EXPENDITURE BASED INTER-AREA COST-OF-LIVING INDEX

ALEXANDRU VOICU
AND
MICHAEL L. LAHR

CENTER FOR URBAN POLICY RESEARCH
RUTGERS – THE STATE UNIVERSITY OF NEW JERSEY
CIVIC SQUARE • 33 LIVINGSTON AVENUE • SUITE 400
NEW BRUNSWICK, NEW JERSEY 08901-1982
(732) 932-3133 / FAX (732) 932-2363

SUBMITTED TO

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
OFFICE OF POLICY DEVELOPMENT AND RESEARCH
WASHINGTON, DC

CONTRACT NO. DU100C000005967, TASK ORDER 8

JUNE 1998

Abstract

The main difficulty in comparing the cost-of-living among metropolitan areas is that, at this level, prices of most goods and services are not available. Even when the prices are available, constructing aggregate prices for groups of goods and services comparable across areas, is a difficult task. In this paper we attempt to construct a cost-of-living index for metropolitan areas, using only data on metropolitan-level expenditures. While our method circumvents the two problems mentioned above, it requires two assumptions regarding the level of utility attained across areas, and the effect of demand elasticity on the relationship price—expenditure.

Introduction

The long period of relative calm surrounding the construction of price indexes ended in 1995, when the Senate Finance Committee appointed an Advisory Committee to study the Consumer Price Index (CPI). The initiative sparked from the realization that even a small bias in the widely used CPI can have, in the long run, important economic effects. Recently, *The Journal of Economic Perspectives* (vol. 12, winter 1998) dedicated an entire issue to discussions on the construction of price indexes, centered around the findings of the CPI committee.

The construction of inter-area cost-of-living indexes received far less attention in the literature. To our knowledge, at this moment the only comprehensive cost-of-living index for metropolitan areas is computed quarterly by the American Chamber of Commerce Research Association. While there is no indication of the way the index is computed, it is our understanding that the ACCRA cost of living index is based on fixed-weights price indexes. A different category of inter-area cost-of-living indexes existent in the literature are those based on the estimation of the system of demand equations (Braithwait, 1980; Jorgenson and Slesnick, 1983). There are advantages and disadvantages to using either of the two methods above. A fixed weights index cannot

account for consumer substitution among commodities. As in the case of time-series indexes, both lower level substitution (aggregating prices for categories of goods (strata)), and upper level substitution (when aggregating sub-indexes into the final index) are likely to induce bias. The other main sources of bias in the case of a time-series index —outlet substitution, quality change, and introduction of new items—are less likely to affect an inter-area index. Therefore, the overall bias is likely to be less severe for a cross-sectional index. Estimating the system of demand equations solves the problem of consumer substitution. Because the number of parameters to estimate increases very fast with the number of goods, however, this solution is very difficult to implement at a reasonable level of aggregation.

In this paper, we develop a cost-of-living index for selected metropolitan areas in U.S. It has long been clear that the prices of most goods vary significantly across metropolitan areas. Unfortunately for regional economic analysts, price data are not readily available at the regional level for most goods and services. Hence, regional and urban economic modelers generally assume that national prices prevail everywhere, i.e., prices are fixed across geographic space. At best such modeller account for regional price differences using fixed effects (dummy variables) for the various areas under study. But regional fixed effects also account for many other factors, so that the influence of price differences cannot be distilled.

There are two important problems in comparing the cost of living among metropolitan areas. First, prices of most goods and services are not readily available at metropolitan level. Second, even when the prices are available, constructing aggregate prices for groups of goods and services comparable across areas is a difficult task. Strong

assumptions regarding the contribution of each item in its group, possibility of substitution in consumption, and the supply of consumer goods and services are needed. We try to circumvent this problem by constructing an index based solely on expenditure data. The variation in expenditure comes from two sources—change in prices and change in quantity demanded. While it is impossible to infer price changes solely from variations in spending, under several assumptions, we constructed a weighted expenditure ratio that should yield a better estimate of the price ratio than the simple ratio of expenditure itself.

We identified two different ways of constructing the a cost-of-living index from expenditure data. In the next section we present the two versions of the index and compare their relative advantages and problems.

The Index

To construct the index, we used data contained in CUPR's SONC database. The main data items are metropolitan estimates of household spending as produced for Mogelonsky (1996) from the U.S. Consumer Expenditure Survey, home-ownership rates (the U.S. Bureau of the Census), home price data (National Association of Home Builders), and fair market rent data (U.S. Department of Housing and Urban Development). The form of the index is not essentially different from the indices in the literature. Usually price indices are constructed as weighted sums of prices. The weights reflect either the share of each component in the total expenditure or the relative utility derived from the consumption of the respective item. Instead of using weighted sums, we use a weighted product. As weights, we use two alternative values—the share of each

item in total expenditure for each metropolitan area, and the average share of each item in average total expenditure.

The main problem in our case was that there were few prices available at the metropolitan level. The only data available were average annual spending levels for 17 groups of consumer goods. The 17 groups of consumer goods used are: food at home, food away from home, alcohol, housing, utilities, household operations, apparel, transportation, health care, entertainment, personal care, reading, education, tobacco, miscellaneous fees, cash contributions, personal insurance.[1] There were two possible solutions to this problem. In the first, we assumed that there is one representative agent in each metropolitan area. This agent consumes one unit of each good group. The demands for all good groups are totally inelastic, and there is no possible substitution among them. These very strong assumptions allowed us to assume that all metropolitan expenditure variations are due to prices. This permitted us to construct the price index by simply replacing prices with expenditures. Using this first solution, we constructed two versions of the index. In the first version, we used as weights the average share of each good group in average total expenditure across metropolitan areas. In the second version, the weights were each item's share in total expenditure for each metropolitan area. The two versions of the index are calculated using the following formulae:

[1] Data sources are presented in the appendix at the end of this paper.

$$Index1_i = \prod_{j=1}^{K} \left(\frac{E_{ij}}{\overline{E}_{ij}} \right)^{\frac{\overline{E}_j}{\overline{M}}}$$

$$Index2_i = \prod_{j=1}^{K} \left(\frac{E_{ij}}{\overline{E}_{ij}} \right)^{\frac{E_{ij}}{M_i}}$$

where the index i refers to metropolitan areas, and the index j refers to groups of consumer goods and services.

