965. "Estimating Nonnegative Matrices from Marginal Data", *International Economic Review*, Vol. 6, No. 3 (September), pp. 294-310.

[11] See footnote 3. Two noncomparable item strata are removed, accounting for the lower PCE-based total.

[12] For the 2006-10 data, the redistribution procedure took 7 iterations to produce PCE-based weights that matched the controls within a tolerance of $1.

Alternative 1: Population-allocated county weights

*County Weights*: Among the alternatives, the largest differences appear in comparisons with Alternative 1, ranging from -34,001 to 66,337 (Table 5). These reflect differences in non-rents weights due to the difference in allocation methods. The ACS-based rents weights are the same across treatments because these are estimated from county level data and are unaffected by allocation differences. For example, within BLS area A109, New York County's income share is higher than its population share. Under the current method's income-allocation, this yields higher non-rents weights, and therefore a lower rents share. For Kings and Bronx counties, also in area A109, the opposite holds.

Table5: Top 5 and bottom 5 differences in county weights totals, 2006-10: Current method less Alternative 1

| County FIPS | BLS Area | Title | State | All Items Expenditure Weights (2006-10 sum, millions $) | | | | Rents Share of County Weights | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Current | Alt. 1 | Diff. | Percent | Current | Alt.1 |
| 36061 | A109 | New York | NY | 199,232.6 | 132,895.7 | 66,337.9 | 49.9 | 0.21 | 0.34 |
| 6059 | A420 | Orange | CA | 297,085.9 | 264,333.3 | 32,752.6 | 12.4 | 0.26 | 0.30 |
| 26125 | A208 | Oakland | MI | 153,911.5 | 123,794.5 | 30,116.9 | 24.3 | 0.17 | 0.21 |
| 53033 | A423 | King | WA | 246,050.3 | 223,231.5 | 22,818.8 | 10.2 | 0.18 | 0.20 |
| 12099 | X300 | Palm Beach | FL | 139,071.3 | 116,257.2 | 22,814.1 | 19.6 | 0.23 | 0.28 |
| | | | | | | | | | |
| 36047 | A109 | Kings | NY | 145,770.5 | 170,065.5 | -24,295.0 | -14.3 | 0.29 | 0.24 |
| 6071 | A420 | San Bernardino | CA | 128,831.4 | 153,571.4 | -24,740.0 | -16.1 | 0.27 | 0.22 |
| 26163 | A208 | Wayne | MI | 147,041.4 | 173,960.7 | -26,919.2 | -15.5 | 0.19 | 0.15 |
| 36005 | A109 | Bronx | NY | 60,859.9 | 88,107.8 | -27,247.9 | -30.9 | 0.32 | 0.21 |
| 42101 | A102 | Philadelphia | PA | 93,043.6 | 127,044.5 | -34,000.9 | -26.8 | 0.23 | 0.16 |

*MSA Level RPPs*: The differences in RPPs range from -3.9 to 1.0 (table 6), driven by the relationship between rents price levels and shares. The largest differences occur in MSAs where rents price levels are relatively high or low relative to other expenditure classes; and there is a large difference in rents shares across treatments. Under the current method, for example, low rents price levels in McAllen-Edinburg-Mission, TX combined with a higher rents share yields a lower all items RPP than does the alternative.

Table 6: Top 5 and bottom 5 differences in Regional Price Parities for MSAs, 2006-10: Current Method less Alternative 1

