THE SOCIAL BENEFITS OF URBAN CULTURAL AMENITIES*

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ABSTRACT. This paper uses a two-stage hedonic wage approach to derive the benefits from improvement of five cultural amenities. It is argued that the hedonic approach permits valuation of both private and local public aspects of cultural goods since access to the amenity is an essential input in the production of the final service flow. Empirical estimates of willingness to pay suggest price and income elasticities are approximately unity. Lower-bound estimates of marginal benefits for a representative city range from $0.85 million for an additional theater to $57.9 million for an additional zoo facility.

1. INTRODUCTION

Models of locational equilibrium suggest that workers choose the city in which they locate so as to maximize the utility derived from the bundle of wages and amenities associated with the city.[1] There are two very important policy implications associated with this tradeoff. First, it is possible to measure how much people value increases in amenities and how their standard of living would improve as a result of public investments which improve the amenity level. Second, since improved amenities lead to a more favorable labor market from the perspective of firms, an improvement in the quality of life may lead to entry of firms

This paper examines these two policy issues with regard to cultural amenities such as museums, theater, dance, instrumental music, and zoos. At first glance, it may seen unusual to be discussing cultural amenities as public goods, because they are characterized by excludability and rivalry in consumption like other private goods, and they are often privately provided. However, Baumol and Bowen (1966) discuss the public-good nature of the fine arts in a national context. Additionally, there are at least three local public-good aspects associated with cultural amenities making them of interest to regional policy makers. The first and perhaps most important of these is access to the amenity. Access is a necessary condition to enjoying the private-good characteristics of cultural amenities. One of the reasons access varies across cities is that there are substantial indivisibilities and economies of scale associated with the provision of cultural amenities. Access does have the

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[1]Rosen (1979) was among the first to examine this tradeoff. Recent studies include Henderson (1982), Clark, Kahn and Ofek (1988), and Clark and Kahn (1989).

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public-good characteristics of nonrivalrous and nonexcludable consumption. Although an individual may be excluded from a particular performance, that exclusion does not extend to performances in general. Likewise, one person's enjoyment of access to cultural amenities in no way detracts from the enjoyment of others.

A second source of publicness associated with cultural amenities is the notion of the option demand. Although option demand is often cited in regard to unique environmental amenities like Yellowstone National Park, such a demand exists for cultural amenities as well. For example, a young adult may not currently use zoo facilities but, given the expectation of future children, that individual may have a current demand for the option to use the amenity. A final public aspect of cultural amenities is existence value, discussed by Baumol and Bowen (1966) at the national level. Individuals may place value on the existence of the amenity even if they never intend to use the amenity. This may result from a belief that cultural amenities benefit the community as a whole. Regardless of the source of publicness, such preferences are not revealed in private demand analysis (i.e., using current attendence as the quantity measure, and ticket price as the price). Since local communities are often called upon to provide support for cultural amenities, estimates of demand and the associated benefits are needed if informed choices are to be made.

Several estimation techniques have been developed to estimate benefits for goods with public-good attributes. One approach involves the use of willingness-to-pay surveys where the individual is asked to estimate his or her willingness to pay to improve the amenity level. A number of potential biases exist, although the magnitude of the biases is the subject of a considerable debate in the literature. The intention here is not to argue the merits of the survey approach, but rather to suggest that, given its controversy, techniques using actual behavior as opposed to stated behavior in a hypothetical market situation should be employed to corroborate the findings of the survey approach. One alternative involves the use of hedonic implicit prices to value the goods with public-good characteristics.

Briefly, two hedonic models are possible. The first is the two-stage hedonic housing price model (Rosen, 1974; Freeman, 1979). In this model, hedonic-implicit prices are derived by regressing housing prices on amenity levels in the first stage. In the second stage, the willingness-to-pay function is derived by regressing the implicit price on the amenity level and various socioeconomic characteristics of the household. Clearly, an advantage of this approach is that the findings are based on actual behavior. However, Cropper and Arriaga-Salinas (1980) point out several weaknesses of the hedonic housing price approach in valuing some types of amenities, arguing instead for the hedonic wage approach. Specifically, the hedonic housing price approach relies on *intracity* variation in the amenity level, and the resulting capitalization into housing prices. For cultural amenities, proximity within the city to the amenity source is probably less important than the existence of the amenity in the city in question. A second weakness of this approach results from the unique statistical nature of the simultaneity existing in the hedonic housing price model (Brown and Rosen, 1982). Recent developments in hedonic theory (Diamond and Smith, 1985; Epple, 1987; Bartik, 1987) suggest that the simultaneous hedonic model may require multiple market data to correctly identify the willingness-to-pay function. Such data is often difficult to obtain for housing markets.

