PART VII

Quality of Life

Quality of Life

Urban areas both attract and repel people. Cities offer high-paying jobs, parks, museums, nightlife, and a seemingly infinite variety of consumer goods. They also offer crime, pollution, noise, difficult commutes, crowds, a reduced sense of community, and a greater transience of social relationships. Some people love urban life; others prefer to avoid even visiting cities. Even within urban areas, neighborhoods vary dramatically. Poverty-stricken, crime-ridden neighborhoods offer a striking contrast to beautiful, expensive neighborhoods with excellent schools and virtually no crime. It is probably this contrast between wealth and poverty that has led urban economists to be so interested in measuring and analyzing the quality of life both within and across urban areas. One of the most important roles of urban economists is to help design policies that help improve the quality of life for residents of urban areas.

The most common framework used by urban economists to measure urban amenities is the hedonic model. The hedonic approach, which is used to measure the implicit price of the components of a multidimensional product such as housing, has a long and rich empirical tradition. It was used in early studies to measure the implicit price of components of an automobile – weight, engine size, interior room, and so on. The hedonic approach has been used to measure the price of various attributes of a personal computer, and it is used by labor economists to measure compensating differentials for such labor-market characteristics as workplace safety. Urban economists most commonly use the hedonic approach in studies of the housing market. For example, suppose that we want to measure the value that urban residents place on school quality. House prices and rents can be expected to be higher in areas with good schools, because people will pay a premium to live in these areas. Of course, countless other factors also affect prices and rents, including the size and structural characteristics of homes and other characteristics of the neighborhood. After controlling for as many of these other characteristics as can be measured, the hedonic house price function allows us to place a monetary value on school quality, as revealed through the amount people pay for housing.

Sherwin Rosen (1974) developed the underlying theory of the hedonic approach in a classic article. One of Rosen's students, Jennifer Roback, extended his analysis by simultaneously modeling the housing and labor market (Roback 1982). One use of the approach is to develop an index of the quality of life across urban areas. For example, we can expect house prices to be high in cities with good climates, because people will pay a premium to live in an area with good weather. However, migration to these cities can also lower wages by increasing the supply of labor. Roback's model offers a way of combining the housing and labor-market effects of good weather and other amenities into a single measure of the willingness to pay to live in an urban area. Glenn Blomquist's essay, "Quality of Life," reviews this literature and shows how to estimate a quality of life index.

One of the most extensively studied urban amenities is clean air, usually through its opposite, pollution. Urban areas were once associated with dirty, nearly unbreathable, air that soiled buildings and damaged the health of city residents. Environmental regulations and the movement of heavy industry out of many cities have vastly improved the air quality of many urban areas. It sometimes surprises people, however, that the optimal level of pollution is not equal to zero, because it can be extremely costly to reduce pollution levels beyond some point. Matthew Kahn's essay, "Air Pollution in Cities," presents an overview of the economics of pollution in urban areas.

Although crime is a problem throughout the urban world as well as in rural areas, it is a particular concern in American cities. The ready availability of guns in the United States has helped produce an extraordinarily high murder rate. Although murder rates have fallen recently in the USA, they remain high, particularly in low-income neighborhoods with a large percentage of African-American residents. High crime rates have led to large expenditures on crime prevention and prisons. The essay by Stephen Raphael and Melissa Sills, "Urban Crime, Race, and the Criminal Justice System in the United States," documents these trends.

Many observers blame racial discrimination and prejudice for many of the USA's social problems. Race and poverty are closely linked in the USA. African-Americans are heavily concentrated in low-income areas of the inner cities, where crime rates are high, school quality is low, and access to areas of growing employment is poor. Other observers argue that the modern African-American ghetto is similar to the experiences of previous immigrants to urban areas. Immigrants have come to the USA in waves throughout its history. Each group tends at first to live within its own sharply segregated area. These ethnic enclaves offer familiarity and a network of social contacts. However, they also may restrict access to jobs and delay the eventual assimilation into the mainstream community. In some ways, the African-American experience is similar to this traditional pattern. The 1940s and 1950s witnessed a large migration of African-Americans from the rural south to northern cities. At first, these new urban residents were confined to inner-city ghettos. With the enforcement of Civil Rights laws, it no longer is clear how much of the continued segregation of African-Americans is voluntary and how much is a result of white prejudice and discrimination.

In his essay, "Ethnic Segregation and Ghettos," Alex Anas reviews some of the evidence on segregation in American cities. He uses bid-rent theory to analyze the pattern of land rent within a ghetto and across the ghetto boundaries. Anas does not confine his attention to US ghettos, pointing out that France has Algerian ghettos and Germany has Turkish ghettos. Muslim ghettos in India are often thought to arise from exclusion and discrimination. The link between this section and our earlier treatment of the spatial mismatch hypothesis is obviously a close one. Whether a ghetto arises from voluntary or involuntary forces, it may well restrict employment opportunities, because areas of rapid employment growth are likely to be far from ghettos. Prejudice and discrimination on the part of the majority population accentuate the negative effects of spatial concentration by making it even more difficult to exit the ghetto.

With all the attention paid to urban social problems, it should not be forgotten that cities offer enormous benefits as well. With higher wages and much improved employment opportunities, cities offer a much higher material standard of living than most rural areas. Cities offer variety and opportunity. Urban areas help stimulate innovation by bringing together highly skilled people in close proximity. They provide expanded opportunities to exchange ideas and a greater variety of social networks and cultural amenities, while somewhat paradoxically providing a sense of privacy and anonymity that may be lacking in less populous areas. The same agglomerative forces that make cities a good place to locate a firm make urban areas an exciting place to live and work.

Bibliography

Roback, J. 1982: Wages, rents, and the quality of life. *Journal of Political Economy*, 90(1), 257–78.

Rosen, S. 1964: Hedonic prices and implicit markets: product differentiation in pure competition. *Journal of Political Economy*, 82, 34–55.

CHAPTER TWENTY-EIGHT

Quality of Life

Glenn C. Blomquist

28.1 Money, Quality of Life, and Urban Amenities

Life is good when quality of life is high. To many of us, an ideal quality of life index would measure a person's overall well-being; that is, an individual's total utility. An ideal index would depend upon things that money can buy. Traditional economic goods such as food and drink, shelter, clothing, transportation, and entertainment would be included among these things. An ideal index would depend also upon social, environmental, and perceptual dimensions of well-being. Moderate climate, fresh air, clean water, safe neighborhoods, good schools, and good government would be included among these things. Furthermore, an ideal, holistic index would depend on the way in which individuals and households combine marketed goods and services and environmental and community factors with their own time and energy to produce the things, such as happy homes, that give them utility directly and determine over well-being.