E_{ij} - expenditure on item j for area i;
$\overline{E}_j$ - average expenditure on item j;
M_i - total expenditure for area i;
$\overline{M}$ - average total expenditure;

The direct relationship between expenditures and prices is, however, quite unrealistic. Hence, we sought a more palatable solution. In the second solution, we removed the assumption that each representative agent consumes one unit of each good. Instead, we assumed that each representative agent attains the same level of utility. Thus, the consumption bundle is permitted to vary across metropolitan areas. Consumption variations result from differences in both prices and disposable income. The constant-utility assumption may be regarded as too strong, but if migration costs are zero (or at least very small), utility differences should equilibrate through migration. Hence, this assumption may be less restrictive and certainly is more reasonable than that used in the first solution.

Next, we needed a way to relate expenditure variations to differences in prices in a way that was consistent with the assumption of the approach. The main constraint in relating prices and expenditures was the lack of information on prices or quantities of goods purchased. The intuition of why we cannot relate prices and expenditures is simple. There are two effects of a change in price on expenditures: a direct effect and an

indirect effect. The direct effect is given by the change in price holding the quantity constant. The indirect effect is given by the change in quantity, along the indifference curve, in response to a change in price. It is impossible to formally distinguish between the two effects or measure them using only data on expenditures. The same thing can be shown in a more formal way using the differential of expenditure with respect to price.

To solve this problem we made the following conjecture. For a relatively less elastic good, a change in expenditure would be more closely related to the change in price. This is because the quantity changes by a very small amount. Consequently, the share of a less elastic good in total expenditure would vary more. As a result, for the more elastic goods, the variation in expenditure is only a very noisy reflection of variation in prices. Our approach gives smaller weights to more elastic goods and larger weights to less elastic goods. In this way, we discount the effect of goods for which the changes in expenditures do not reflect the price changes. As weight factors, we used the sample standard deviation of each item's share. Again, we computed two versions of the index, corresponding to the two different weights. The formulae for the two versions are:

$$Index3_i = \prod_{j=1}^{K}\left(\frac{E_{ij}}{\overline{E}_j} * std\left(\frac{E_{ij}}{M_i}\right)\right)^{\frac{\overline{E}_j}{\overline{M}}}$$

where we used as weights the average share of each item in average total expenditure;

$$Index4_i = \prod_{j=1}^{K}\left(\frac{E_{ij}}{\overline{E}_j} * std\left(\frac{E_{ij}}{M_i}\right)\right)^{\frac{E_{ij}}{\overline{M}_i}}$$

where we used as weights the each item's share in total expenditure for each metropolitan area.

The use of two alternative weights—the average share and the individual shares—leads to two conceptually different measures. Using the average share is equivalent to a fixed consumption basket in the case of a price index. In our case, each item has a fixed share in the total expenditure—the average share—which is the base for comparison. For this reason, it may be a better cost-of-living measure. On the other hand, when we use individual shares, the base of comparison becomes the area's expenditure structure. The relationship between the two versions closely resembles the relationship between Laspeyres and Paasche indexes.

Table 1 presents the index values for 73 selected metropolitan areas (we estimated the index for 296 metropolitan areas).[2] The values in the table are normalized by the index value calculated at the sample average. Normalization makes the indices using average shares as weights identical (index 1 and index 3), therefore, we present only one of them.

The indices perform in similar ways with respect to both magnitude and ranking. Nonetheless, the versions using individual shares seem to yield index values with larger spread. The reason may be that the effect of expensive and relatively inelastic housing is augmented by a relatively large share in total expenditure, while the influence of relatively cheap items is reduced by their implicitly smaller share. Metropolitan areas in California and Northeast appear to have the highest cost of living, while metropolitan areas in Midwest and South are less expensive.

[2] The index values for all 296 metropolitan areas are presented in appendix B.

