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INTERURBAN COMPARISONS OF THE QUALITY OF LIFE

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Quality-of-life comparisons of metropolitan areas are typically based on the weighted summation of a specific set of attributes that characterize an urban area. Recent studies by Blomquist, et al. (1988) and Roback (1982) have focused on developing theoretically consistent weights by estimating implicit prices for individual urban attributes. These prices are derived from equilibrium location models where households pay for urban attributes in the form of wages and rents. By focusing on the value of individual attributes, however, these studies have overlooked a much simpler and more direct method of constructing quality-of-life indexes--by valuing the total bundle rather than its parts.

This alternative method, which is used in this paper, follows the same theoretical model as Blomquist, et al. and Roback but recognizes that in the same way that households reveal their preferences for individual attributes through their location decisions, they also reveal their preferences for the entire bundle of attributes that characterize an urban area. Consequently, quality-of-life (QOL) indexes can be constructed by simply estimating wage and rent differentials across metropolitan areas. Then, by using Blomquist, et al.'s and Roback's weighting methodology, we can use the differentials to determine the implicit price of the full bundle of attributes. Therefore, there is no need to unbundle the attributes, value them individually, and then rebundle them in order to determine the full price of all the attributes of a city. The full price can be determined directly from interarea wage and rent differentials.

In addition to being more direct, our approach avoids some of the problems of estimation and interpretation associated with comparisons based on individual attributes. Unless all attributes are considered, it is unclear whether an index based on a subset of attributes is representative of the overall QOL. Unfortunately, theory does not provide a basis for determining the optimal list of attributes, and as Blomquist, et al. note, even if data were available, problems of collinearity prevent the inclusion of all urban attributes. Furthermore, even though a "true" index reflects the value of all attributes, increasing the number of attributes considered does not necessarily result in an index that is more representative of the "true" ranking.[1]

Another problem with QOL comparisons is that preferences may vary among individuals. Like previous indexes, our basic index assumes identical individuals. To the extent that individuals differ in their valuation of an area's amenities and in the amount paid in the form of wages and rents, the relative rankings of urban areas can vary across households. We address this question by constructing and comparing alternative indexes of the overall quality of life for different segments of the population, reflecting differences in age, education, and family status.

I. Framework

The method used to evaluate the relative quality of life across metropolitan areas directly follows the models Blomquist, et al. and Roback used to value individual urban attributes. In these models utility depends, in part, on the attributes of the city in which an individual lives, s. The only difference between our approach and that of Blomquist, et al. and Roback is that we consider s to be the full bundle of attributes rather than a vector of distinct attributes. The relevant features of the model can be summarized as follows.[2]

Individuals are assumed to be identical in tastes and skills and completely mobile across cities. Each worker supplies one unit of labor, independent of the wage rate, to produce a composite commodity, x. Individuals maximize utility, which depends on consumption of the composite commodity, on housing, and on urban attributes, subject to an income constraint.

Equilibrium for workers requires that utility be the same at all locations or, stated in terms of an indirect utility function,

$$(1) \qquad V(w,r;s) = V_0,$$

where w is the wage rate, r is the price of housing, and s is the bundle of urban attributes. The migration of workers in response to interarea differences in utility will ensure that wages and rents adjust to compensate workers for differences in urban attributes across areas.

Differentiating equation (1) with respect to location yields

$$(2) \qquad dV/ds = 0 = V_w(dw/ds) + V_r(dr/ds) + V_s.$$

Using Roy's identity and rearranging,

$$(3) \qquad V_s/V_w = p_s = h(dr/ds) - dw/ds$$

or, in log form,

(4) $$p_s/w = k(d\log r/ds) - d\log w/ds,$$

where h is the per-person consumption of housing, k is the budget share of housing, and p_s is the monetized value of the marginal evaluation of the area's attributes. Equation(3) states that in equilibrium, the price that individuals implicitly pay in the form of wages and rents to live in an area is equal to their marginal valuation of the area's attributes.