Money income can be used as a metric to measure well-being. The logic is straightforward. More money relaxes the budget constraint and allows a person to purchase more things and achieve a higher level of utility. Not surprisingly, great attention is given to average incomes in different areas, with the underlying notion that households are be better off where incomes are higher because they can buy more. For example, in Berger and Blomquist (1988), we used US Census data to compare household incomes, poverty rates, and unemployment rates across urban areas. We made these comparisons for households of different ages and races, and with and without children. Chambers of Commerce, elected officials, and others talk about the importance of jobs, and the accompanying income, to the well-being of individuals who live in the area.

Money income matters, for sure, but it is an imperfect measure of utility. In part, money income is imperfect because it does not measure the satisfaction that individuals and households derive from traditional market goods that are used to produce things that households really care about. In part, money income is imperfect because it does not directly measure the value of the social and natural environment in which the consumption of traditional market goods takes place. It is in this context that Sherwin Rosen (1979) developed an index of urban quality of life. His quality of life index is designed to measure the value of local amenities that vary from one urban area to another and even from county to county. These amenities are features of locations that are attractive, such as sunny, smog-free days, safety from violent crime, and well-staffed, effective schools. This index measures the monetary value of the bundle of amenities that households get by living and working in the area.

To Rosen and many urban economists, a quality of life index should measure the value of local amenities. While information about money incomes in urban areas is readily available, information about the value of amenities that households get to consume in areas is not. Rosen's quality of life index fills the gap. So, a tradition has developed in urban economics that quality of life means not overall well-being or total utility but, rather specifically, the value of the bundle of local amenities in various locations. Such a quality of life index cannot tell us if individuals in Denver, Colorado, at the foothills of the Rocky Mountains, are better off overall than similar individuals in Detroit, Michigan, in the northern Midwest, but it can tell us whether the amenities in Denver are preferred to the amenities in Detroit by the typical consumer/worker.

28.2 A Framework for Valuing Local Amenities

First, think of a simple, bland world in which everyone is the same in tastes, has the same job opportunities and financial assets, lives in similar housing, and consumes the same bundle of local amenities. Strictly, everything should be identical. Few of us would want to live in this dull world, but it will help to illustrate Rosen's framework for quality of life based on urban amenities. For everyone to be satisfied and remain living and working where they are, it must be true that no one has any incentive to move. If moving costs are negligible, so as to make people footloose, then wherever people live they must have the same level of overall well-being, or total utility.

Now, for some spice in our lives, introduce variety in the bundles of local amenities. Let some urban areas have warmer climates, some wetter, others dirtier air and water, some more crime, and other areas better schools. For everyone to be equally well off in this more stimulating world, each household must have the same utility, or someone who is not as well off moves. If there are local labor and housing markets, then when enough people move they affect these markets by changing the supplies and demands in the areas that they leave and the areas that they join. Rosen's fundamental insight is that households will be attracted to areas where there are good buys; that is, better combinations of amenities, wages, and housing prices. Combinations will be more attractive the better are the amenities, the higher are the wages, and the lower are the housing prices. In like fashion, households will be driven away from areas that are bad buys, until all combinations of local amenity bundles, wages, and housing prices everywhere are equally attractive. This concept of spatial equilibrium is central to urban and regional economics. All similar households will have the same total utility. Those who know finance will recognize this spatial equilibrium as a "no arbitrage" condition. In the end, no one can gain by moving from one market to another. Households that choose to live in high-amenity areas will pay for them with combinations of wages and housing prices that make the high-amenity areas more expensive. Households are forced to trade off money for the better amenity bundles. The combination of lower wages and higher housing prices is an implicit premium, or price, that households pay for choosing an urban area with more attractive amenities. It is this value of the local amenity bundle that Rosen and other urban economists call urban quality of life.

The formal framework for analyzing compensating differentials and quality of life was developed by Rosen (1979) and Roback (1982). In this equilibrium model of wages, rents, and amenities, consumer/workers with similar preferences and firms with similar production technologies face different local amenity bundles across urban areas. Spatial equilibrium in the model means that there is no incentive to move, because differences in wages and/or housing prices develop so as to require payments for locating in amenity-rich areas and provide compensation for locating in amenity-poor areas. The full implicit price of a specified amenity is the sum of the housing price differential and the (negative of the) wage differential. In Blomquist, Berger, and Hoehn (1988), we expanded this framework to incorporate agglomeration effects and used this form of the implicit price of amenities to create a quality of life index.

In this model, households derive utility from consumption of a composite good, local housing, and local amenities. Access to local amenities of any given city is through buying housing h in that urban area. Both the composite good and housing are purchased out of labor earnings. For simplicity, households have one unit of labor each, they sell to local firms, and they earn a wage w. Again for simplicity, all labor is alike and all income is labor income. In any given urban area, household well-being is

$$v = v(w,p;a), \tag{28.1}$$

where $v(\cdot)$ is the indirect utility function reflecting the maximum utility that a household can obtain given the wages and amenities that it gets and the prices it pays. The letter p denotes the price of housing in the urban area, and a is an index of local amenities. The price of the composite good is fixed as equal to one and suppressed. Wages increase utility, $\partial v/\partial w > 0$, and the price of housing decreases utility, $\partial v/\partial p < 0$. An increase in local amenities will increase utility if a is an amenity (good) for consumer/workers, $\partial v/\partial a > 0$. An increase will decrease utility if a is a disamenity (bad) for consumer/workers, $\partial v/\partial a < 0$, and will not matter if a is not an amenity factor.