Table 1. The cost-of-living index for selected metropolitan areas

AREANAMEA	Index 1,3	Rank	Index 2	Rank	Index 4	Rank
San Francisco, CA PMSA	1.36	3	1.50	2	2.11	1
San Jose, CA PMSA	1.43	1	1.53	1	2.00	2
Honolulu, HI MSA	1.36	2	1.46	3	1.93	3
Oakland, CA PMSA	1.27	4	1.32	4	1.59	4
Los Angeles-Long Beach, CA PMSA	1.15	9	1.22	7	1.56	5
Newark, NJ PMSA	1.24	5	1.26	5	1.41	6
Boston, MA-NH PMSA	1.14	11	1.16	11	1.37	7
Washington, DC-MD-VA-WV PMSA	1.23	6	1.24	6	1.34	8
San Diego, CA MSA	1.15	10	1.17	10	1.33	9
New York, NY PMSA	1.04	16	1.08	13	1.32	10
Hartford, CT MSA	1.20	7	1.21	8	1.29	11
Seattle-Bellevue-Everett, WA PMSA	1.12	12	1.12	12	1.15	12
Anchorage, AK MSA	1.16	8	1.17	9	1.12	13
Sacramento, CA PMSA	1.07	13	1.07	15	1.12	14
Providence-Fall River-Warwick, RI-MA	1.03	18	1.03	19	1.06	15
Burlington, VT MSA	1.05	15	1.05	16	1.05	16
Portland, ME MSA	1.02	19	1.02	21	1.03	17
Wilmington-Newark, DE-MD PMSA	1.07	14	1.08	14	1.01	18
Chicago, IL PMSA	0.99	23	0.99	25	1.00	19
Baltimore, MD PMSA	1.04	17	1.04	17	0.96	20
Philadelphia, PA-NJ PMSA	1.01	22	1.01	22	0.96	21
Miami, FL PMSA	0.94	27	0.94	34	0.94	22
Las Vegas, NV-AZ MSA	0.96	26	0.97	27	0.93	23
Atlanta, GA MSA	1.01	21	1.02	20	0.93	24
Minneapolis-St. Paul, MN-WI MSA	1.02	20	1.03	18	0.93	25
Denver, CO PMSA	0.98	24	0.99	23	0.91	26
Dallas, TX PMSA	0.98	25	0.99	24	0.90	27
Austin-San Marcos, TX MSA	0.93	34	0.94	35	0.89	28
Virginia Beach-Norfolk-Newport News,	0.94	29	0.95	32	0.87	29
Phoenix-Mesa, AZ MSA	0.94	31	0.95	33	0.87	30
Albuquerque, NM MSA	0.91	36	0.92	47	0.85	31
Portland-Vancouver, OR-WA PMSA	0.94	32	0.95	31	0.85	32
Milwaukee-Waukesha, WI PMSA	0.94	30	0.96	29	0.84	33
Fort Worth-Arlington, TX PMSA	0.94	28	0.96	28	0.83	34
Fresno, CA MSA	0.89	45	0.90	50	0.83	35
Houston, TX PMSA	0.93	33	0.96	30	0.83	36
Nashville, TN MSA	0.91	37	0.92	41	0.82	37
Tucson, AZ MSA	0.86	54	0.87	60	0.81	38
Detroit, MI PMSA	0.93	35	0.97	26	0.80	39
Columbia, SC MSA	0.91	39	0.93	39	0.80	40
Salt Lake City-Ogden, UT MSA	0.91	38	0.93	37	0.80	41
Cleveland-Lorain-Elyria, OH PMSA	0.90	43	0.92	43	0.79	42
Cincinnati, OH-KY-IN PMSA	0.90	42	0.92	42	0.79	43
Kansas City, MO-KS MSA	0.90	40	0.94	36	0.78	44
Columbus, OH MSA	0.89	46	0.92	45	0.78	45
Boise City, ID MSA	0.87	50	0.89	54	0.78	46
St. Louis, MO-IL MSA	0.90	41	0.93	38	0.78	47

Table 1. The cost-of-living index for selected metropolitan areas (continued)

AREANAMEA	Index 1,3	Rank	Index 3	Rank	Index 4	Rank
Jacksonville, FL MSA	0.88	48	0.90	49	0.78	48
Indianapolis, IN MSA	0.90	44	0.93	40	0.78	49
Buffalo-Niagara Falls, NY MSA	0.87	52	0.89	53	0.78	50
Cheyenne, WY MSA	0.87	51	0.89	52	0.78	51
Tampa-St. Petersburg-Clearwater, FL MSA	0.85	56	0.86	65	0.77	52
Des Moines, IA MSA	0.88	47	0.92	44	0.76	53
New Orleans, LA MSA	0.84	63	0.85	68	0.76	54
Fargo-Moorhead, ND-MN MSA	0.85	58	0.86	61	0.75	55
Charlotte-Gastonia-Rock Hill, NC-SC	0.88	49	0.92	46	0.75	56
Omaha, NE-IA MSA	0.87	53	0.91	48	0.74	57
San Antonio, TX MSA	0.84	62	0.86	64	0.74	58
Charleston, WV MSA	0.83	68	0.84	70	0.74	59
Memphis, TN-AR-MS MSA	0.84	59	0.87	57	0.74	60
Sioux Falls, SD MSA	0.85	57	0.88	56	0.74	61
Toledo, OH MSA	0.85	55	0.88	55	0.73	62
Tulsa, OK MSA	0.84	60	0.87	59	0.73	63
Little Rock-North Little Rock, AR MSA	0.83	66	0.86	66	0.72	64
Jackson, MS MSA	0.83	65	0.86	63	0.72	65
Billings, MT MSA	0.82	69	0.84	71	0.72	66
Louisville, KY-IN MSA	0.83	64	0.87	58	0.72	67
Birmingham, AL MSA	0.83	67	0.86	62	0.71	68
El Paso, TX MSA	0.79	72	0.81	72	0.71	69
Wichita, KS MSA	0.84	61	0.89	51	0.71	70
Oklahoma City, OK MSA	0.81	70	0.85	67	0.69	71
Pittsburgh, PA MSA	0.81	71	0.85	69	0.69	72

In the remainder of this section we present a comparison between the ACCRA index and the three versions of our index. As we mentioned before, the index provided by ACCRA is the only comprehensive inter-area cost-of-living index that is widely available. Similar performance to the ACCRA index would validate our expenditure based index. Finally, only 187 metropolitan areas were available in both indexes. Unfortunately, ACCRA did not calculate their index for most of the Californian metropolitan areas in 1993, the year of our data set. Since these areas are among the most expensive, their absence most likely biases the correlation between indexes. We computed the simple correlation coefficients, Kendall rank correlation coefficient, and the Spearman rank correlation coefficient between the index of the 187 areas. Table 2

presents the values of the correlation coefficients between each of the three versions of the index and the ACCRA index.

Table 2. Correlation Coefficients

	Index 1, 3	Index 2	Index 4
correlation coeff.	0.7307	0.7281	0.7606
Kendall correlation coeff.	0.4635	0.4473	0.4718
Spearman correlation coeff.	0.6395	0.6199	0.6508

Even with the missing observations in Californian areas, the indexes display a relatively high correlation with the ACCRA index. As expected, the version using standard errors as weights performs closest to the ACCRA index with respect to all three correlation coefficients.