| MSA Code | Title | All Items RPP | | | | Rents RPP | | Rents share of MSA weights | |
|---|---|---|---|---|---|---|---|---|---|
| | | Current | Alt. 1 | Diff. | Percent | Current | Alt. 1 | Current | Alt. 1 |
| 46700 | Vallejo-Fairfield, CA | 116.0 | 115.0 | 1.0 | 0.9 | 132.5 | 132.6 | 0.26 | 0.20 |
| 42100 | Santa Cruz-Watsonville, CA | 118.9 | 118.0 | 0.9 | 0.8 | 150.9 | 151.0 | 0.24 | 0.22 |
| 15260 | Brunswick, GA | 86.8 | 86.0 | 0.8 | 0.9 | 75.2 | 75.3 | 0.27 | 0.32 |
| 42220 | Santa Rosa-Petaluma, CA | 117.1 | 116.4 | 0.7 | 0.6 | 138.3 | 138.4 | 0.25 | 0.22 |
| 40140 | Riverside-San Bernardino-Ontario, CA | 105.4 | 104.7 | 0.7 | 0.7 | 120.5 | 120.5 | 0.27 | 0.23 |
| | | | | | | | | | |
| 29700 | Laredo, TX | 91.9 | 93.9 | -2.0 | -2.1 | 77.1 | 77.2 | 0.22 | 0.13 |
| 21340 | El Paso, TX | 90.0 | 92.0 | -2.0 | -2.2 | 70.8 | 70.8 | 0.22 | 0.15 |
| 25180 | Hagerstown-Martinsburg, MD-WV | 102.1 | 104.1 | -2.1 | -2.0 | 85.2 | 85.3 | 0.24 | 0.17 |
| 15180 | Brownsville-Harlingen, TX | 87.7 | 91.4 | -3.7 | -4.0 | 64.4 | 64.4 | 0.21 | 0.12 |
| 32580 | McAllen-Edinburg-Mission, TX | 87.2 | 91.1 | -3.9 | -4.3 | 62.4 | 62.4 | 0.21 | 0.12 |

Alternative 2: CE-based rents weights

*County-level weights*: In comparisons with Alternative 2, the differences narrow to a range of -28,070 to 16,300 (Table 7). These reflect the differences between the CE and ACS-based rent weights, either of which may be the larger depending on the county. For example, in New York County, the ACS-based estimate is lower than the CE-based, income-allocated estimate. The reverse is true in Harris County.

Table 7: Top 5 and bottom 5 differences in county weights totals, 2006-10: Current method less Alternative 2.

| County FIPS | Title | State | All Items Expenditure Weights (2006-10 sum, millions $) | | | | Rents Share of County Weights | |
|---|---|---|---|---|---|---|---|---|
| | | | Current | Alt. 2 | Difference | Percent | Current | Alt. 2 |
| 48201 | Harris | TX | 309,027.3 | 292,726.9 | 16,300.5 | 5.6 | 0.21 | 0.18 |
| 6059 | Orange | CA | 297,085.9 | 284,160.3 | 12,925.6 | 4.5 | 0.26 | 0.24 |
| 6065 | Riverside | CA | 154,958.1 | 144,922.8 | 10,035.3 | 6.9 | 0.27 | 0.24 |
| 12099 | Palm Beach | FL | 139,071.3 | 129,489.1 | 9,582.2 | 7.4 | 0.23 | 0.19 |
| 6073 | San Diego | CA | 265,366.9 | 256,383.4 | 8,983.5 | 3.5 | 0.28 | 0.26 |
| | | | | | | | | |
| 12011 | Broward | FL | 176,127.8 | 190,585.2 | -14,457.4 | -7.6 | 0.24 | 0.28 |
| 53033 | King | WA | 246,050.3 | 263,237.6 | -17,187.4 | -6.5 | 0.18 | 0.22 |
| 12086 | Miami-Dade | FL | 192,947.3 | 211,382.9 | -18,435.6 | -8.7 | 0.23 | 0.28 |
| 6037 | Los Angeles | CA | 805,736.1 | 832,316.3 | -26,580.1 | -3.2 | 0.24 | 0.26 |
| 36061 | New York | NY | 199,232.6 | 227,302.8 | -28,070.1 | -12.3 | 0.21 | 0.28 |

*MSA Level RPPs*: The range of differences in RPPs is similar to the first comparison, from -3.4 to 1.5 (table 8). The largest differences again occur where rents price levels are among the highest or lowest across all MSAs, and the difference in the rents share is large. Under the alternate method, for example, low rents price levels in Bismarck, ND combined with a higher rents share yields a lower all items RPP than does the current method.

Table 8: Top 5 and bottom 5 differences in Regional Price Parities for MSAs, 2006-10: Current Method less Alternative 2