Firms produce the composite good by combining capital and local labor and production technology is constant returns to scale. For simplicity, the prices of the composite good and capital are fixed by international markets, and wages and prices are normalized on the price of the composite good. Wages and the price of housing are relative the composite good. In any given urban area, unit production costs are

$$c = c(w;a), \tag{28.2}$$

where c is the unit cost function for a firm and the price of capital is left implicit. If a is a production amenity, then costs to firms are lower to area firms, $\partial c/\partial a < 0$. If a is a production disamenity, then costs are higher for local firms, $\partial c/\partial a > 0$. Also, a may not affect firm costs. Movement of households and firms among urban areas influences wages and housing prices so that labor and housing markets clear. Spatial equilibrium exists when all households regardless of location experience a common level of utility, u^*, and unit production costs are equal to the unit production price. For any area, the set of wages and housing prices that sustains an equilibrium satisfies the system of equations

$$u^* = v(w,p;a), \tag{28.3a}$$

$$1 = c(w;a). \tag{28.3b}$$

Equilibrium differentials for wages and housing prices can be used to compute implicit prices of the amenities, f_i. By taking the total differential of equation (28.3a) and rearranging, the implicit price of any amenity i can be found as $f_i = (\partial v/\partial a_i)/(\partial v/\partial w)$. The full implicit price is as follows:

$$f_i = h(\mathrm{d}p/\mathrm{d}a_i) - \mathrm{d}w/\mathrm{d}a_i, \tag{28.4}$$

where h is the quantity of housing purchased by a household, $\mathrm{d}p/\mathrm{d}a_i$ is the equilibrium housing price differential, and $\mathrm{d}w/\mathrm{d}a_i$ is the equilibrium wage differential. The full implicit price is a combination of the effects in the housing and labor markets. Comparative-static analysis of such a model shows that the signs of the housing price and wage differentials depend on the effect of the amenity factor on households and the effect of the amenity factor on firms. A pure consumption amenity, which does not have an effect on firms, is expected to have a full implicit price that is positive. It is the weighted sum of the differentials in the housing market and labor market that is expected to be positive. It is not necessary that both the housing prices are higher and the wages are lower in cities that are rich in the consumption amenity, but for the situation just described they will be. A variety of combinations are possible.

28.3 Quality of Life, Wages, and Rents in Different Urban Areas

The variety of possible combinations of wages and rents for some specified quality of life and constant utility for consumer/workers is shown as the upward-sloping curve in Figure 28.1. Rents, the flow from asset values, are shown instead of housing prices. In different cities that have the same quality of life, consumer workers can experience the same overall well being with high rents and high wages as in the upper right of the curve, with low rents and low wages as in the lower left of the curve, or other combinations of rents and wages along the

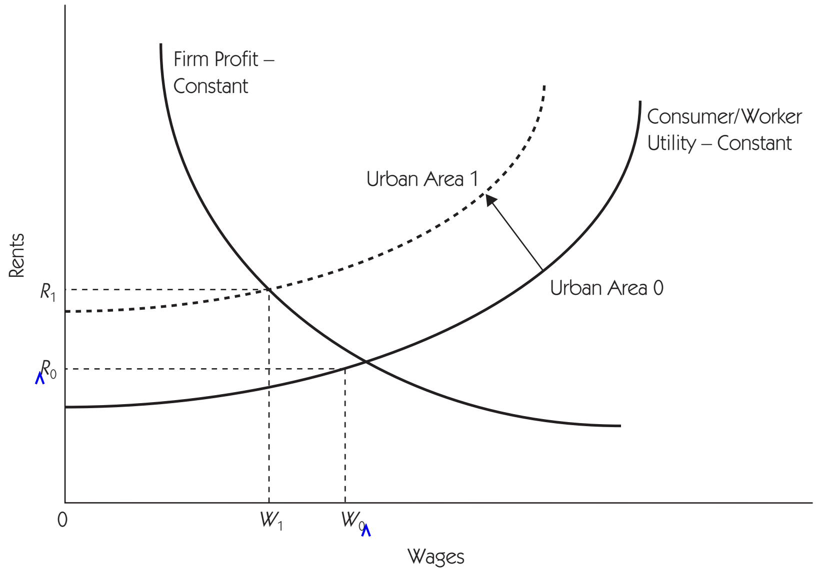

Figure 28.1 A comparison of wages and rents in two urban areas – location 1 has more consumption amenities than location 0.

constant-utility curve. The downward-sloping curve in Figure 28.1 shows the variety of combinations for some specified set of production amenities and constant (zero) profits for firms when rents are added to the cost function. In different cities that have the same set of production amenities, firms can experience the same profits with high rents and low wages as in the upper left part of the curve, low rents and high wages as in the lower right part of the curve, or other combinations along the constant-profit curve. The rent and wage observed for a typical residence and a typical worker is determined by the interaction of consumer/workers and firms and is the equilibrium combination shown as R_0 and W_0.

Now, let us consider comparing urban areas that have different amenity bundles. Figure 28.1 shows what happens when one area has more of a local amenity, such as a spectacular view of a mountain range, that is good for consumer/workers. Assume that the mountains are not amenities in any other way and that they do not affect firms. The presence of such a consumption amenity that increases quality of life is to shift the entire upward-sloping curve for consumer/workers up and to the left, as shown by the dashed curve. Because of better amenities, consumer/workers are now willing to pay combinations of higher rents and lower wages and remain just as well off as they were. In this case of a pure consumption amenity, the equilibrium rents will be higher ($R_1 > R_0$) and wages lower ($W_1 < W_0$) in the urban area with the better views. A comparison of rents for typical housing and wages for typical workers in the two urban areas would show the differences due to the difference in quality of life. Comparisons across many urban areas can be made more readily using a quality of life index.

28.4 A Quality of Life Index for Making Comparisons

Comparison across a host of cities is facilitated by an index that aggregates local amenities using the differences in rents and wages. In Blomquist, Berger, and Hoehn (1988), the quality of life index (QOLI) for any urban area is as follows:

$$\text{QOLI} = \sum_i f_i a_i, \tag{28.5}$$

where QOLI is the sum of the endowments of the amenities in the given urban area. Each amenity is weighted by its estimated full implicit price. The full implicit price is based on the wage and housing price differentials. As such, the QOLI is an estimate of the total compensation, or premium, for local amenities made through the housing and labor markets.

The dominant advantage of this type of index is that the weights for each of the amenities in the index are based on consumer/worker preferences, not the preferences of the authors. The weights are firmly grounded in economic theory. What we did in our study was choose a set of amenities that we thought would be salient enough for consumers in the housing market and workers in the labor market that they would affect rents and wages. The weights (f_i) can reflect the preferences of tens of thousands of residents and workers.