References

Abraham, Katharine G., John S. Greenlees, and Brent R. Moulton. 1998. "Working to Improve the Consumer Price Index." *The Journal of Economic Perspectives* 12: 27-36.

American Chamber of Commerce Research Association. 1993. "Cost of Living Index." Third quarter 1993.

Boskin, Michael J., Ellen R. Dulberger, Robert J. Gordon, Zvi Griliches, and Dale W. Jorgenson. 1998. "Consumer Prices, the Consumer Price Index, and the Cost of Living." *The Journal of Economic Perspectives* 12: 3-26.

Braithwait, Steven D. 1980. "Substitution Bias of the Laspeyres Price Index: An Analysis Using Estimated Cost-of-Living Index." *American Economic Review*, 70:64-77.

Deaton, Angus. 1998. "Getting Prices Right: What Should Be Done?" *The Journal of Economic Perspectives* 12: 37-46.

Diewert, Erwin W. 1998. "Index Number Issues in the Consumer Price Index." *The Journal of Economic Perspectives* 12: 47-58.

Jorgenson, Dale W., and Daniel T. Slesnick. 1983, "Individual and Social Cost-of-Living Indexes." In W.E. Diewert and C. Montmarquette, eds. Price Level Measurement. Ottawa: Statistics Canada: 241-336.

Mogelonsky, Marcia. 1996. "America's Hottest Markets." *American Demographics.* Data and article are available at the web site http://www.demographics.com/publications/ad/96_ad/9601_ad/ad858.htm

Nordhaus, William D. 1998. "Quality Change in Price Indexes." *The Journal of Economic Perspectives* 12: 59-68.

Pollak, Robert A. 1998. "The Consumer Price Index: A Research Agenda and Three Proposals." *The Journal of Economic Perspectives* 12: 69-78.

Appendix A. Data Sources

Label	Variable definition	Source
MSA	MSA and PMSA code	Consumer expenditure survey, Metro level data
AREANAMEA	The name of the metro area	Consumer expenditure survey, Metro level data
FD_HOME	1993 estimated household spending on food at home	Consumer expenditure survey, Metro level data
FD_AWAY	1993 estimated household spending on food away from home	Consumer expenditure survey, Metro level data
ALCOHOL	1993 estimated household spending on alcoholic beverages	Consumer expenditure survey, Metro level data
RENT	1993 estimated household spending on owned house units	National Association of Realtors 1996
OWN	1993 estimated household spending on rented units	FY 1996 Fair Market Rent Federal Register, feb. 21, 1996 and our calculation
UTILITIES	1993 estimated household spending on utilities	Consumer expenditure survey, Metro level data
HSE_OPER	1993 estimated household spending on household operations	Consumer expenditure survey, Metro level data
APPAREL	1993 estimated household spending on apparel	Consumer expenditure survey, Metro level data
TRANSPORT	1993 estimated household spending on transportation	Consumer expenditure survey, Metro level data
HEALTH	1993 estimated household spending on health care	Consumer expenditure survey, Metro level data
ENTERTAIN	1993 estimated household spending on entertainment	Consumer expenditure survey, Metro level data
PER_CARE	1993 estimated household spending on personal care products	Consumer expenditure survey, Metro level data
READING	1993 estimated household spending on reading matter	Consumer expenditure survey, Metro level data
EDUCATE	1993 estimated household spending on education	Consumer expenditure survey, Metro level data
TOBACCO	1993 estimated household spending on tobacco products	Consumer expenditure survey, Metro level data
MIS_FEES	1993 estimated household spending on miscellaneous fees & expenses	Consumer expenditure survey, Metro level data
CASH_CONT	1993 estimated household spending on cash contributions	Consumer expenditure survey, Metro level data
PER_INSURE	1993 estimated household spending on personal insurance and pension	Consumer expenditure survey, Metro level data
Total	total estimated spending, 1993	Consumer expenditure survey, Metro level data