| MSA | Title | All Items RPPs | | | | Rents RPPs | | Rents share of MSA weights | |
|---|---|---|---|---|---|---|---|---|---|
| | | Current | Alt. 2 | Diff. | Percent | Current | Alt. 2 | Current | Alt. 2 |
| 13900 | Bismarck, ND | 91.8 | 90.3 | 1.5 | 1.7 | 71.0 | 70.5 | 0.13 | 0.17 |
| 21820 | Fairbanks, AK | 105.6 | 104.1 | 1.5 | 1.4 | 136.2 | 135.2 | 0.22 | 0.18 |
| 24500 | Great Falls, MT | 91.0 | 89.5 | 1.5 | 1.7 | 69.9 | 69.4 | 0.16 | 0.20 |
| 12700 | Barnstable Town, MA | 103.2 | 101.9 | 1.3 | 1.3 | 120.9 | 119.9 | 0.23 | 0.17 |
| 28740 | Kingston, NY | 103.4 | 102.1 | 1.3 | 1.3 | 122.9 | 121.9 | 0.22 | 0.17 |
| | | | | | | | | | |
| 21060 | Elizabethtown, KY | 85.0 | 87.4 | -2.5 | -2.8 | 71.5 | 70.9 | 0.29 | 0.18 |
| 27180 | Jackson, TN | 84.7 | 87.4 | -2.7 | -3.1 | 71.4 | 70.8 | 0.30 | 0.18 |
| 17420 | Cleveland, TN | 84.4 | 87.2 | -2.7 | -3.1 | 70.4 | 69.9 | 0.30 | 0.18 |
| 27860 | Jonesboro, AR | 82.8 | 85.7 | -2.9 | -3.4 | 65.5 | 65.0 | 0.28 | 0.18 |
| 34100 | Morristown, TN | 82.2 | 85.6 | -3.4 | -3.9 | 65.1 | 64.6 | 0.29 | 0.18 |

Alternative 3: CE-based commodity distribution

*County-Level Weights*: The differences narrow further under alternative 3, ranging from 0.0 to -6,968.1 (Table 9). Under the current method, weights are lower across all counties. This is because the current method's PCE-adjustment excludes two item strata that are retained in the alternative weights (see footnote 2). The rents share of county weights is always lower under the current method because the PCE adjustment reduces rents weights relative to other classes by about one-third (see page 4)

Table 9: Top 5 and bottom 5 differences in county weights totals, 2006-10: Current Method less Alternative 3

| County FIPS | Title | State | All Items Expenditure Weights (2006-10 sum, millions $) | | | | Rents Share of County Weights | |
|---|---|---|---|---|---|---|---|---|
| | | | Current | Alt 3 | Diff | Percent | Current | Alt 3 |
| 48261 | Kenedy | TX | 5.4 | 5.4 | 0.0 | -0.8 | 0.12 | 0.18 |
| 48301 | Loving | TX | 9.7 | 9.8 | -0.1 | -0.8 | 0.03 | 0.05 |
| 15005 | Kalawao* | HI | 12.0 | 12.1 | -0.1 | -0.8 | 0.00 | 0.00 |
| 31117 | McPherson | NE | 20.6 | 20.7 | -0.1 | -0.6 | 0.12 | 0.18 |
| 31113 | Logan | NE | 34.0 | 34.2 | -0.2 | -0.5 | 0.20 | 0.28 |
| | | | | | | | | |
| 48201 | Harris | TX | 309,027.3 | 311,024.2 | -1,996.9 | -0.6 | 0.21 | 0.30 |
| 17031 | Cook | IL | 446,165.3 | 448,234.1 | -2,068.8 | -0.5 | 0.21 | 0.30 |
| 4013 | Maricopa | AZ | 348,190.1 | 350,401.5 | -2,211.4 | -0.6 | 0.20 | 0.29 |
| 6059 | Orange | CA | 297,085.9 | 299,391.0 | -2,305.1 | -0.8 | 0.26 | 0.36 |
| 6037 | Los Angeles | CA | 805,736.1 | 812,704.2 | -6,968.1 | -0.9 | 0.24 | 0.34 |

* ACS rents data are not available for Kalawao County.

*MSA-Level RPPs*: The range of differences in all-items RPPs under Alternative 3 is greater than in the previous two comparisons, from -5.8 to 4.6 (table 10). Across all MSAs, the rents share of weights is lower under the current method due to the PCE-adjustment, narrowing the range of all-items RPPs relative to the alternative. The direction of the difference in all-items RPPs depends on rent price levels: MSAs with relatively low rents RPPs (top 5 below) have higher all-items RPPs under the current method. Conversely, MSAs with relatively high rents RPPs (bottom 5 below) have lower all-items RPPs.