An alternative to valuing each of the observed amenities and aggregating to obtain the QOLI is to use the combined, total differences in wages and rents in the urban areas without trying to separate the differences attributable to specific amenities. This alternative does not attempt to estimate the weights for each amenity. Ranking is then based on the effect of the entire group of amenities in each urban area on wages and rents. The idea is that after typical housing characteristics, such as number of rooms, and usual worker characteristics, such as education, are accounted for, the differences in rents and wages must be due to differences in local amenities. Beeson and Eberts (1989) use this approach to identify urban areas that are rich in consumption amenities and production amenities. Gyourko, Kahn, and Tracy (1999) discuss the advantages of the observed amenities and group effects approaches. Their work also emphasizes the importance of local amenities, such as crime control, that are produced by local governments.

28.5 Constructing a QOLI – Step by Step

Let's think about how we construct a QOLI such as that shown in equation (28.5), where the index number for an urban area is the sum of the amenity endowment for each amenity (a_i) weighted by the full price of the amenity (f_i) over all the amenities in the index. The first step is to obtain data on housing prices and rents and housing characteristics and wages and worker and job characteristics in various urban areas. The locations of the residences and the jobs must be identified in the data. In Blomquist, Berger, and Hoehn (1988) we used microdata from the 1 in 1000 A Public Use Sample of the 1980 US Census of Population and

Housing. These data are collected from individual residents and individual workers and identify the urban county in which each is located. If someone wanted to update our study, similar data for Public Microdata Areas in electronic form are available from www.census.gov.

The second step is to augment the basic housing price and wage data with local amenities that must be matched to the locations of the individual residences and jobs. Matching these amenities by location is a lot of work. We collected data for 16 different amenity factors from a variety of sources. Urban conditions were represented by three variables. We obtained data on the violent crime rate from FBI crime reports, on the teacher–pupil ratio in public schools from the Census of Governments, and from the Census of Population and Housing we created a central city variable if the individual was located in the central city of an urban area. Crime data are now available at www.fbi.gov/ucr/00cius.htm. Climate was represented by seven variables that were available through the National Climatic Data Center, with one exception. Climate was represented by precipitation, relative humidity, heating degree days as a measure of cold, cooling degree days as a measure of heat, wind speed, prevalence of sunshine, and whether the urban county was on a coast. The last variable was created by consulting maps. If someone wanted to collect similar data for 2000, it is available at www.ncdc.noaa.gov. Environmental quality was represented by six variables that were based on data supplied from various sources at the US Environmental Protection Agency. Environmental quality for each urban county was measured by atmospheric visibility, total suspended particulates in the air, the number of National Pollution Discharge Elimination System dischargers for water, landfill waste quantity, the number of Superfund sites, and the number of Treatment, Storage, and Disposal sites. Environmental data can now be downloaded from www.epa.gov/STORET.

The third step is to estimate housing and wage hedonic regressions. We need to estimate these hedonic regressions in order to obtain estimates of the differences in housing prices due to the local amenities ($\mathrm{d}p/\mathrm{d}a_i$) and the difference in wages due to local amenities ($\mathrm{d}w/\mathrm{d}a_i$). If all housing were alike except for the local amenities, then we could easily find these differences by comparing averages, county by county. However, housing differs by living space, age, and other features. Similarly, workers differ in their training, experience, occupation, and other characteristics. Statistically, we control for the nonamenity factors in multiple regression so that we can isolate the influence of the amenities. The hedonic regression for housing is shown in Table 28.1. The dependent variable is monthly housing expenditures with owners and renters combined. Owner's value is converted to monthly imputed rent using a 7.85 percent discount rate. The table shows the coefficient for each of the 16 amenity factors, structural characteristics, and allows for differences between owners and renters. The hedonic regression for wages is shown in Table 28.2. The dependent variable is hourly wage. This table shows the coefficient for each of the same 16 amenity factors, and the characteristics of the worker and the job. Both sets of regression results are reported in linear form rather than for the Box–Cox power transformations that were used in estimation. The linear form is much easier to interpret. Anyone

Table 28.1 Housing hedonic regression: the dependent variable is monthly housing expenditures

Explanatory variable	*Units*	*Mean*	*Coefficient*
Amenities			d*p*/d*a*
Precipitation	Inches per year	32.02	–1.047
Humidity	Percent	68.22	–2.127
Heating degree days	Degree days per year	4,223.0	–0.014
Cooling degree days	Degree days per year	1,185.0	–0.076
Wind speed	Miles per hour	8.872	11.88
Sunshine	Percentage of days	61.36	2.135
Coast	Yes = 1, no = 0	0.345	32.52
Central city	Yes = 1, no = 0	0.329	–40.75
Violent crime	Crimes per 100,000 population per year	681.60	0.043
Teacher–pupil ratio	Teachers per student	0.080	635.30
Visibility	Miles	15.66	–0.831
Total suspended particulates	$\mu g\ m^{-3}$	73.72	–0.535
Water effluent dischargers	Number per county	1.564	–7.458
Landfill waste	100 million metric tons per county	467.20	0.010
Superfund sites	Sites per county	0.858	13.43
Treatment, storage, and disposal sites	Sites per county	47.59	0.218
Other housing characteristics			
Units at address	Units	2.667	1.375
Age of structure	Years	23.73	–2.363
Height of structure	Stories	2.433	16.52
Rooms	Number	5.395	40.33
Bedrooms	Number	3.510	6.485
Bathrooms	Number	1.486	119.80
Condominium	Yes = 1, no = 0	0.032	–84.82
Central air conditioning	Yes = 1, no = 0	0.313	55.68
Sewer	Yes = 1, no = 0	0.886	10.84
Lot larger than 1 acre	Yes = 1, no = 0	0.062	78.80
Renter	Yes = 1, no = 0	0.410	–58.64
Renter × units at address		1.992	–2.580
Renter × age		9.964	0.899
Renter × height of building		1.220	–17.19

Table 28.1 (*cont'd*)

Explanatory variable	*Units*	*Mean*	*Coefficient*
Renter × rooms		1.622	–7.189
Renter × bedrooms		1.112	2.014
Renter × bathrooms		0.479	–30.85
Renter × condominium		0.008	126.87
Renter × central air		0.130	50.95
Renter × sewer		0.395	–39.19
Renter × acre lot		0.014	–95.75
Constant			1,256.0

Notes: $R^2 = 0.6624$, $F = 1{,}823$, $N = 34{,}414$. All coefficients are statistically significant at the 5 percent level except for four variables: Units at address, Renter × unit, Renter × bedrooms, and Treatment, storage, and disposal sites. The sample mean of monthly housing expenditures in 1980 is $462.93. The dependent variable (p) was estimated in the form $(p^{0.2} - 1)/0.2$ based on Box–Cox maximum-likelihood search. The coefficients reported in this table are linearized by multiplying each coefficient by the mean of p raised to the 0.8 power.

updating this study with more recent data might estimate the housing price and wage equations with the (natural) logarithms of the dependent variables, with a gain in simplicity that would probably outweigh any cost in the less satisfactory functional form of the hedonic regressions.