A second hedonic approach is the two-stage hedonic wage model (Clark and Kahn, 1989) in which first-stage hedonic prices are derived from *intercity* wage differentials, and the willingness-to-pay function is again derived in the second stage. This approach is more appropriate for the valuation of cultural amenities and is shown to address more easily the simultaneity issue since multiple market data is readily available in most microlevel wage data sets. In addition, the technique permits benefits to be derived at the local, regional, and national levels. By comparison, it is likely that national benefits may only be estimated from the two-stage hedonic housing price model if one is willing to extrapolate to obtain benefits outside the sample.

This paper utilizes the hedonic wage approach to estimate the social benefits of cultural amenities. Section 2 develops the theoretical model for the two-stage hedonic model. Section 3 presents the empirical work which consists of the estimation of the model. Section 4 presents the estimates of social benefits. And the final section contains concluding remarks.

2. THE TWO-STAGE HEDONIC WAGE MODEL

The First-stage Model

The two-stage hedonic wage model (2SHWM) combines the single-stage hedonic wage model and the two-stage hedonic housing price approach originally developed by Rosen (1974) and Freeman (1979). The 2SHWM assumes that households are mobile within and between cities. The city is permitted to spatially adjust so long as households are willing to outbid agriculture for land. Given this definition of a city, the standard Muth-Alonzo-Mills model of household location predicts that wage and housing price gradients will leave households indifferent between locations within the city. The 2SHWM takes the *intracity* equilibrium location of households and the resulting within-city wage and housing price gradients as given, thereby allowing the *intercity* location decision to be examined.

Assume that mobile households maximize utility defined over housing (H) and other goods (X), and the citywide amenity set (A).

$$U = U(X, H; A) \tag{1}$$

The budget constraint is given as,

$$W = P_X X + P_H(A)H \tag{2}$$

The price of housing is expressed as a function of the amenity level, since the height of the housing price gradient reflects the overall demand for housing in the city. Maximizing (1) subject to (2) permits the derivation of Marshallian demand functions for housing and other goods as indicated in equation set (3).

$$\begin{aligned} X &= X[P_X, P_H(A), W] \\ H &= H[P_X, P_H(A), W] \end{aligned} \tag{3}$$

Substituting (3) into (1) gives the indirect utility function,

$$V[W, P_X, P_H(A);\ A] \tag{4}$$

relating utility levels to income, prices and the citywide amenity level. Assuming households are mobile between cities, utility levels are exogenous at V^* giving Equation (5).

$$V^* = V[W, P_X, P_H(A); A] \tag{5}$$

From the implicit function theorem, the wage can be solved in terms of the exogenous utility level, prices and the amenity level.

$$W_a = W_a(V^*, P_X, P_H; A) \tag{6}$$

This relationship, which Henderson (1982) calls the wage-acceptance function (W_a) can be used to describe the compensating differentials that households require to remain indifferent between two locations with slightly different amenity levels. Totally differentiating (6) and setting $dP_X = dV^* = O$, the compensating wage differential is given by Equation (7).

$$dW_a/dA = (\partial W_a/\partial P_H)(\partial P_H/\partial A) + \partial W_a/\partial A \tag{7}$$

Examining the right-hand side of (7) shows two opposing effects. The first term is positive since $\partial W_a/\partial P_H > 0$ (i.e., higher housing prices increase the wage required for indifference) and $\partial P_H/\partial A > 0$ (i.e., marginally better amenities will bid up average housing prices in the city). By contrast, the second term is negative ($\partial W_a/\partial A < 0$), since households are willing to sacrifice wages to live in a city with slightly better amenities. It is clear that whereas dW_a/dA is of an indeterminant sign, $\partial W_a/\partial A$ is negative. Henderson (1982) establishes that as long as the average housing price is controlled in the estimation of (6), the second term in Equation (7) reflects the correct "micro amenity valuation". In short, Equation (6) is an indifference surface in W-A space and $\partial W/\partial A$ represents the marginal willingness to pay, δ, for a small improvement in the amenity level.