Table 10: Top 5 and bottom 5 differences in MSA Regional Price Parities, 2006-10: Current Method less Alternative 3

| MSA | Title | All Items RPPs | | | | Rents RPPs | | Rents share of MSA weights | |
|---|---|---|---|---|---|---|---|---|---|
| | | Current | Alt. 3 | Diff | Percent | Current | Alt. 3 | Current | Alt. 3 |
| 27780 | Johnstown, PA | 87.3 | 82.6 | 4.6 | 5.6 | 56.8 | 57.0 | 0.18 | 0.26 |
| 48540 | Wheeling, WV-OH | 87.4 | 83.4 | 4.1 | 4.9 | 59.2 | 59.3 | 0.17 | 0.25 |
| 32580 | McAllen-Edinburg-Mission, TX | 87.2 | 83.3 | 3.9 | 4.7 | 62.4 | 62.6 | 0.21 | 0.29 |
| 28700 | Kingsport-Bristol-Bristol, TN-VA | 88.2 | 84.3 | 3.8 | 4.5 | 61.3 | 61.5 | 0.18 | 0.25 |
| 22520 | Florence-Muscle Shoals, AL | 88.1 | 84.3 | 3.8 | 4.5 | 61.9 | 62.1 | 0.18 | 0.26 |
| | | | | | | | | | |
| 42060 | Santa Barbara-Santa Maria-Goleta, CA | 105.0 | 109.6 | -4.6 | -4.2 | 156.1 | 156.6 | 0.21 | 0.30 |
| 41860 | San Francisco-Oakland-Fremont, CA | 120.0 | 124.8 | -4.8 | -3.8 | 163.2 | 163.8 | 0.23 | 0.32 |
| 41940 | San Jose-Sunnyvale-Santa Clara, CA | 120.2 | 125.2 | -5.0 | -4.0 | 167.1 | 167.7 | 0.23 | 0.32 |
| 26180 | Honolulu, HI | 121.1 | 126.7 | -5.6 | -4.5 | 163.7 | 164.2 | 0.27 | 0.37 |
| 37100 | Oxnard-Thousand Oaks-Ventura, CA | 110.6 | 116.4 | -5.8 | -5.0 | 153.2 | 153.7 | 0.26 | 0.37 |

**Conclusions:**

To summarize, the choice of allocation method, rents weight, and commodity distribution impacts resulting RPPs largely through the impact on rents. RPPs are sensitive to rents because of their large expenditure share and wide range of the price levels. Large differences between methods arise where rents price levels are relatively high or low and the alternative methods create large differences in rents shares.

The current method uses income-allocation, ACS-based rents, and a CE commodity distribution. Income is arguably more appropriate for our allocation than population because we are interested in weights related to dollar expenditures. Correlations with CE-based weights show little difference between population and income[13] (table 11).

Table 11. Correlations across 42 BLS areas (2006-10 annual averages, log values)

| *Data Series* | Intercensal Population | ACS Money Income |
|---|---|---|
| CE-based weights | 0.9586 | 0.9599 |

Differences arising from the county allocation are dampened when the weights are aggregated to the MSA and State levels. For example, New York County's income-allocated weights were 49.9% higher than its population-allocated weights; while Kings and Bronx counties were 14.3% and 30.9% lower, respectively (Table 5). However, when aggregated to the State level, the difference is 1.5%.

The choice of rents weights and commodity distribution are more straightforward. We incorporate ACS-based rents because they are derived from direct observation at the county-level across the United States. By contrast, the CE-based rents are only collected for the 38 urban BLS areas. These data exclude rural areas and must be allocated to counties. Our use of the ACS-based rents removes the need to trust allocation assumptions for this important expenditure class. Finally, the current method uses PCE-based weights because they are consistent with the accounting framework of BEA data, including the regional data intended for adjustment by the RPPs .

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[13] This was also seen in preparing prototype 2005-09 estimates, see Aten, Figueroa, Martin (2011, p 11).

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Appendix table 1: BLS sampling areas with 2006-10 share data