The fourth step is to calculate the estimated full prices (f_i) in accordance with equation (28.4) above using the estimated coefficients from the hedonic housing equation for $\mathrm{d}p/\mathrm{d}a_i$ and from the wage hedonic equation for $\mathrm{d}w/\mathrm{d}a_i$. These full prices are then used along with the amenity endowments in each urban county to yield the QOLI value for each county. Before combining the effects from the housing and labor markets, we must adjust the coefficients to make them annual effects for households. The monthly household housing expenditure must be multiplied by 12 months per year. The hourly wage for a worker must be multiplied by the average number of weeks worked per year (42.79), the average number of hours worked per week (37.85), and the average number of workers per household (1.54). An example might be helpful. For the teacher–pupil ratio, the full price per household per year is (635.30)(12) – (–5.45)(42.79)(37.85)(1.54) = $21,217. (The value that we get if we do not round as much as we do in reporting numbers in Tables 28.1 and 28.2 is $21,250.) Estimated full implicit prices (f_i) are calculated for all 16 amenity factors that make up the QOLI.

The fifth step is to calculate an estimated QOLI value for each location. Following equation (28.5) above, we multiply the estimated full implicit price for each amenity factor times the quantity of that amenity in the location, QOLI = $\sum_i f_i a_i$. We did this to obtain QOLI values for each of the 253 urban counties in our sample. We can illustrate by calculating the QOLI value for a fictitious county

Table 28.2 Wage hedonic regression: the dependent variable is hourly wage rate

Explanatory variable	*Units*	*Mean*	*Coefficient*
Amenities			dw/da
Precipitation	Inches per year	32.01	−0.014
Humidity	Percent	68.27	0.0072
Heating degree days	Degree days per year	4,326.0	−0.000035
Cooling degree says	Degree days per year	1,162.0	−0.00022
Wind speed	Miles per hour	8.895	0.096
Sunshine	Percent of days	61.12	−0.0092
Coast	Yes = 1, no = 0	0.330	−0.031
Central city	Yes = 1, no = 0	0.290	−0.454
Violent crime	Crimes per 100,000 population per year	646.80	0.00062
Teacher–pupil ratio	Teachers per student	0.080	−5.45
Visibility	Miles	15.80	−0.0026
Total suspended particulates	μg m^{-3}	73.24	−0.0024
Water effluent dischargers	Number per county	1.513	−0.0051
Landfill waste	100 million metric tons per county	477.50	0.00009
Superfund sites	Number per county	0.883	0.107
Treatment, storage, and disposal sites	Number per county	46.44	0.0013
Worker and job characteristics			
Experience	Age – schooling – 6, years	17.44	0.310
Experience squared		513.90	−0.005
Schooling	Years	12.76	0.442
Race	Nonwhite = 1, white = 0	0.153	−0.959
Gender	Female = 1, male = 0	0.452	−0.312
Enrolled in school	Yes = 1, no = 0	0.149	−0.600
Marital status	Married = 1, unmarried = 0	0.586	1.441
Health limitations	Yes = 1, no = 0	0.048	−0.885
Gender × experience		7.598	−0.132
Gender × experience square		221.30	0.0023
Gender × race		0.075	1.102
Gender × marital status		0.237	−1.392
Gender × children		1.118	−0.254

Table 28.2 (*cont'd*)

Explanatory variable	*Units*	*Mean*	*Coefficient*
Professional or managerial	Yes = 1, no = 0	0.232	2.499
Technical or sales	Yes = 1, no = 0	0.336	1.214
Farming	Yes = 1, no = 0	0.012	0.129
Craft	Yes = 1, no = 0	0.113	1.437
Operator of laborer	Yes = 1, no = 0	0.173	0.690
Industry unionization	Percent	23.35	0.038
Constant			2.76

Notes: $R^2 = 0.3138$, $F = 601$, $N = 46{,}004$. All coefficients are significant at the 5 percent level except for: Farming, Humidity, Heating degree days, Coast, Visibility, Total suspended particulates, and Water effluent dischargers. The hourly wage is earnings in 1979 divided by the product of weeks worked and usual hours worked per week. The sample mean for hourly wage is \$8.04. The dependent variable w was estimated in the form $(w^{0.1} - 1)/0.1$ based on a Box–Cox maximum-likelihood search. The coefficients reported in this table are linearized by multiplying each coefficient by the mean of w raised to the 0.9 power. The omitted occupation category is Service.

that is also the central city, is located inland and not on a coast, and has the average quantity of each of the other 14 amenities. Following the order of the amenities in Table 28.2 and using the means in that table, we have QOLI (inland, central city, average) = (23.5)(32.01) + (–43.42)(68.27) + (–0.08)(4,326) + (–0.36)(1,162) + (–97.51)(8.895) + (48.52)(61.12) + (467.72)(0) + (645.02)(1) + (–1.03)(646.8) + (21,250)(0.0799) + (–3.41)(15.8) + (–0.36)(73.24) + (–76.68)(1.513) + (–0.11)(477.5) + (–106.07)(0.883) + (–0.58)(46.44) = 429.05. This example turns out to be close to the QOLI value for Sacramento, California. Sacramento County is ranked 80th, and this brings us to the sixth step.