This observable implicit price can then be used to make inferences concerning the unobservable value of an area's attributes. A high implicit price, reflected in relatively low wages and high rents, implies that an area possesses attributes that households value. Similarly, a low implicit price for an area, reflected in relatively high wages and low rents, reflects compensation to households for a relatively low quality of life.

The derivation of equation *(4)* assumes identical individuals. If all individuals in an area, independent of their valuation of an area's attributes, devote the same share of their income to housing and face the same relative prices, p_s will be the same for all individuals in the area, and individual differences will result in inframarginal rents. However, if individual differences that affect the valuation of area attributes also affect relative prices and the demand for housing, the implicit price paid for a location can vary with individual characteristics.

We assume that all workers in an area compete in the same housing market; therefore, $d\log r/ds$ is independent of individual characteristics. The share of income spent on housing, k, and relative wages, $d\log w/ds$, however, may vary with individual characteristics.[3] In this case, implicit prices of various locations--and therefore, relative rankings of urban areas based on these prices--can vary with individual characteristics. In order to examine these potential differences, alternative indexes for broadly defined groups based on age, education, and family status are presented, in addition to the overall index, in section III.

Quality-of-life comparisons based on market valuations may differ from the household's valuation of a location for several reasons. First, to the extent that individual preferences differ even within a specified subgroup of individuals, individuals who value a location more than the marginal worker will receive inframarginal rents.[4] Second, transaction costs, including information costs and moving costs, may also cause a divergence between the prices paid and a resident's valuation of a location. Third, any other factors or shocks that may cause the local markets to be in disequilibrium will bias the valuation of urban areas.

II. Data and Estimation

The data used to estimate the wage and rent equations are from the Public Use Micro Sample (PUMS) of the 1980 Census of Populations, combined A and B samples. Included in the sample are individuals who lived and worked in a Standard Metropolitan Statistical Area SMSA in 1980 and who changed addresses between 1975 and 1980. This subsample of movers was chosen so that the data would more accurately reflect current land market conditions.

Specification of the wage and rent equations follows Blomquist, et al. (1988) as closely as possible. The rent equation includes both owner-occupied and rental units for which positive values of unit or gross contract rents are reported. Monthly housing expenditures are the dependent variable in the rent equation. Monthly rent for owner-occupied dwellings is calculated based on the value of the home using 7.85 percent as the discount rate.[5] Total housing expenditure is the sum of this imputed monthly rent and monthly utility expenditures. For renters, monthly housing expenditure is gross rent--contract rent plus utilities.

The housing regression includes various structural characteristics and central city status as reported in the Census. All housing characteristics are interacted with rental status in order to capture any differences in the value of these characteristics between owners and renters.

The dependent variable in the wage equation is average weekly earnings, calculated by dividing annual wage and salary income by the number of weeks worked. In addition, individuals included in the sample are between the ages of 25 and 55, work more than 25 hours per week, are not self-employed, and have positive wage and salary income and positive total income.

Included in the wage regression are Census measures of individual characteristics that are thought to influence their wage. In addition to these individual characteristics, a measure of industry unionization from Kokkelenberg and Sockell (1985) is included as a proxy for union status.

We calculate quality-adjusted wages and rents for individual workers and housing units by subtracting the predicted wage and rent from the actual wage and rent. Quality-adjusted wage and rent differentials for metropolitan areas are then obtained by averaging these individual values over all workers and housing units in a particular metropolitan area. By construction, these quality-adjusted wages and rents are expressed relative to the sample average.

In order to assure a somewhat reliable sample at the individual city level, quality-adjusted wages and rents and quality-of-life indexes are calculated only for SMSAs that have at least 100 observations. The quality-adjusted wages and rents for these 38 SMSAs relative to the sample average are presented in table 1.

III. Quality-of-Life Indexes

The implicit prices that individuals pay to live in each of the 38 SMSAs in our sample compared with the "average" city, along with the relative rankings of SMSAs based on their quality-of-life estimates, are presented in the last two columns of table 1. These are the prices individuals implicitly pay through labor and land market adjustments to live in each SMSA and are used to compare the quality of life across metropolitan areas.