Although Equation (7) reflects the demand side of the implicit market for amenities, there also exists a supply side. For endogenous amenities, the improvement of amenity levels is achieved at a cost to firms. This gives firm-offer curves representing the tradeoff between the amenity level and the amount of wages necessary to maintain constant profits. In equilibrium, the firm-offer curves (F_o) are tangent to the household wage-acceptance curves (W_a) as shown in Figure 1. For exogenous amenities, only the lower-envelope curve for various W_a exists. Regardless, the observed wage-amenity tradeoff represents a reduced-form equation, called the wage opportunity locus, W_o, whose parameters include supply and demand influences. The wage opportunity locus is given by Equation (8).

$$W_o = W_o(P_X, P_H; A) \tag{8}$$

Equation (8) differs from (6) in that the latter does not hold utility levels constant. The partial derivative of W_o with respect to the amenity level, A, is interpreted as the implicit price of the amenity level, γ. So long as taste parameters cannot be completely isolated, W_a cannot be estimated. However, the marginal willingness to

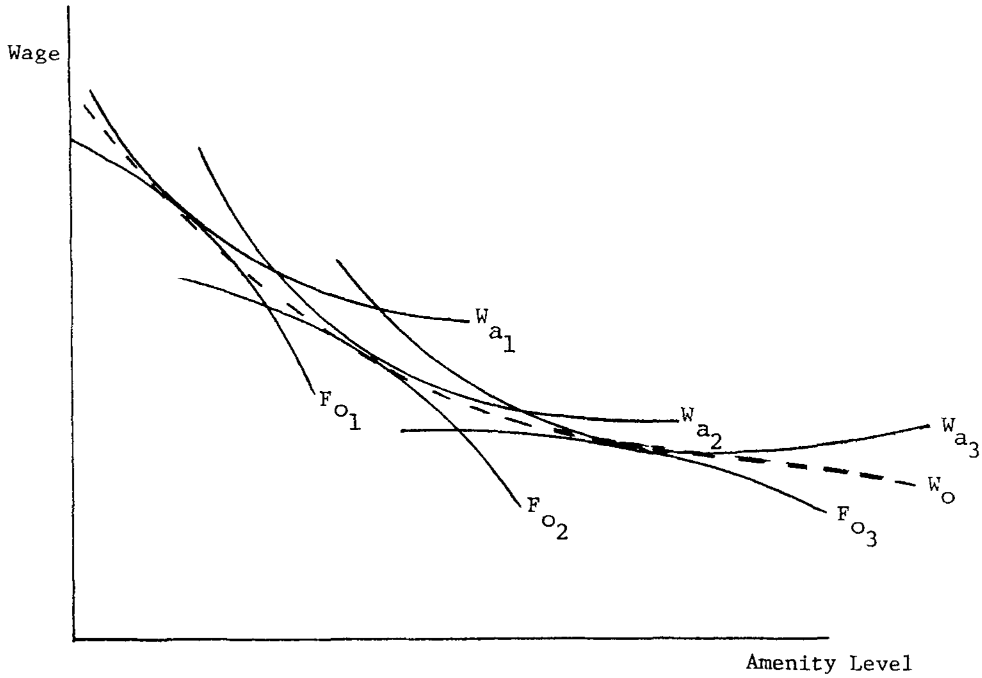

FIGURE 1: Equilibrium Wage Opportunity Locus.

pay for amenities, δ, can be estimated since $\delta = \gamma$ in equilibrium. That is, the two functions are tangent at the observed amenity level.