Appendix B. The cost-of-living index

AREANAMEA	Index 1,3	Rank	Index 2	Rank	Index 4	Rank
San Francisco, CA PMSA	1.36	4	1.50	2	2.11	1
San Jose, CA PMSA	1.43	1	1.53	1	2.00	2
Honolulu, HI MSA	1.36	3	1.46	3	1.93	3
Santa Cruz--Watsonville, CA PMSA	1.30	8	1.40	6	1.88	4
Ventura, CA PMSA	1.36	5	1.42	4	1.74	5
Santa Barbara--Santa Maria--Lompoc, CA	1.24	11	1.32	9	1.72	6
Bergen--Passaic, NJ PMSA	1.32	6	1.36	7	1.61	7
Oakland, CA PMSA	1.27	9	1.32	10	1.59	8
Nassau--Suffolk, NY PMSA	1.37	2	1.40	5	1.59	9
Los Angeles--Long Beach, CA PMSA	1.15	20	1.22	15	1.56	10
Santa Rosa, CA PMSA	1.20	14	1.24	14	1.48	11
Middlesex--Somerset--Hunterdon, NJ PMSA	1.32	7	1.33	8	1.45	12
Newark, NJ PMSA	1.24	10	1.26	11	1.41	13
Salinas, CA MSA	1.15	22	1.18	19	1.38	14
Boston, MA--NH PMSA	1.14	23	1.16	23	1.37	15
New Haven-Bridgeport-Stamford-Danbury-W	1.23	13	1.24	13	1.35	16
Washington, DC--MD--VA--WV PMSA	1.23	12	1.24	12	1.34	17
San Diego, CA MSA	1.15	21	1.17	22	1.33	18
New York, NY PMSA	1.04	34	1.08	26	1.32	19
Hartford, CT MSA	1.20	15	1.21	16	1.29	20
Monmouth--Ocean, NJ PMSA	1.19	16	1.19	17	1.28	21
Vallejo--Fairfield--Napa, CA PMSA	1.17	18	1.17	21	1.25	22
Trenton, NJ PMSA	1.18	17	1.18	18	1.20	23
New London--Norwich, CT--RI MSA	1.13	24	1.14	24	1.19	24
Jersey City, NJ PMSA	1.05	33	1.06	32	1.16	25
Seattle--Bellevue--Everett, WA PMSA	1.12	25	1.12	25	1.15	26
Anchorage, AK MSA	1.16	19	1.17	20	1.12	27
Sacramento, CA PMSA	1.07	26	1.07	28	1.12	28
Riverside--San Bernardino, CA PMSA	1.06	28	1.07	29	1.11	29
Naples, FL MSA	1.06	29	1.06	30	1.08	30
Providence--Fall River--Warwick, RI--MA	1.03	37	1.03	38	1.06	31
Burlington, VT MSA	1.05	30	1.05	34	1.05	32
Portland, ME MSA	1.02	39	1.02	41	1.03	33
Reno, NV MSA	1.02	38	1.02	40	1.03	34
Stockton--Lodi, CA MSA	1.01	43	1.01	44	1.03	35
Santa Fe, NM MSA	1.04	35	1.04	36	1.02	36
Springfield, MA MSA	1.00	45	1.01	45	1.02	37
Modesto, CA MSA	0.99	48	0.99	51	1.01	38
Boulder--Longmont, CO PMSA	1.05	31	1.05	33	1.01	39
Wilmington--Newark, DE--MD PMSA	1.07	27	1.08	27	1.01	40
Atlantic--Cape May, NJ PMSA	1.02	40	1.02	42	1.00	41
Chicago, IL PMSA	0.99	49	0.99	56	1.00	42
Pittsfield, MA MSA	0.99	51	0.99	58	0.98	43
Ann Arbor, MI PMSA	1.05	32	1.06	31	0.97	44
Baltimore, MD PMSA	1.04	36	1.04	35	0.96	45
Philadelphia, PA--NJ PMSA	1.01	44	1.01	43	0.96	46
Allentown--Bethlehem--Easton, PA MSA	1.00	47	1.00	48	0.96	47
West Palm Beach--Boca Raton, FL MSA	1.00	46	1.00	46	0.95	48
Miami, FL PMSA	0.94	69	0.94	85	0.94	49

Appendix B. The cost-of-living index (continuation)

AREANAMEA	Index 1,3	Rank	Index 2	Rank	Index 4	Rank
Fort Lauderdale, FL PMSA	0.97	59	0.97	62	0.94	50
Las Vegas, NV--AZ MSA	0.96	62	0.97	66	0.93	51
Atlanta, GA MSA	1.01	42	1.02	39	0.93	52
Minneapolis--St. Paul, MN--WI MSA	1.02	41	1.03	37	0.93	53
Albany--Schenectady--Troy, NY MSA	0.99	50	0.99	52	0.92	54
Raleigh--Durham--Chapel Hill, NC MSA	0.98	53	0.99	57	0.92	55
Bellingham, WA MSA	0.95	65	0.95	74	0.92	56
Charlottesville, VA MSA	0.96	61	0.97	64	0.91	57
Denver, CO PMSA	0.98	52	0.99	49	0.91	58
Bremerton, WA PMSA	0.98	55	0.99	55	0.90	59
Dallas, TX PMSA	0.98	57	0.99	53	0.90	60
Madison, WI MSA	0.98	56	0.99	54	0.90	61
Austin--San Marcos, TX MSA	0.93	79	0.94	86	0.89	62
Rochester, NY MSA	0.98	54	0.99	50	0.89	63
Lancaster, PA MSA	0.97	58	0.98	59	0.89	64
Orlando, FL MSA	0.94	72	0.94	82	0.88	65
Fort Collins--Loveland, CO MSA	0.94	68	0.95	77	0.88	66
Olympia, WA PMSA	0.96	64	0.97	63	0.88	67
Norfolk--Virginia Beach--Newport News,	0.94	71	0.95	79	0.87	68
Tacoma, WA PMSA	0.95	66	0.96	70	0.87	69
Phoenix--Mesa, AZ MSA	0.94	74	0.95	81	0.87	70
Richmond--Petersburg, VA MSA	0.96	63	0.98	61	0.86	71
Sarasota--Bradenton, FL MSA	0.90	102	0.91	117	0.85	72
Chico--Paradise, CA MSA	0.86	151	0.86	184	0.85	73
Albuquerque, NM MSA	0.91	91	0.92	113	0.85	74
Fort Myers--Cape Coral, FL MSA	0.90	98	0.91	116	0.85	75
Fort Pierce--Port St. Lucie, FL MSA	0.92	87	0.93	94	0.85	76
Colorado Springs, CO MSA	0.92	85	0.93	92	0.85	77
Bakersfield, CA MSA	0.92	88	0.93	99	0.85	78
Merced, CA MSA	0.89	114	0.89	137	0.85	79
Portland--Vancouver, OR--WA PMSA	0.94	75	0.95	76	0.85	80
Redding, CA MSA	0.88	117	0.89	142	0.85	81
Rochester, MN MSA	0.97	60	1.00	47	0.84	82
Richland--Kennewick--Pasco, WA MSA	0.93	80	0.95	78	0.84	83
Milwaukee--Waukesha, WI PMSA	0.94	73	0.96	69	0.84	84
Fort Worth--Arlington, TX PMSA	0.94	70	0.96	67	0.83	85
Fresno, CA MSA	0.89	108	0.90	129	0.83	86
Reading, PA MSA	0.93	77	0.95	75	0.83	87
York, PA MSA	0.94	76	0.96	68	0.83	88
Vineland--Millville--Bridgeton, NJ PMSA	0.92	89	0.93	98	0.83	89
Houston, TX PMSA	0.93	78	0.96	72	0.83	90
Syracuse, NY MSA	0.92	86	0.94	88	0.82	91
Glens Falls, NY MSA	0.91	96	0.92	109	0.82	92
Huntsville, AL MSA	0.93	82	0.95	73	0.82	93
Nashville, TN MSA	0.91	92	0.92	100	0.82	94
Melbourne--Titusville--Palm Bay, FL MSA	0.91	90	0.93	95	0.82	95
Harrisburg--Lebanon--Carlisle, PA MSA	0.93	84	0.95	80	0.82	96
Iowa City, IA MSA	0.89	109	0.91	123	0.82	97
Brazoria, TX PMSA	0.95	67	0.98	60	0.82	98