According to table 1, residents of Miami on average pay $1,949 annually, in the form of higher housing prices and forgone wages, to live in Miami rather than in the "average" city. Because this is the highest implicit price for any of the 38 SMSAs, we infer that Miami's amenities are valued more highly than those of the other SMSAs. At the other end of the scale, lower rents and higher wages represent an implicit payment of $2,144 annually to residents of Detroit. In our framework this is assumed to reflect compensation for the low value of this area's attributes.

The rank ordering of the quality of life for urban areas in this study varies considerably with the rankings by Liu (1976), Boyer and Savageau (1982), Roback (1982), and Blomquist, et al. (1988), as shown in table 2. The rankings in these studies vary substantially. This variance is due in part to the use of selected attributes in the construction of the other indexes, in part to the arbitrary weights used by Boyer and Savageau and Liu, and in the case of Liu's and Roback's rankings, to differences in the time periods considered.

Our ranking is most highly correlated with the rankings of Blomquist, et al. and Roback, both of which use preference-based weights derived in a manner similar to the weights used here. While our ranking is most highly correlated with Blomquist, et al., there are still notable differences in the rankings. New York City, for example, is ranked much higher in our study, and Washington, D.C. is ranked much lower. These disparities suggest that other characteristics of these SMSAs, such as cultural events, or interactions between characteristics affect the prices individuals are willing to pay to live in these cities.

Our ranking is least correlated with that of Boyer and Savageau, which is constructed using arbitrary weights for attributes. The correlation between these two indexes is in fact negative (-.29). This is not surprising, because in their ranking, low rents and high wages are viewed as indications of a high quality of life. In contrast, low rents and high wages are assumed to reflect compensation for a lower quality of life in indexes like ours, which are based on equilibrium location models.

Quality-of-Life Rankings by Age, Education, and Family Status

The quality-of-life rankings presented above assume that all individuals place the same relative value on locations. There is no reason, however, to believe that this is the case. For example, households with children may place different weights on urban attributes than those without children. And, as noted earlier, if the budget share of housing or interarea wage differentials are also related to these individual characteristics, then the price households implicitly pay for a location, and relative rankings of the quality of life based on these implicit prices, may vary with individual characteristics.

These potential differences are examined by constructing separate quality-of-life indexes for broad subsets of the population. Quality-of-life rankings by age, education, and family status are constructed using the same methodology and data sources discussed above. These rankings are presented in tables 3, 4 and 5, respectively.[6] Since the number of observations in each SMSA for these subgroups is limited, some cities with as few as 50 observations for a group are reported. These cities are noted in the tables.

There appears to be some consistency in the ranking of cities across these broad groups, at least at the extremes. For example, Miami, Tampa, and Boston are ranked in the top 10 for almost all groups, while Detroit, Houston, and Cleveland are near the bottom for most groups. Despite these similarities, the correlation across rankings is fairly low--.5 between the two age groups, .45 between the two education groups, and .41 between households with and without children.

A number of interesting differences in rankings emerge across groups. In comparing the rankings for age groups, we find Sacramento and Anaheim to be considerably higher in the ranking for the younger age group than for the older age group, while the opposite is true of Columbus, Milwaukee, and Seattle.

Comparing the rankings based on educational attainment indicates considerable disagreement about the rankings of Portland and Indianapolis, which are both ranked in the top 10 for those who have attended college but in the bottom half for those who have not attended. Similar disagreement is found for Milwaukee, Denver, and Los Angeles, which are in the bottom half of the ranking for those who have attended college but in the top 10 for those who have not.

Finally, the rankings of individual SMSAs also depend on family status. Households with children appear to value the attributes of Salt Lake City, Portland, New York City, and Kansas City more than households without children; while households without children show a stronger preference for Riverside-San Bernardino, Sacramento, Phoenix, and San Antonio.