The Second-stage Model and the Identification Problem

Henderson (1982) concludes that the hedonic wage model is inappropriate for the estimation of a willingness-to-pay function, because different skill categories face different wage opportunity loci.[2] Hence, individuals from different occupations do not face the same hedonic wage function, and Equation (8) will shift with the occupation. It will be seen that once the nature of the simultaneity in the hedonic model is fully understood, the differing occupational and/or regional classes provide the necessary information to identify the willingness-to-pay function.[3]

Assuming the wage opportunity locus is nonlinear in the amenity level, the marginal implicit price, γ, is derived from Equation (8). The equilibrium implicit

[2]This is also typically true for individuals living in different regions and any other factor that shifts the wage opportunity locus, and not the willingness-to-pay function.

[3]Henderson (1982) also argues that there is no guarantee that households will sort themselves out across different cities as indicated in Figure 1. Although Clark and Kahn (1989) address this issue in more detail, it suffices to say that the problem is not expected to be serious. The reason is that employers prefer to pay the lowest wage premium possible and, hence, will hire individuals with tastes closest to the predominant taste group.

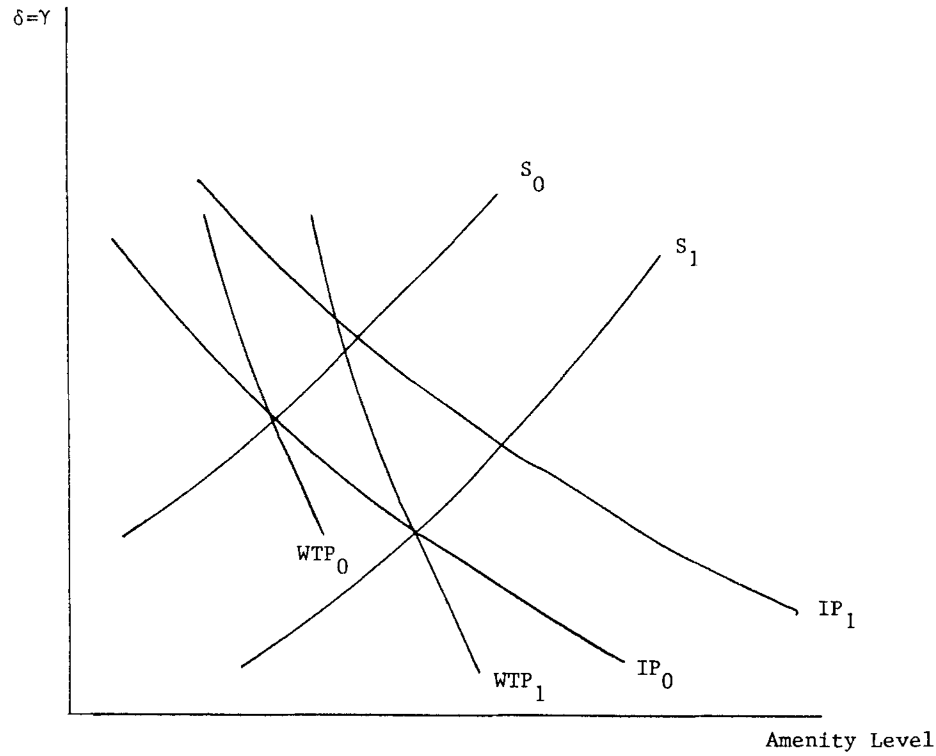

FIGURE 2: Identification of Willingness to Pay in Multiple Markets.

price-quantity pairs result from various intersections of structural inverse demand and supply functions. The system is represented by Equations (9) and (10).

$$\gamma = g(A, D, \mu_1) \tag{9}$$

$$A = h(\gamma, S, \mu_2) \tag{10}$$

Equation (9) represents willingness to pay as a function of the amenity level, a vector of demand shifters and a random error term, μ_1. Equation (10) shows the supply relationship (amenity level) as dependent on the implicit price,[4] a vector of supply shifters, and a random error term, μ_2. Rosen (1974) and later Freeman (1979) suggest that the endogeneity that exists represents the classical problem of identifying structural equations from points of equilibrium. Thus, supply shifters are used as instruments to arrive at consistent parameter estimates in Equation (9) and demand shifters are employed as instruments in the estimation of (10). However, several recent papers (Diamond and Smith, 1985; Epple, 1987; Bartik, 1987) recognize that since households treat the hedonic function as parametric, the classical identification problem does not exist. As illustrated in Figure 2, each point