Appendix B. The cost-of-living index (continuation)

AREANAMEA	Index 1,3	Rank	Index 2	Rank	Index 4	Rank
State College, PA MSA	0.88	121	0.89	148	0.81	99
Hamilton--Middletown, OH PMSA	0.93	83	0.96	71	0.81	100
Hagerstown, MD PMSA	0.89	110	0.91	120	0.81	101
Tucson, AZ MSA	0.86	140	0.87	166	0.81	102
Bangor, ME MSA	0.87	135	0.87	155	0.81	103
Detroit, MI PMSA	0.93	81	0.97	65	0.80	104
Medford--Ashland, OR MSA	0.85	154	0.86	186	0.80	105
Columbia, SC MSA	0.91	95	0.93	91	0.80	106
Lewiston--Auburn, ME MSA	0.86	144	0.87	168	0.80	107
Binghamton, NY MSA	0.90	107	0.91	115	0.80	108
Salt Lake City--Ogden, UT MSA	0.91	94	0.93	89	0.80	109
Cleveland--Lorain--Elyria, OH PMSA	0.90	105	0.92	106	0.79	110
Cincinnati, OH--KY--IN PMSA	0.90	104	0.92	102	0.79	111
Grand Rapids--Muskegon--Holland, MI MSA	0.90	99	0.93	93	0.79	112
Yuba City, CA MSA	0.85	155	0.86	183	0.79	113
Lansing--East Lansing, MI MSA	0.91	93	0.94	84	0.79	114
Kansas City, MO--KS MSA	0.90	97	0.94	87	0.78	115
Bloomington--Normal, IL MSA	0.90	103	0.93	96	0.78	116
Columbus, OH MSA	0.89	111	0.92	108	0.78	117
Charleston--North Charleston, SC MSA	0.88	115	0.91	121	0.78	118
Tallahassee, FL MSA	0.86	141	0.87	156	0.78	119
Boise City, ID MSA	0.87	127	0.89	140	0.78	120
St. Louis, MO--IL MSA	0.90	101	0.93	90	0.78	121
Greensboro--Winston-Salem--High Point,	0.88	120	0.90	131	0.78	122
Jacksonville, FL MSA	0.88	118	0.90	127	0.78	123
Kenosha, WI PMSA	0.89	112	0.92	101	0.78	124
Indianapolis, IN MSA	0.90	106	0.93	97	0.78	125
Eugene--Springfield, OR MSA	0.85	161	0.86	188	0.78	126
Provo--Orem, UT MSA	0.87	132	0.89	147	0.78	127
Buffalo--Niagara Falls, NY MSA	0.87	130	0.89	139	0.78	128
Galveston--Texas City, TX PMSA	0.89	113	0.92	103	0.78	129
Cheyenne, WY MSA	0.87	129	0.89	138	0.78	130
Champaign--Urbana, IL MSA	0.86	147	0.87	162	0.77	131
Racine, WI PMSA	0.90	100	0.94	83	0.77	132
Lexington, KY MSA	0.86	138	0.88	151	0.77	133
Tampa--St. Petersburg--Clearwater, FL M	0.85	158	0.86	181	0.77	134
Visalia--Tulare--Porterville, CA MSA	0.84	168	0.85	192	0.77	135
Lawrence, KS MSA	0.84	165	0.85	189	0.77	136
Wilmington, NC MSA	0.85	152	0.87	167	0.77	137
Fort Walton Beach, FL MSA	0.87	136	0.89	145	0.77	138
Bloomington, IN MSA	0.83	181	0.84	205	0.76	139
Des Moines, IA MSA	0.88	116	0.92	107	0.76	140
Bryan--College Station, TX MSA	0.80	217	0.81	246	0.76	141
Greeley, CO PMSA	0.84	176	0.85	197	0.76	142
Green Bay, WI MSA	0.88	119	0.92	112	0.76	143
Lafayette, IN MSA	0.86	150	0.87	154	0.76	144
Daytona Beach, FL MSA	0.83	186	0.84	208	0.76	145
New Orleans, LA MSA	0.84	177	0.85	196	0.76	146
Fargo--Moorhead, ND--MN MSA	0.85	162	0.86	172	0.75	147

Appendix B. The cost-of-living index (continuation)