| Sampling area code | Sampling area title | County area[1] | CPI cost weights 2006-10 shares | ACS money Income 2006-10 shares | Census population 2006-10 annual average shares |
|---|---|---|---|---|---|
| All | | 3155 | 100.0 | 100.0 | 100.0 |
| A102 | Philadelphia-Wilmington-Atlantic City, PA-NJ-DE-MD | 14 | 2.4 | 2.4 | 2.1 |
| A103 | Boston-Brockton-Nashua, MA-NH-ME-CT | 14 | 2.5 | 2.5 | 2.0 |
| A104 | Pittsburgh, PA | 6 | 0.9 | 0.8 | 0.8 |
| A109 | New York City | 5 | 2.3 | 2.9 | 2.7 |
| A110 | New York-Connecticut Suburbs | 11 | 3.2 | 3.1 | 2.1 |
| A111 | New Jersey-Pennsylvania Suburbs | 15 | 3.0 | 3.0 | 2.3 |
| A207 | Chicago-Gary-Kenosha, IL-IN-WI | 13 | 3.3 | 3.5 | 3.1 |
| A208 | Detroit-Ann Arbor-Flint, MI | 10 | 2.0 | 1.8 | 1.8 |
| A209 | St. Louis, MO-IL | 12 | 1.0 | 0.9 | 0.9 |
| A210 | Cleveland-Akron, OH | 8 | 0.9 | 0.9 | 1.0 |
| A211[2] | Minneapolis-St. Paul, MN-WI | 13 | 1.4 | 1.3 | 1.1 |
| A212 | Milwaukee-Racine, WI | 5 | 0.6 | 0.6 | 0.6 |
| A213 | Cincinnati-Hamilton, OH-KY-IN | 13 | 0.8 | 0.7 | 0.7 |
| A214 | Kansas City, MO-KS | 11 | 0.7 | 0.7 | 0.6 |
| A312 | Washington, DC-MD-VA-WV | 26 | 2.5 | 2.8 | 1.9 |
| A313[2] | Baltimore, MD | 7 | 1.0 | 1.1 | 0.9 |
| A316 | Dallas-Fort Worth, TX | 12 | 2.0 | 2.1 | 2.0 |
| A318 | Houston-Galveston-Brazoria, TX | 8 | 1.7 | 1.9 | 1.9 |
| A319 | Atlanta, GA | 20 | 1.6 | 1.7 | 1.6 |
| A320 | Miami-Fort Lauderdale, FL | 2 | 1.6 | 1.3 | 1.4 |
| A321[2] | Tampa-St. Petersburg-Clearwater, FL | 4 | 0.9 | 0.9 | 0.9 |
| A419 | Los Angeles-Long Beach, CA | 1 | 3.2 | 3.2 | 3.2 |
| A420 | Los Angeles Suburbs, CA | 4 | 2.4 | 2.7 | 2.6 |
| A422 | San Francisco-Oakland-San Jose, CA | 10 | 3.3 | 3.4 | 2.4 |
| A423 | Seattle-Tacoma-Bremerton, WA | 6 | 1.9 | 1.6 | 1.3 |
| A424[2] | San Diego, CA | 1 | 1.0 | 1.1 | 1.0 |
| A425 | Portland-Salem, OR-WA | 8 | 1.1 | 0.9 | 0.8 |
| A426[2] | Honolulu, HI | 1 | 0.3 | 0.3 | 0.3 |
| A427 | Anchorage, AK | 1 | 0.1 | 0.1 | 0.1 |
| A429[2] | Phoenix-Mesa, AZ | 2 | 1.4 | 1.4 | 1.3 |
| A433 | Denver-Boulder-Greeley, CO | 8 | 1.2 | 1.1 | 1.0 |
| D200 | Midwest nonmetropolitan urban | 303 | 1.8 | 2.9 | 3.5 |
| D300 | South nonmetropolitan urban | 457 | 2.4 | 4.3 | 5.8 |
| D400 | West nonmetropolitan urban | 141 | 1.8 | 2.1 | 2.4 |
| X100 | Northeast small metropolitan | 125 | 5.3 | 5.8 | 5.9 |
| X200 | Midwest small metropolitan | 138 | 6.4 | 6.2 | 6.6 |
| X300 | South small metropolitan | 312 | 15.3 | 15.9 | 17.2 |
| X499 | West small metropolitan | 50 | 6.2 | 5.4 | 6.0 |
| R100 | Northeast rural | 40 | 1.0 | 0.4 | 0.5 |
| R200 | Midwest rural | 529 | 2.5 | 1.7 | 2.1 |
| R300 | South rural | 574 | 4.2 | 2.1 | 3.1 |
| R400 | West rural | 215 | 1.0 | 0.6 | 0.8 |
| CPI urban | | 1797 | 91.4 | 95.2 | 93.5 |
| CPI rural | | 1358 | 8.6 | 4.8 | 6.5 |
| Maximum | | 457 | 15.3 | 15.9 | 17.2 |
| Minimum | | 1 | 0.1 | 0.1 | 0.1 |
| Range | | 456 | 15.2 | 15.8 | 17.2 |

[1] The BLS areas cover 3,143 counties. Most counties are contained in a single area; however, twelve in the Northeast region are each subdivided by BLS areas yielding 24 county-area combinations (see Appendix Table 2). The total number of distinct county-areas is 3,155.