[4]If the amenity in question is exogenous, the supply relationship between A and S, and "supply" is vertical in A-γ space.

on the implicit price function,[5] represents a unique intersection between a supply and demand function. Thus, supply shifters do not map out the willingness-to-pay function (WTP_0), and Equation (9) can be estimated without any reference to Equation (10). The true source of endogeneity results from the codetermination of implicit prices and quantities.[6] Although supply shifters will not correctly identify Equation (9), shifts in the implicit price function (IP_0 and IP_1 in Figure 2) will map out the function, thereby addressing the endogeneity problem. It can be readily seen that the 2SHWM provides these instruments in the regional dummy variables which are included as controls in the empirical estimates of the wage-opportunity locus. Bartik (1987) notes that such instruments must not be correlated with μ_1 if consistent estimates are to be derived. As a result, occupational dummy variables are not used as instruments in this application.[7]

Overall, the fact that residents in different regions face different hedonic wage functions provides precisely the information necessary to address the simultaneity problem which plagues the two-stage hedonic model. Since regional location is frequently available in census data sets, this represents a clear advantage of the 2SHWM.

3. THE EMPIRICAL MODEL

The First-stage Model

The wage opportunity locus is estimated using a number of different data sources. The wage data are from the Public Use Microdata Sample of the 1980 Census of Population and Housing.[8] Observations include household heads between the ages of 18 and 65 who are working full time.[9] Secondary wage earners are not considered because their locational choice is likely tied to the household head. Amenity data come from a variety of sources summarized in Table 1.

The wage opportunity locus is specified by Equation (11). The sample consists of 4,301 observations covering 279 of the 316 SMSAs in the contiguous United States.[10] To avoid problems of missing data, zero-order and first-order correction techniques are used when data is missing.[11]

$$W = W(P, HC, DISEQ, A, OCC, REGN) \tag{11}$$

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[5]The implicit wage function is the relationship between γ and A, which does not hold demand or supply influences constant.

[6]This endogeneity extends to any other variable entering both the hedonic function and a structural equation.

[7]This does not preclude the use of occupational dummy variables as instruments in other applications however. All that is required is the assumption that occupation and tastes are uncorrelated.

[8]PUMS is advantageous since it identifies a large number of cities ranging in size from 50 thousand to 9.1 million persons.

[9]Full-time work is defined as an average of at least 35 hours weekly and 40 weeks worked in 1979.

[10]Cities less than 100,000 inhabitants were deleted due to data limitations.

[11]See Pindyck and Rubinfeld (1981, pp. 245–252) for an explanation of these techniques.

TABLE 1: Variable Description and Data Sources

Variable Name	Description	Source
WAGE	Computed hourly wage (yearly earned income/yearly hours of work)	PUMS
EDUC	Years of formal education.	PUMS
EXP	Estimated years of experience calculated as *AGE* − *EDUC*−6.	PUMS
SEX	1 = Male, 0 = Female.	PUMS
RACE	1 = White, 0 = Nonwhite.	PUMS
MIGR	1 + the rate of in-migration.	1982 Databook
UNEMPL	Citywide unemployment rate, 1979.	1982 Databook
WEEKS79	Total weeks unemployed in 1979.	PUMS
JAN	Average minimum January temperature.	1983 Databook
SUN	Percent of the available sunshine.	1983 Databook
MURDER	Murders in the central city divided by central-city population.	FBI
MAJORBB	Number of major-league baseball teams in 1979.	199 ACC
SIZE/SIZESQ	Population of the *SMSA*/$SIZE^2$.	1982 Databook
SPORTFISH	Quality of warm-water sportfishing, comprised of a weighted average of average catch for the following warm-water fish: Bass + (1.5 × Walleye) + (2.5 × Pike) + Catfish + (0.25 × Panfish)	NFHWAR
BEACH	Miles of ocean shoreline within a 50-mile radius of the city.	Computed
HOUSE	Median housing value.	1982 Databook
GROCERY	Citywide price index for grocery products.	ACCRA
SO2MAX	Average maximum concentrations of sulphur dioxide within the city ($\mu g/m^3$). Comprised of readings from various monitoring stations within the city.	EPA
MUSEUM	Number of art, science and technological museums, planetariums, historic sites and reconstructions and related facilities.	199 ACC
ZOO	Includes avaries, aquariums, seaquariums, and similar institutions.	199 ACC
DANCE	Resident ballet and dance companies	199 ACC
THEATER	Resident professional and nonprofessional theaters	199 ACC
OPERA	Vocal and opera groups	199 ACC
SYMPHONY	Instrumental music groups	199 ACC
INCOME	Sum of wage and salary, nonfarm self-employment, interest, dividend, net rental, and social-security income sources.	PUMS
CHILD	1 = Any children 17 or younger: 0 = No children.	PUMS
AGE	Age in years.	
MSTAT	1 = married, 0 = ummarried.	PUMS
RAIN	Annual inches of precipitation.	1983 Databook
CCITY	1 = Live in central city: 0 = Live in suburbs.	PUMS
SUPER	1 = NYC, Chicago, or Los Angeles: 0 = otherwise.	PUMS