AREANAMEA	Index 1,3	Rank	Index 2	Rank	Index 4	Rank
Dayton--Springfield, OH MSA	0.87	126	0.91	119	0.75	148
Salem, OR PMSA	0.85	160	0.87	169	0.75	149
Lincoln, NE MSA	0.86	142	0.89	143	0.75	150
Charlotte--Gastonia--Rock Hill, NC--SC	0.88	123	0.92	111	0.75	151
Appleton--Oshkosh--Neenah, WI MSA	0.88	122	0.92	105	0.75	152
Elkhart--Goshen, IN MSA	0.87	131	0.90	126	0.75	153
Akron, OH PMSA	0.86	139	0.90	134	0.75	154
Cedar Rapids, IA MSA	0.88	124	0.92	104	0.75	155
Roanoke, VA MSA	0.86	149	0.88	149	0.75	156
Omaha, NE--IA MSA	0.87	133	0.91	122	0.74	157
Augusta--Aiken, GA--SC MSA	0.86	148	0.89	144	0.74	158
Springfield, IL MSA	0.87	134	0.90	124	0.74	159
Baton Rouge, LA MSA	0.85	153	0.88	152	0.74	160
Rockford, IL MSA	0.87	128	0.91	114	0.74	161
Gary, IN PMSA	0.87	125	0.92	110	0.74	162
Kalamazoo--Battle Creek, MI MSA	0.86	143	0.89	141	0.74	163
Savannah, GA MSA	0.84	169	0.86	171	0.74	164
San Antonio, TX MSA	0.84	173	0.86	177	0.74	165
Columbia, MO MSA	0.83	179	0.85	191	0.74	166
Charleston, WV MSA	0.83	189	0.84	206	0.74	167
Memphis, TN--AR--MS MSA	0.84	163	0.87	161	0.74	168
Bismarck, ND MSA	0.84	164	0.87	159	0.74	169
Spokane, WA MSA	0.84	174	0.86	180	0.74	170
Sioux Falls, SD MSA	0.85	159	0.88	153	0.74	171
Utica--Rome, NY MSA	0.83	187	0.85	201	0.74	172
Yuma, AZ MSA	0.81	211	0.82	235	0.74	173
Athens, GA MSA	0.81	199	0.83	224	0.74	174
Grand Forks, ND--MN MSA	0.81	201	0.83	223	0.74	175
Fort Wayne, IN MSA	0.86	137	0.91	118	0.74	176
Macon, GA MSA	0.84	166	0.87	157	0.73	177
Toledo, OH MSA	0.85	156	0.88	150	0.73	178
Tulsa, OK MSA	0.84	170	0.87	165	0.73	179
Sheboygan, WI MSA	0.86	145	0.90	125	0.73	180
Topeka, KS MSA	0.86	146	0.90	128	0.73	181
Gainesville, FL MSA	0.80	222	0.81	242	0.73	182
Montgomery, AL MSA	0.84	172	0.87	164	0.73	183
St. Cloud, MN MSA	0.83	190	0.85	199	0.73	184
Little Rock--North Little Rock, AR MSA	0.83	184	0.86	182	0.72	185
Fayetteville, NC MSA	0.81	196	0.84	217	0.72	186
Jackson, MS MSA	0.83	182	0.86	175	0.72	187
Killeen--Temple, TX MSA	0.80	220	0.82	236	0.72	188
Janesville--Beloit, WI MSA	0.85	157	0.90	132	0.72	189
Billings, MT MSA	0.82	194	0.84	211	0.72	190
Louisville, KY--IN MSA	0.83	180	0.87	163	0.72	191
Rapid City, SD MSA	0.81	198	0.84	214	0.72	192
Wausau, WI MSA	0.84	167	0.89	135	0.71	193
Birmingham, AL MSA	0.83	185	0.86	173	0.71	194
Corpus Christi, TX MSA	0.81	200	0.84	216	0.71	195
Greenville--Spartanburg--Anderson, SC M	0.83	188	0.86	176	0.71	196

Appendix B. The cost-of-living index (continuation)

AREANAMEA	Index 1,3	Rank	Index 2	Rank	Index 4	Rank
Tyler, TX MSA	0.82	193	0.85	203	0.71	197
Scranton--Wilkes-Barre--Hazleton, PA MS	0.80	224	0.82	232	0.71	198
Asheville, NC MSA	0.80	219	0.82	228	0.71	199
Tuscaloosa, AL MSA	0.80	216	0.83	226	0.71	200
El Paso, TX MSA	0.79	234	0.81	250	0.71	201
Wichita, KS MSA	0.84	171	0.89	136	0.71	202
Yakima, WA MSA	0.80	223	0.82	230	0.71	203
Kankakee, IL PMSA	0.82	191	0.86	174	0.71	204
Pensacola, FL MSA	0.81	209	0.83	219	0.70	205
Knoxville, TN MSA	0.81	202	0.84	207	0.70	206
Flint, MI PMSA	0.84	175	0.90	133	0.70	207
La Crosse, WI--MN MSA	0.81	208	0.84	210	0.70	208
Panama City, FL MSA	0.80	230	0.82	233	0.70	209
Kokomo, IN MSA	0.84	178	0.90	130	0.70	210
Peoria--Pekin, IL MSA	0.83	183	0.89	146	0.70	211
Las Cruces, NM MSA	0.78	243	0.79	266	0.70	212
Lubbock, TX MSA	0.80	227	0.82	231	0.70	213
Jacksonville, NC MSA	0.77	252	0.79	270	0.70	214
Hickory--Morganton, NC MSA	0.80	215	0.84	212	0.69	215
Lakeland--Winter Haven, FL MSA	0.79	235	0.82	238	0.69	216
Victoria, TX MSA	0.81	203	0.85	195	0.69	217
Casper, WY MSA	0.82	192	0.87	158	0.69	218
Canton--Massillon, OH MSA	0.81	206	0.85	194	0.69	219
Decatur, AL MSA	0.81	197	0.86	185	0.69	220
Oklahoma City, OK MSA	0.81	204	0.85	193	0.69	221
Pittsburgh, PA MSA	0.81	207	0.85	198	0.69	222
Lynchburg, VA MSA	0.81	213	0.84	209	0.69	223
Chattanooga, TN--GA MSA	0.80	218	0.84	218	0.69	224
South Bend, IN MSA	0.81	195	0.86	178	0.69	225
Lake Charles, LA MSA	0.79	231	0.82	229	0.69	226
Albany, GA MSA	0.80	229	0.83	222	0.69	227
Great Falls, MT MSA	0.78	238	0.81	254	0.69	228
Elmira, NY MSA	0.80	226	0.84	215	0.68	229
Lima, OH MSA	0.81	210	0.85	190	0.68	230
Benton Harbor, MI MSA	0.80	221	0.84	204	0.68	231
Fayetteville--Springdale--Rogers, AR MS	0.78	237	0.81	245	0.68	232
Biloxi--Gulfport--Pascagoula, MS MSA	0.78	240	0.81	252	0.68	233
Ocala, FL MSA	0.76	266	0.78	276	0.68	234
Davenport--Moline--Rock Island, IA--IL	0.81	212	0.86	187	0.68	235
Shreveport--Bossier City, LA MSA	0.78	246	0.80	258	0.68	236
Saginaw--Bay City--Midland, MI MSA	0.81	205	0.87	160	0.68	237
Wichita Falls, TX MSA	0.78	242	0.81	249	0.68	238
Columbus, GA--AL MSA	0.78	245	0.80	256	0.68	239
Springfield, MO MSA	0.78	248	0.80	257	0.68	240
Lawton, OK MSA	0.77	249	0.80	259	0.68	241
Evansville--Henderson, IN--KY MSA	0.80	225	0.85	200	0.68	242
Erie, PA MSA	0.79	232	0.84	213	0.67	243
Amarillo, TX MSA	0.79	236	0.82	227	0.67	244
Jackson, MI MSA	0.80	214	0.86	170	0.67	245