IV. Summary

Quality-of-life comparisons based on the valuation of individual attributes are typically plagued by two problems: omitted attributes and multicollinearity. This paper suggests a methodology that circumvents these problems by valuing the full bundle of an area's attributes. Comparing indexes based on our approach with indexes constructed from the other method reveals differences, which may be attributable to the ad hoc way in which attributes are included in the analysis and to differences in individual preferences.

Footnotes

1. Our reference to a "true" index combines both unbiased estimates and a complete list of urban characteristics. The effect of adding or subtracting individual attributes from a set of attributes can be illustrated using the implicit prices of individual attributes for the top 15 cities reported in table 2 of Blomquist and Berger (1986), which draws from the same analysis as found in Blomquist, et al. (1988). Based on these data, we constructed four alternative rankings. The first included only two attributes (crime and teacher/pupil ratio); the remaining indexes were constructed by adding attributes until all five reported attributes were included. Blomquist and Berger's overall index, which was based on 15 attributes, was most highly correlated with the index based on only two attributes. Moreover, the rank correlation tended to decline as the number of attributes considered increased, which of course was due to the order in which we chose to add attributes. This suggests that if one wanted to construct an index that reflected Blomquist and Berger's overall ranking but had data on only these five attributes, the most representative index that could be constructed would not include all of the available information.

2. See either Blomquist, et al. or Roback for a fuller description of the model. Blomquist, et al.'s model differs from Roback's in the assumptions of intracity location and land that are used to close the model. While these differences affect some of the implications of the general location model, they are not relevant for the valuation of amenities discussed here.

3. Beeson (1987) discusses how differences in worker characteristics that affect the demand for amenities relative to housing can be reflected in relative wage differences related to these worker characteristics.

4. Differences in tastes also have implications for the interpretation of the hedonic estimates of wages and rents. These implications are discussed in Epple (1987) and Bartik (1987).

5. The discount rate is from a study of the user cost of capital by Peiser and Smith (1985).

6. To conserve space, estimates of the wage and rent equations and the quality-adjusted wages and rents by metropolitan areas for these groups are not presented, but are available from the authors on request.

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Table 1: Quality-Adjusted Wages and Rents and Implicit Prices of Metropolitan Areas

SMSA	Wages	Rents	Implicit Price	Rank
Anaheim, CA	.078	.281	-33.0	20
Atlanta, GA	.014	-.145	-780.2	31
Baltimore, MD	.031	-.075	-752.3	28
Boston, MA	-.001	.220	884.5	3
Chicago, IL	.081	.104	-778.3	30
Cincinnati, OH	.064	-.082	-1266.5	34
Cleveland, OH	.108	-.053	-1789.9	36
Columbus, OH	-.074	-.126	594.5	10
Dallas, TX	.001	-.103	-430.6	24
Denver, CO	-.013	.036	336.9	14
Detroit, MI	.149	.013	-2144.0	38
Ft. Lauderdale, FL	-.029	.039	578.8	11
Houston, TX	.142	.023	-1989.1	37
Indianapolis, IN	.041	-.172	-1288.3	35
Kansas City, MO	-.037	-.155	-67.8	21
Los Angeles, CA	.049	.261	314.2	15
Miami, FL	-.112	.076	1948.9	1
Milwaukee, WI	-.002	.100	434.7	13
Minneapolis, MN	.065	.073	-671.9	27
Nassau, NY	.077	.239	-181.4	22
New Orleans, LA	-.079	-.110	726.2	7
New York, NY	.036	.145	42.3	19
Newark, NJ	.045	.195	111.4	18
Philadelphia, PA	.017	-.013	-304.3	23
Phoenix, AZ	-.047	-.029	572.3	12
Pittsburgh, PA	.047	-.078	-999.8	32
Portland, OR	-.027	.059	638.3	9
Riverside, CA	-.008	.016	183.5	16
Sacramento, CA	-.047	-.014	639.0	8
St. Louis, MO	.019	-.085	-619.6	26
Salt Lake City, UT	-.081	-.099	802.6	4
San Antonio, TX	-.105	-.202	734.7	6
San Diego, CA	-.014	.148	797.0	5
San Francisco, CA	.073	.308	149.4	17
San Jose, CA	.125	.269	-769.7	29
Seattle, WA	.047	.048	-500.8	25
Tampa, FL	-.119	-.142	1191.1	2
Washington, DC	.103	.116	-1062.2	33

Source: Data are from U.S. Census of Population, 1980 (PUMS files A and B). The wage equation has 22,539 observations, and the rent equation has 18,224 observations.