PUMS: 1980 Census of Population and Housing: Public Use Microdata Samples. 1982 Databook: *1982 State and Metropolitan Databook.* 1983 Databook: *1983 City and County Databook.* 199 ACC: *199 American Cities Compared.* NFHWAR: *1982 National Survey of Fishing, Hunting and Wildlife Associated Recreation.* FBI: *FBI 1979 Uniform Crime Reports for the US. EPA: Air Quality Data—1979 Annual Statistics Including Summaries with Reference to Standards.* ACCRA: *American Chamber of Commerce Researchers Association*

P represents the median price of housing *HOUSE*,[12] and a citywide price index for *GROCERY* products. *HC* is a vector of human-capital variables including education, *EDUC*, and experience, *EXP*. *RACE* and SEX are also included to account for differences in human capital accumulation and/or possible discrimination for women and nonwhites. Although the hedonic model is an "equilibrium model," the system may not be in actual equilibrium; however, it tends towards equilibrium. A recent adaptation of the hedonic model by Anas and Eum (1984) includes variables measuring the effect of excess supply (or demand) on the hedonic price function. As a result, the rate of in-migration, *MIGR*; the unemployment rate, *UNEMPL*; and the number of weeks unemployed in 1979, *WEEKS79*, are included in the *DISEQ* category. All three variables should proxy excess supply in the labor market.[13] The vector of amenities, *A*, includes climatic amenities such as percent of available sunshine, *SUN*, and the average minimum January temperature, *JAN*. Crime is proxied by a central-city *MURDER* rate and recreational amenities include miles of ocean shoreline within a 50-mile radius, *BEACH* and a recreational-fishing-quality variable, *SPORTFISH*. Number of major-league baseball teams, *MAJORBB*, is included to capture the availability of professional-sports amenities.[14] Urban air quality is measured by *SO2MAX*, the average maximum reading of sulphur dioxide among various monitoring stations in the city. Finally, *SIZE* represents related amenities that remain unmeasured and is measured by *SMSA* population. *OCC* represents 18 occupational dummy variables,[15] and *REGN* represents dummy variables for nine census regions.[16]

Finally, cultural amenities must be defined. It may be tempting to approximate cultural amenities using *SIZE* since they tend to be highly correlated with urban scale. However, this would eliminate any public policy implications of the study, because *SIZE* also captures disamenities not controlled in the regression. Since the amenity and disamenity components of *SIZE* are not known, the effect of *SIZE* on wage cannot be attributed to a given set of attributes such as cultural amenities. It is impossible to define a complete or correct set of cultural amenities. However, we have defined a set of cultural amenities which appears to represent the major cultural amenities.

Cultural amenities examined include the number of *MUSEUMs*, the number of *ZOOs*, the number of *DANCE*, *OPERA*, and *THEATER* companies, and the

[12]Given the endogenous nature of the housing price as indicated in Equation (7), the average price of farmland in the census region is used as an instrument.

[13]The complete disequilibrium model as derived in Anas and Eum (1984) includes lagged values for the hedonic price (the wage in this application). Unfortunately, this requires wage data defined for multiple years. Such panel data defined across SMSAs are not currently available.