Appendix B. The cost-of-living index (continuation)

AREANAMEA	Index 1,3	Rank	Index 2	Rank	Index 4	Rank
Jackson, TN MSA	0.78	241	0.81	241	0.67	246
Mobile, AL MSA	0.78	247	0.81	244	0.67	247
Odessa--Midland, TX MSA	0.79	233	0.85	202	0.67	248
Eau Claire, WI MSA	0.78	244	0.82	234	0.66	249
Decatur, IL MSA	0.80	228	0.86	179	0.66	250
Clarksville--Hopkinsville, TN--KY MSA	0.76	263	0.79	271	0.66	251
Williamsport, PA MSA	0.77	250	0.81	243	0.66	252
Waco, TX MSA	0.76	257	0.79	267	0.66	253
Longview--Marshall, TX MSA	0.77	251	0.81	248	0.66	254
Mansfield, OH MSA	0.78	239	0.83	220	0.66	255
Lafayette, LA MSA	0.74	273	0.76	285	0.66	256
San Angelo, TX MSA	0.77	253	0.81	253	0.66	257
Florence, AL MSA	0.76	261	0.80	260	0.65	258
Monroe, LA MSA	0.75	267	0.78	273	0.65	259
Pueblo, CO MSA	0.74	275	0.76	286	0.65	260
Jamestown, NY MSA	0.76	264	0.80	263	0.65	261
Youngstown--Warren, OH MSA	0.77	256	0.82	240	0.65	262
Dothan, AL MSA	0.76	260	0.81	255	0.65	263
Parkersburg--Marietta, WV--OH MSA	0.76	262	0.81	247	0.64	264
Sherman--Denison, TX MSA	0.76	258	0.82	237	0.64	265
Beaumont--Port Arthur, TX MSA	0.77	255	0.83	225	0.64	266
Waterloo--Cedar Falls, IA MSA	0.77	254	0.83	221	0.64	267
Florence, SC MSA	0.76	259	0.82	239	0.64	268
Johnson City--Kingsport--Bristol, TN--V	0.74	272	0.78	274	0.64	269
Abilene, TX MSA	0.76	265	0.81	251	0.64	270
Alexandria, LA MSA	0.73	277	0.76	281	0.64	271
Anniston, AL MSA	0.75	270	0.79	269	0.64	272
Texarkana, TX--Texarkana, AR MSA	0.75	268	0.80	262	0.63	273
Owensboro, KY MSA	0.75	269	0.80	264	0.63	274
Houma, LA MSA	0.72	280	0.76	291	0.63	275
Danville, VA MSA	0.73	276	0.78	277	0.63	276
Cumberland, MD--WV MSA	0.72	282	0.76	289	0.63	277
Muncie, IN MSA	0.74	271	0.80	261	0.62	278
Laredo, TX MSA	0.70	288	0.73	294	0.62	279
Sioux City, IA--NE MSA	0.74	274	0.80	265	0.62	280
Steubenville--Weirton, OH--WV MSA	0.73	278	0.79	268	0.61	281
Duluth--Superior, MN--WI MSA	0.72	281	0.78	275	0.61	282
Sharon, PA MSA	0.73	279	0.79	272	0.61	283
Fort Smith, AR--OK MSA	0.72	284	0.76	284	0.61	284
Pine Bluff, AR MSA	0.72	283	0.76	282	0.61	285
Huntington--Ashland, WV--KY--OH MSA	0.71	285	0.76	288	0.60	286
Altoona, PA MSA	0.71	286	0.77	279	0.60	287
Wheeling, WV--OH MSA	0.71	287	0.76	290	0.60	288
Gadsden, AL MSA	0.70	290	0.77	280	0.59	289
St. Joseph, MO MSA	0.70	291	0.76	283	0.59	290
Terre Haute, IN MSA	0.70	289	0.77	278	0.59	291
Enid, OK MSA	0.70	292	0.76	287	0.59	292
Brownsville--Harlingen--San Benito, TX	0.67	295	0.71	295	0.59	293
Johnstown, PA MSA	0.69	293	0.74	292	0.58	294

Appendix B. The cost-of-living index (continuation)

AREANAMEA	Index 1,3	Rank	Index 2	Rank	Index 4	Rank
Joplin, MO MSA	0.68	294	0.73	293	0.57	295
McAllen--Edinburg--Mission, TX MSA	0.63	296	0.68	296	0.54	296