Note: Implicit prices are computed using equation (4) in the text and are evaluated at the mean annual earnings, $p=[k(\log r)-\log w]w$. Average annual earnings equal $14,705. The average budget share of housing (k) equals .27. Negative numbers indicate compensation required to live in an SMSA.

Table 2: Comparison of Quality-of-Life **Rankings** Across Studies

SMSA	QOLI (1980)	BBH (1980)	Roback (1973)	BS (1980)	Liu (1970)
Milwaukee, WI	1	5	8	15	8
Los Angeles, CA	2	3	1	17	10
San Francisco, CA	3	4	3	8	2
Newark, NJ	4	8	12	19	11
New York, NY	5	12	10	12	13
Anaheim, CA	6	1	2	6	9
Nassau-Suffolk, NY	7	2	6	18	--
Philadelphia, PA	8	6	13	4	7
Dallas, TX	9	14	4	5	5
Seattle, WA	10	9	18	3	1
St. Louis, MO	11	19	7	11	5
Minneapolis, MN	12	13	9	10	4
Baltimore, MD	13	15	5	13	12
Chicago, IL	14	16	15	9	17
Pittsburgh, PA	15	11	19	2	18
Washington, DC	16	7	11	1	3
Cleveland, OH	17	10	17	7	14
Houston, TX	18	17	14	14	6
Detroit, MI	19	18	16	16	16
Rank Correlation with QOLI		.66	.63	-.29	.26

Note/Source: QOLI is the ranking based on table 1; BB refers to the Blomquist and Berger (1986) ranking; BS is the Boyer and Savageau (1982) ranking. The years in parentheses refer to the year the data were collected to construct the rankings. Liu's (1976) study did not include Nassau-Suffolk.

Table 3: Rankings of the Quality of Life by Age Groups

SMSA	All Ages (QOLI)	Ages 20-30	Ages 31-55
Miami, FL	1	1	3
Tampa, FL	2	6	5
Boston, MA	3	3	14
Salt Lake City, UT	4	18	2*
San Diego, CA	5	2	17
San Antonio, TX	6	7	8
New Orleans, LA	7	12	4*
Sacramento, CA	8	5	22
Portland, OR	9	9	7
Columbus, OH	10	31	1
Ft. Lauderdale, FL	11	8	10*
Phoenix, AZ	12	10	11
Milwaukee, WI	13	20	6
Denver, CO	14	11	15
Los Angeles, CA	15	13	20
Riverside, CA	16	14*	18*
San Francisco, CA	17	22	13
Newark, NJ	18	16	12
New York, NY	19	23	16
Anaheim, CA	20	4	32
Kansas City, MO	21	15	19
Nassau, NY	22	25	21*
Philadelphia, PA	23	21	23
Dallas, TX	24	27	25
Seattle, WA	25	33	9
St. Louis, MO	26	17	33
Minneapolis, MN	27	26	28
Baltimore, MD	28	19	35
San Jose, CA	29	30	24
Chicago, IL	30	29	30
Atlanta, GA	31	28	27
Pittsburgh, PA	32	34	29*
Washington, DC	33	24	37
Cincinnati, OH	34	37	26
Indianapolis, IN	35	32	31
Cleveland, OH	36	35	34
Houston, TX	37	36	38
Detroit, MI	38	38	36

Rank Correlation (Ages 20-30, Ages 30-55) = .50

Source: Data are from U.S. Census of Population, 1980 (PUMS files A and B).