[2] These sampling areas have identical definitions as OMB-defined MSAs for which 2006-10 RPPs were estimated.

Appendix Table 2: Twelve northeast counties subdivided by BLS areas

| 12 Counties | | | 24 County-Areas | |
|---|---|---|---|---|
| State | County FIPS | Title | BLS Area | Share of County Weights |
| CT | 9005 | Litchfield | A110 | 16.6 |
| | | | X100 | 83.4 |
| | 9007 | Middlesex | A110 | 12.2 |
| | | | X100 | 87.8 |
| | 9009 | New Haven | A110 | 79.0 |
| | | | X100 | 21.0 |
| | 9015 | Windham | A103 | 8.3 |
| | | | X100 | 91.7 |
| ME | 23031 | York | A103 | 21.9 |
| | | | X100 | 78.1 |
| MA | 25005 | Bristol | A103 | 55.1 |
| | | | X100 | 44.9 |
| | 25013 | Hampden | A103 | 0.5 |
| | | | X100 | 99.5 |
| | 25027 | Worcester | A103 | 96.3 |
| | | | X100 | 3.7 |
| NH | 33011 | Hillsborough | A103 | 92.3 |
| | | | X100 | 7.7 |
| | 33013 | Merrimack | A103 | 11.0 |
| | | | X100 | 89.0 |
| | 33015 | Rockingham | A103 | 96.2 |
| | | | X100 | 3.8 |
| | 33017 | Strafford | A103 | 94.0 |
| | | | X100 | 6.0 |

Weights shares are for the 2006-10 sum.

Appendix Table 3: CE and PCE-based weights by 16 expenditure classes, 2006-10

| Expenditure class | | CE-based Share | PCE-based Share |
|---|---|---|---|
| Apparel | Goods | 3.7 | 5.5 |
| Education | Goods | 0.5 | 1.0 |
| | Services | 5.5 | 5.7 |
| Food | Goods | 8.6 | 10.1 |
| | Services | 6.5 | 7.1 |
| Housing | Goods | 3.9 | 5.7 |
| | Services | 8.8 | 7.0 |
| Medical | Goods | 1.6 | 1.2 |
| | Services | 4.5 | 3.9 |
| Other | Goods | 1.7 | 2.9 |
| | Services | 1.8 | 4.0 |
| Recreation | Goods | 2.5 | 5.4 |
| | Services | 3.3 | 3.1 |
| Rents | Services | 29.2 | 20.4 |
| Transportation | Goods | 12.1 | 10.7 |
| | Services | 5.7 | 6.3 |
| Total | | 100.0 | 100.0 |

Weights shares are for the 2006-10 sum.

Appendix Table 4: Shares for Income vs. Population-Allocated Weights for States, 2006-10