The last step is to rank the areas by QOLI value. Table 28.3 shows the rankings for the top urban counties with a QOLI value more than one standard deviation greater than the mean of QOLI. Table 28.4 shows the rankings for the bottom urban counties with a QOLI value more than one standard deviation below the mean of QOLI. These areas are the best and worst out of the 253 urban counties ranked. The average value of the QOLI is 186, and is less than the value for the fictitious county that we considered in our example above because only 29 percent of the counties are central city. Quality of life as measured by the values of the bundle of local amenities revealed in the housing and labor markets tends to be highest in small and medium-sized urban areas in the Sun Belt and Colorado. Quality of life tends to be lowest in large northern urban areas. The annual premium that the typical household of consumer/workers is willing to pay is \$5,146, the difference between the QOLI values for top-ranked Pueblo, Colorado, and St Louis City, Missouri.

Table 28.3 The quality of life ranking for urban counties: the best

Urban county	*Metropolitan area*	*State*	*QOLI rank*	*QOLI value ($)*
Pueblo	Pueblo	Colorado	1	3,288.72
Norfolk City	Norfolk – Virginia Beach – Portsmouth	Virginia	2	2,105.77
Arapahoe	Denver–Boulder	Colorado	3	2,097.07
Bibb	Macon	Georgia	4	1,599.57
Washoe	Reno	Nevada	5	1,575.37
Broome	Binghamton	New York	6	1,485.63
Hampton City	Newport News – Hampton	Virginia	7	1,444.63
Sarasota	Sarasota	Florida	8	1,430.84
Palm Beach	West Palm Beach – Boca Raton	Florida	9	1,422.54
Pima	Tucson	Arizona	10	1,341.86
Broward	Fort Lauderdale – Hollywood	Florida	11	1,326.91
Boulder	Denver–Boulder	Colorado	12	1,319.47
Larimer	Fort Collins	Colorado	13	1,297.84
Denver	Denver–Boulder	Colorado	14	1,295.25
Charleston	Charleston – North Charleston	South Carolina	15	1,280.21
Monterey	Salinas – Seaside – Monterey	California	16	1,213.97
Roanoke City	Roanoke	Virginia	17	1,129.65
Lackawanna	Northeast Pennsylvania	Pennsylvania	18	1,127.43
Leon	Tallahassee	Florida	19	1,066.51
Richmond City	Richmond	Virginia	20	1,059.96
Fayette	Lexington–Fayette	Kentucky	21	1,055.50
Santa Barbara	Santa Barbara – Santa Maria – Lompoc	California	22	1,025.76
Ventura	Oxnard – Simi Valley – Ventura	California	23	1,022.83
Durham	Raleigh–Durham	North Carolina	24	1,014.01
New Hanover	Wilmington	North Carolina	25	1,000.92
Wake	Raleigh–Durham	North Carolina	26	990.98
San Diego	San Diego	California	27	980.93
Virginia Beach City	Norfolk – Virginia Beach – Portsmouth	Virginia	28	967.70
Lancaster	Lancaster	Pennsylvania	29	965.38
Manatee	Bradenton	Florida	30	958.13
Weld	Greeley	Colorado	31	957.23
El Paso	El Paso	Texas	32	923.02
Racine	Racine	Wisconsin	33	912.83
Guilford	Greensboro – Winston Salem – High Point	North Carolina	34	908.74
Lane	Eugene–Springfield	Oregon	35	884.00
Maricopa	Phoenix	Arizona	36	870.69

Note: The QOLI value for each of these top urban counties is greater than $853, which is more than one standard deviation above the average value of $186.

28.6 QOLI AND *PLACES RATED* RANKINGS

Rankings of urban areas generate an amazing amount of interest. Boyer and Savageau's (1985) *Places Rated Almanac* helped make comparisons popular and *USA Today*, with its national market and proclivity for colorful lists and pie charts, capitalized on heightened interest. The *Places Rated* index was comprised of nine categories for quality of life: climate and terrain, housing, health care and the environment, crime, transportation, education, the arts, recreation, and economics. The authors, using their own judgment, awarded points for characteristics in each category for each of 329 urban areas, ranked urban areas in each category, and added the rankings in each category to obtain an overall ranking. The top-ranked metropolitan area overall was Pittsburgh in Allegheny County, Pennsylvania, and the bottom-ranked area was Yuba City, which is in Sutter County, California, north of Sacramento.

Two distinctive aspects make this procedure different from the one that urban economists use. The first is that economic conditions are included in addition to local amenities, almost as if the attempt is to try to make comparisons of overall well-being. The second is that the authors use their own judgment and preferences. They interject their own preferences in two ways. One is that they assign points in each of the nine categories of quality of life. The other is that they weight the rankings in each of the nine categories equally to calculate the overall score and ranking. This equal weighting means that a one-position difference in climate is equally important as a one-position difference in the crime ranking. In contrast, urban economists use a Rosen index – or something like it – that includes only local amenities, and that aggregates the amenities in each urban area by the values of the amenities that reflect combined individual preferences, which are implicit in the choices that individuals make in the housing and labor markets.

In Berger, Blomquist, and Waldner (1987), we find for approximately the same time period that our QOLI-based, quality of life ranking for metropolitan areas is quite different from the 1981 *Places Rated*. We find that consumer/workers rank the quality of life in the Pittsburgh area 164th of 185 metropolitan areas, far below the top ranking found in *Places Rated*. In fact, we find that the rank correlation between our QOLI ranking of metropolitan areas and the *Places Rated* ranking is essentially zero. What is clear is that a preference-based ranking of the value of the local amenities, such as our QOLI, and a ranking based on equal weighting of various local amenities – and some economic conditions – yield vastly different results.

28.7 ONE QUALITY OF LIFE INDEX DOES NOT FIT ALL

The application of the QOLI by Blomquist, Berger, and Hoehn (1988) is based on an analysis of labor and housing markets, and ranks urban areas based on the revealed values of thousands of workers and residents for a bundle of amenities in which there is broad interest. The ranking reflects the value of typical