Note: An asterisk (*) indicates 50-75 observations. SMSAs with fewer than 50 observations in a category are not included in the ranking. More than 100 observations for all SMSAs are included in the overall ranking (QOLI).

Table 4: **Rankings** of the Quality of Life by Education Groups

SMSA	All (QOLI)	No College	Attended College
Miami, FL	1	4	1
Tampa, FL	2	3	6
Boston, MA	3	5	9
Salt Lake City, UT	4	16*	3
San Diego, CA	5	15	4
San Antonio, TX	6	6	12
New Orleans, LA	7	1*	18
Sacramento, CA	8	--	8
Portland, OR	9	21	2
Columbus, OH	10	10*	13
Ft. Lauderdale, FL	11	14	5
Phoenix, AZ	12	8	10
Milwaukee, WI	13	2	30
Denver, CO	14	9	20
Los Angeles, CA	15	7	27
Riverside, CA	16	13*	16*
San Francisco, CA	17	18	14
Newark, NJ	18	11	22
New York, NY	19	12	25
Anaheim, CA	20	20	17
Kansas City, MO	21	19	11
Nassau, NY	22	23	21
Philadelphia, PA	23	17	29
Dallas, TX	24	25	23
Seattle, WA	25	30	19
St. Louis, MO	26	32	15
Minneapolis, MN	27	29	24
Baltimore, MD	28	26	32
San Jose, CA	29	24	33
Chicago, IL	30	27	31
Atlanta, GA	31	22	34
Pittsburgh, PA	32	33	26
Washington, DC	33	28	36
Cincinnati, OH	34	35	28
Indianapolis, IN	35	37	7*
Cleveland, OH	36	36	35
Houston, TX	37	31	38
Detroit, MI	38	34	37

Rank Correlation (No College, College) = .45

Source: Data are from U.S. Census of Population, 1980 (PUMS files A and B).

Note: An asterisk (*) indicates 50-75 observations. SMSAs with fewer than 50 observations in a category are not included in the ranking. More than 100 observations for all SMSAs are included in the overall ranking (QOLI).

Table 5: **Rankings** of the Quality of Life for Households With and Without Children

SMSA	All Households (QOLI)	Households With Children	Households Without Children
Miami, FL	1	1	1
Tampa, FL	2	8	3
Boston, MA	3	9	7
Salt Lake City, UT	4	6	20*
San Diego, CA	5	11	8
San Antonio, TX	6	19	2
New Orleans, LA	7	5*	11
Sacramento, CA	8	20*	6
Portland, OR	9	2	21
Columbus, OH	10	3*	17
Ft. Lauderdale, FL	11	4*	16
Phoenix, AZ	12	21	4
Milwaukee, WI	13	16	9
Denver, CO	14	22	10
Los Angeles, CA	15	14	13
Riverside, CA	16	27*	5*
San Francisco, CA	17	18	14
Newark, NJ	18	13	18
New York, NY	19	7	27
Anaheim, CA	20	12	29
Kansas City, MO	21	10	26
Nassau, NY	22	23	23
Philadelphia, PA	23	24	19
Dallas, TX	24	26	28
Seattle, WA	25	15	33
St. Louis, MO	26	33	12
Minneapolis, MN	27	17	34
Baltimore, MD	28	31	24
San Jose, CA	29	29	31
Chicago, IL	30	28	32
Atlanta, GA	31	32	22
Pittsburgh, PA	32	35	25
Washington, DC	33	34	30
Cincinnati, OH	34	30	36
Indianapolis, IN	35	36	15
Cleveland, OH	36	25	38
Houston, TX	37	37	37
Detroit, MI	38	38	35

Rank Correlation (Children, No Children) = .41

Source: Data are from U.S. Census of Population, 1980 (PUMS files A and B).

Note: An asterisk (*) indicates 50-75 observations. SMSAs with fewer than 50 observations in a category are not included in the ranking. More than 100 observations for all SMSAs are included in the overall ranking (QOLI).