| State FIPS | State | Income-Allocation | | Population-Allocation | | income less Population Allocation | |
|---|---|---|---|---|---|---|---|
| | | Share | Rank | Share | Rank | Share | Rank |
| 1 | AL | 1.3 | 25 | 1.3 | 25 | 0.0 | 0 |
| 2 | AK | 0.3 | 47 | 0.3 | 48 | 0.0 | -1 |
| 4 | AZ | 2.1 | 16 | 2.1 | 16 | -0.1 | 0 |
| 5 | AR | 0.8 | 34 | 0.8 | 34 | 0.0 | 0 |
| 6 | CA | 12.7 | 1 | 12.8 | 1 | -0.1 | 0 |
| 8 | **CO** | 1.9 | 18 | 1.8 | 20 | 0.1 | -2 |
| 9 | CT | 1.6 | 23 | 1.4 | 24 | 0.2 | -1 |
| 10 | DE | 0.3 | 45 | 0.3 | 45 | 0.0 | 0 |
| 11 | **DC** | 0.3 | 48 | 0.3 | 46 | 0.0 | 2 |
| 12 | FL | 6.0 | 4 | 5.7 | 4 | 0.3 | 0 |
| 13 | **GA** | 2.7 | 12 | 2.7 | 10 | -0.1 | 2 |
| 15 | HI | 0.4 | 42 | 0.4 | 42 | 0.0 | 0 |
| 16 | ID | 0.5 | 41 | 0.5 | 41 | 0.0 | 0 |
| 17 | IL | 4.2 | 6 | 4.2 | 6 | 0.0 | 0 |
| 18 | **IN** | 1.8 | 21 | 1.9 | 19 | -0.1 | 2 |
| 19 | IA | 1.0 | 31 | 0.9 | 30 | 0.1 | 1 |
| 20 | KS | 0.9 | 32 | 0.9 | 33 | 0.0 | -1 |
| 21 | KY | 1.2 | 26 | 1.3 | 26 | 0.0 | 0 |
| 22 | LA | 1.1 | 28 | 1.2 | 28 | 0.0 | 0 |
| 23 | ME | 0.5 | 38 | 0.6 | 37 | 0.0 | 1 |
| 24 | MD | 2.1 | 15 | 2.1 | 15 | 0.0 | 0 |
| 25 | MA | 2.6 | 13 | 2.6 | 13 | 0.1 | 0 |
| 26 | MI | 3.3 | 9 | 3.4 | 9 | -0.1 | 0 |
| 27 | MN | 2.0 | 17 | 2.0 | 17 | 0.0 | 0 |
| 28 | MS | 0.7 | 35 | 0.8 | 35 | -0.1 | 0 |
| 29 | **MO** | 1.8 | 20 | 1.9 | 18 | -0.1 | 2 |
| 30 | MT | 0.3 | 44 | 0.3 | 43 | 0.0 | 1 |
| 31 | **NE** | 0.6 | 37 | 0.5 | 39 | 0.0 | -2 |
| 32 | NV | 1.0 | 30 | 0.9 | 31 | 0.1 | -1 |
| 33 | NH | 0.5 | 39 | 0.5 | 40 | 0.0 | -1 |
| 34 | NJ | 3.7 | 7 | 3.7 | 7 | 0.0 | 0 |
| 35 | NM | 0.6 | 36 | 0.6 | 36 | 0.0 | 0 |
| 36 | NY | 6.7 | 3 | 6.7 | 3 | -0.1 | 0 |
| 37 | NC | 2.6 | 14 | 2.5 | 14 | 0.1 | 0 |
| 38 | ND | 0.2 | 50 | 0.2 | 50 | 0.0 | 0 |
| 39 | OH | 3.5 | 8 | 3.5 | 8 | -0.1 | 0 |
| 40 | OK | 1.0 | 29 | 1.0 | 29 | 0.0 | 0 |
| 41 | OR | 1.4 | 24 | 1.4 | 23 | 0.0 | 1 |
| 42 | PA | 4.2 | 5 | 4.4 | 5 | -0.2 | 0 |
| 44 | RI | 0.3 | 43 | 0.3 | 44 | 0.0 | -1 |
| 45 | SC | 1.2 | 27 | 1.2 | 27 | 0.0 | 0 |
| 46 | SD | 0.2 | 49 | 0.2 | 49 | 0.0 | 0 |
| 47 | TN | 1.7 | 22 | 1.7 | 22 | 0.0 | 0 |
| 48 | TX | 7.0 | 2 | 7.2 | 2 | -0.3 | 0 |
| 49 | UT | 0.8 | 33 | 0.9 | 32 | 0.0 | 1 |
| 50 | VT | 0.3 | 46 | 0.3 | 47 | 0.0 | -1 |
| 51 | **VA** | 2.9 | 10 | 2.6 | 12 | 0.3 | -2 |
| 53 | WA | 2.7 | 11 | 2.7 | 11 | 0.0 | 0 |
| 54 | **WV** | 0.5 | 40 | 0.5 | 38 | 0.0 | 2 |
| 55 | **WI** | 1.9 | 19 | 1.8 | 21 | 0.1 | -2 |
| 56 | WY | 0.2 | 51 | 0.2 | 51 | 0.0 | 0 |
| Total | | 100.0 | 1,326 | 100.0 | 1,326 | 0.0 | 0.0 |
| Minimum | | 12.7 | 51 | 12.8 | 51 | 0.3 | 2.0 |
| Maximum | | 0.2 | 1 | 0.2 | 1 | -0.3 | -2.0 |
| Range | | 12.5 | 50 | 12.6 | 50 | 0.5 | 4.0 |

Weights shares are for the 2006-10 sum.