Table 28.4 The quality of life ranking for urban counties: the worst

Urban county	*Metropolitan area*	*State*	*QOLI rank*	*QOLI value ($)*
Baltimore	Baltimore	Maryland	220	–485.32
St Charles	St Louis	Missouri	221	–486.10
Hennepin	Minneapolis – St Paul	Minnesota	222	–488.20
Camden	Philadelphia	New Jersey	223	–523.00
Saginaw	Saginaw	Michigan	224	–537.30
Clark	Portland	Washington	225	–547.30
Dakota	Minneapolis – St Paul	Minnesota	226	–558.10
Snohomish	Seattle–Everett	Washington	227	–562.70
Allen	Lima	Ohio	228	–585.10
Jackson	Jackson	Michigan	229	–635.30
Will	Chicago	Illinois	230	–676.10
Greene	Dayton	Ohio	231	–681.30
Niagara	Buffalo	New York	232	–682.70
Calhoun	Battle Creek	Michigan	233	–701.10
Denton	Dallas – Fort Worth	Texas	234	–709.90
Peoria	Peoria	Illinois	235	–758.80
Rockland	New York	New York	236	–795.50
Cameron	Brownsville – Harlingen – San Benito	Texas	237	–795.70
Medina	Cleveland	Ohio	238	–823.30
Hidalgo	McAllen – Pharr – Edinburg	Texas	239	–823.80
St Louis	St Louis	Missouri	240	–875.30
Harris	Houston	Texas	241	–916.30
Jefferson	St Louis	Missouri	242	–918.30
Washington	Minneapolis – St Paul	Minnesota	243	–920.20
Kent	Grand Rapids	Michigan	244	–950.90
Kalamazoo	Kalamazoo–Portage	Michigan	245	–976.30
Cook	Chicago	Illinois	246	–979.10
Genesse	Flint	Michigan	247	–1,018.50
Macomb	Detroit	Michigan	248	–1,024.10
Wayne	Detroit	Michigan	249	–1,267.50
Brazoria	Houston	Texas	250	–1,403.50
Jefferson	Birmingham	Alabama	251	–1,539.30
Waukesha	Milwaukee	Wisconsin	252	–1,791.50
St Louis City	St Louis	Missouri	253	–1,856.70

Note: The QOLI value for each of these bottom urban counties is less than –$481, which is more than one standard deviation below the average value of $186.

workers and residents and depends on the distribution of firms and supply of local amenities by nature and local governments. While clamor about the Sun Belt draws attention to climate, products of local governments can be of paramount importance to some groups. Single individuals are likely to be interested in entertainment, recreation, and advanced education opportunities. Married couples with school-age children are likely to focus on school quality and crime control. A QOLI that has these amenity factors will be more relevant for these couples than one that does not. Retirees may be interested in local crime control, but are likely less interested in school quality. A QOLI that excludes school quality may be more relevant for retirees who may not be willing to pay much for the schools. A special QOLI could be constructed for each group.

Numbers can illustrate. Consider again married couples with school-age children. In our study of 253 urban counties, we re-ranked counties based on the teacher–pupil ratio in public schools, the violent crime rate, and central city location. While this ranking may not match exactly what these couples would want in their amenity bundle, comparison to the ranking based on the overall index that includes climate and environmental quality is informative. The comparison is shown in the rightmost column in Table 28.5. Five of the top 15 urban counties remain in the top 15, but others drop. Examples are Sarasota (Florida), which falls to 26, and Hampton City (Virginia), which falls to 48. Palm Beach (Florida), Washoe (Nevada), Pima (Arizona), and Charleston (South Carolina) all drop out of the top 100. Among the bottom 10, all but one move out of the bottom 10. Waukesha (Wisconsin) moves up to 113 and Kent (Michigan) jumps up to 78. St Louis City (Missouri), remains at the bottom.

Using subsets of the QOLI, we ranked the counties by urban conditions, climate, and environmental quality. The correlations of the ranking based on the overall QOLI with the rankings based on subset QOLIs were 0.48 for urban conditions, 0.63 for the climate, and 0.21 for environmental quality. Even with the same weights, the rankings are different because the bundle of amenities varies.

Different groups will be interested not only in different amenity bundles in various urban areas, but in how the price for the local quality of life is paid. A household with two wage earners in the labor market will shy away from urban areas in which most of the premium for a high quality of life is paid for through lower wages. Those households would pay double, in a sense. Retirees, in contrast, will find these urban areas with a large share of the compensation paid in the labor market attractive, because their incomes are independent of local wages. Graves and Waldman (1991) analyzed census data and found that, in fact, migration of the elderly flowed to areas in which the price for the local amenities is paid predominantly through the labor market.

Taken to the limit, each of us could construct a personal QOLI and rank urban areas for ourselves. We would use our own weights and include local amenities that we value. It is possible to tailor an index. Recent editions of the *Places Rated Almanac* by Savageau and Boyer (1993) Savageau and D'Agostino (2000) and offer a short chapter in which an individual completes a preference inventory test that yields weights for each of the factors such as crime, transportation, education, and jobs. These personal weights can be applied to the ratings of the

Table 28.5 A comparison of rankings of urban counties, overall QOLI versus QOLI with only urban conditions, and top 15 and bottom 10 counties

Urban county	*Metropolitan area*	*State*	*QOLI rank*	*QOLI urban conditions rank*
Hampton City	Beach – Portsmouth	South Carolina	*QOLI*	*QOLI urban*
Pueblo	Pueblo	Colorado	1	1
Norfolk City	Norfolk – Virginia Beach – Portsmouth	Virginia	2	5
Arapahoe	Denver–Boulder	Colorado	3	3
Bibb	Macon	Georgia	4	4
Washoe	Reno	Nevada	5	130
Broome	Binghamton	New York	6	2
Hampton City	Newport News – Hampton	Virginia	7	48
Sarasota	Sarasota	Florida	8	26
Palm Beach	West Palm Beach – Boca Raton	Florida	9	102
Pima	Tucson	Arizona	10	151
Broward	Fort Lauderdale – Hollywood	Florida	11	33
Boulder	Denver–Boulder	Colorado	12	28
Larimer	Fort Collins	Colorado	13	50
Denver	Denver–Boulder	Colorado	14	29
Charleston	Charleston – North Charleston	South Carolina	15	110
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Kent	Grand Rapids	Michigan	244	78
Kalamazoo	Kalamazoo–Portage	Michigan	245	165
Cook	Chicago	Illinois	246	168
Genesee	Flint	Michigan	247	212
Macomb	Detroit	Michigan	248	231
Wayne	Detroit	Michigan	249	242
Brazoria	Houston	Texas	250	211
Jefferson	Birmingham	Alabama	251	188
Waukesha	Milwaukee	Wisconsin	252	113
St Louis City	St Louis	Missouri	253	253

factors to yield a personal ranking of urban areas. The 1993 edition offered a diskette as a supplement to facilitate personal rankings.

Urban quality of life related to consumption amenities valued by consumer/workers offers a fascinating perspective on life in different urban areas. Firms, however, need not have the same perspective. As discussed above, production amenities that make firms more efficient in one urban area than another need not be consumption amenities, and vice versa. An implication is that firms will be attracted to high-consumption amenity locations where the price paid by consumer/workers is mostly through the labor market. This attraction will be even stronger for firms that are labor intensive in workers who value local consumption amenities greatly. Holding skill level constant, these locations will be low-wage areas to these firms. Gabriel and Rosenthal (2004) make use of this relationship to rank 37 metropolitan areas by quality of business environment for the period 1977–95. They compare the ranking with a ranking based on a QOLI (using the group effects alternative) and find that many of the areas that are attractive to consumer/workers are unattractive to business. For example, Miami was ranked first for consumers and 34th for firms, near the bottom. Overall, the correlation between the premium for consumption amenities and the premium paid by firms for production amenities was only 0.05, almost zero.

In the end, a QOLI can indicate where quality of life is higher and lower for a bundle of local amenities in which there is broad interest. There is no single index that will serve well for all purposes. Different consumer/workers will value different amenities differently because of their stage in the life cycle and because of different preferences. Firms will value different amenities and have a different perspective and lower wages that compensate for consumption amenities. Quality of business environment need not be the same as quality of life. Urban areas will be ranked differently depending on perspective.

28.8 WHAT HAS BEEN LEARNED FROM STUDYING QUALITY OF LIFE?

Quality of life matters. We have substantial evidence that individuals trade off money for better quality of life as measured by better local amenities in some urban areas. They pay for a higher quality of life through a less attractive combination of lower wages and higher rents. Most of the evidence is for the United States, but in Berger, Blomquist, and Sabirianova (2003) we also find a willingness to pay for local amenities in the large transition economy of Russia.

Local public officials and Chambers of Commerce who ignore local amenities related to environmental and urban conditions may find their areas shrinking as competing urban areas offer more attractive local amenity-tax packages to consumer/workers. As Diamond and Tolley (1982) and Bartik and Smith (1987) demonstrate, these local amenities influence residential location patterns, urban density, and urban development. Governments are crucial to urban quality of life. Crime is influenced by police, courts, social services, and street lighting. Public-school quality is influenced by teachers, facilities, and the ability to attract good students. Environmental quality is influenced by local policy and implementation of national policy that permits some local discretion. Urban governments that attempt to "race to the bottom" of environmental regulation risk earning a reputation for a low quality of life.

Quality of life indexes should be tailored to the purpose. While a general QOLI can be useful, the relevant amenities and values can vary from group to group and from individual to individual. A household with a married couple who both work in the labor market and have two school-age children will not necessary want the same amenity bundle or have the same amenity values as a retired couple. A tailored QOLI can be used to help forecast changes in urban areas by indicating how demands for particular amenities are going to change with demographic and social trends.

There's no place like home. Even if everyone were alike and valued amenities the same way, we couldn't all live in the same place. With different amenity bundles in different places, differences in wages and rents will arise to compensate households in areas with a low quality of life and make households pay in areas with a high quality of life. Households get distributed across urban areas. Differences in households produce differences in values of amenity bundles in different urban areas, and the distribution of households across areas will be systematic, not random. Young couples with children will tend to sort to high-rent areas with good schools. Retirees will tend to sort to low-wage areas with pleasant climates. In general, households will tend to sort themselves to areas that offer the amenity bundle (and price) that they like. The fact that lots of folks think that the quality of life is good right where they are is no surprise. Residents stayed in or moved to their current locations because those urban areas offered the best combination of wages, rents, and quality of life.

Bibliography

Bartik, T. J. and Smith, V. K. 1987: Urban amenities and public policy. In E. S. Mills (ed.), *Handbook of Urban and Regional Economics*, vol. 2: *Urban Economics*. New York: Elsevier.

Beeson, P. E. and Eberts, R. W. 1989: Identifying productivity and amenity effects in interurban wage differentials. *Review of Economics and Statistics*, 71(3), 443–52.

Berger, M. C. and Blomquist, G. C. 1988: Income, opportunities, and the quality of life of urban residents. In M. G. H. McGeary and L. E. Lynn, Jr (eds.), *Urban Change and Poverty*. Washington, DC: National Academy Press.

——, ——, and Sabrianova, K. Z. 2003: Compensating differentials in emerging labor and housing markets: estimates of quality of life in Russian cities. Paper presented at a session in honor of the memory of Sherwin Rosen at the AERE/ASSA meetings held in Washington, DC, on January 3–5, 2003.

——, ——, and Waldner, W. 1987: A revealed-preference ranking of quality of life in metropolitan areas. *Social Science Quarterly*, 68(4), 761–78.

Blomquist, G. C., Berger, M. C., and Hoehn, J. P. 1988: New estimates of quality of life in urban areas. *American Economic Review*, 78(1), 89–107.

Boyer, R. and Savageau, D. 1985: *Places Rated Almanac: Your Guide to Finding the Best Places to Live in America*. Chicago: Rand McNally.

Diamond, D. B., Jr and Tolley, G. S. 1982: *The Economics of Urban Amenities*. New York: Academic Press.

Gabriel, S. A. and Rosenthal, S. S. 2004: Quality of the business environment versus the quality of life: Do firms and households like the same cities? *Review of Economics and Statistics*, 86(1), 438–44.

Graves, P. E. and Waldman, D. M. 1991: Multimarket amenity compensation and the behavior of the elderly. *American Economic Review*, 81, December, 1,374–81.

Gyourko, J., Kahn, M., and Tracy, J. 1999: Quality of life and environmental comparisons. In E. S. Mills and P. Cheshire (eds.), *The Handbook of Applied Urban Economics*. New York: North-Holland.

Roback, J. 1982: Wages, rents, and the quality of life. *Journal of Political Economy*, 90, December, 1,257–78.

Rosen, S. 1979: Wage-based indexes of urban quality of life. In P. Mieszkowski and M. Straszheim (eds.), *Current Issues in Urban Economics*. Baltimore, MD: Johns Hopkins University Press.

Savageau, D. and Boyer, R. 1993: *Places Rated Almanac: Your Guide to Finding the Best Places to Live in North America*. New York: Prentice Hall Travel.

—— and D'Agostino, R. 2000: *Places Rated Almanac*. Foster City, CA: IDG Books.