[14]Different types of sports, such as hockey, are not aggregated since willingness to pay might be expected to differ by type of sport. For example, residents may have greater willingness to pay for a major-league baseball team as compared to an NHL hockey team.

[15]Occupational dummy variables include Manager, Clergy, Engineer, Doctor, Nurse, Teacher, Technician, Supervisor, Clerk, Police and Fire, Mechanic, Electrical, Construction, Precision, Operator, Assembly, Sales, and Unskilled.

[16]These include the New England, Middle Atlantic, South Atlantic, East North Central, East South Central, West North Central, West South Central, Mountain, and Pacific regions.

number of instrumental music groups, *SYMPHONY*.[17] Precise variable definitions are found in Table 1. Ideally, one would like to measure both quantity and quality of these amenities, but no objective measure of quality is available. However, two attempts are made to control for quality of the amenity. First, city size is included in quadratic form. In addition, the dominant cities are included as dummy variables. These *SUPER* cities include New York City, Chicago, and Los Angeles.[18]

Several functional forms are possible since theory does not provide, a priori, any preference with respect to the reduced-form equation. However, Nelson (1978) notes that among the choices, the log-linear form may be superior because it places the fewest restrictions on the implicit price function. Specifically, the implicit price function (IP in Figure 2) may be increasing, constant or decreasing in the amenity level depending on the magnitude of coefficient. For that reason, the log-linear specification is chosen here.

Regression Findings. Among the cultural amenities examined in this paper, multicollinearity is expected to present a problem.[19] That is, cities with a large number of symphonies are also likely to have a large number of museums and so on. For that reason, Equation (11) is estimated combining all amenities, and with each amenity separately. The first-stage regression results are given in Table 2.

Before discussing the cultural amenities, a few observations regarding other variables are warranted. The first concerns climatic amenities. *JAN* has the wrong sign and is significant in some regressions. One reason may be multicollinearity with regional shift variables. Indeed, when the latter are excluded, *JAN* becomes insignificant although it remains incorrectly signed in some regressions. Second, *BEACH* has the wrong sign, approaching significance with a t-statistic in excess of unity. This is consistent with the Clark and Kahn (1989) findings, although the reason for the finding is not known. *SIZE* is found to have a net positive effect on wages, which is also found in Clark, Kahn, and Ofek (1988). The disequilibrium controls, *MIGR* and *WEEKS79* are generally significant with the expected sign. That is, excess supply in the labor market has a negative effect on wages. *UNEMPL* is insignificant. Finally, super-city dummy variables which provide control for quality variation are insignificant in all specifications. These findings are not reported in Table 2 to save space.

As expected, the combined regression gives lower parameter estimates for urban cultural amenities and lower values for the t-statistics than the equations where amenities are included separately. Although the combined regression gives

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[17]Amenities are not deflated by city size because it is believed that variety in the amenity, as reflected in the number of establishments in the region, is an important factor in determining willingness to pay. For example, New York City has both a large number of amenities and a large population. By comparison, a smaller city may have proportionally fewer amenities and a population with much less variety. Deflated amenities will not capture that variety.

[18]It should be noted that proxies for amenity quality are collinear with quantities for the amenities. However, the inclusion of such proxies should avoid biases resulting from left out quality variables. Since the primary interest is in the quantity measures, the presence of multicollinearity is seen as less troublesome than the biases that are introduced without quality controls.

[19]Indeed, for the cases discussed here, the correlation among independent variables is always greater than the correlation between individual independent variables and the dependent variable.

TABLE 2: Wage Opportunity Locus: Combined and Separate Regression Results Dependent Variable: Log of Hourly Wage

Independent Variable[a]	Combined Amenities	Separate Amenities					
		MUSEUM	*BALLET*	*OPERA*	*ZOO*	*THEATER*	*SYMPHONY*
INTERCEPT	−3.2527	−3.4072	−3.1306	−3.8147	−3.7152	−3.3735	−3.6784
	(−2.39)	(−2.58)	(−2.35)	(−2.88)	(−2.83)	(−2.55)	(−2.80)
EDUC	0.5643	0.5655	0.5695	0.5673	0.5660	0.5667	0.5650
	(17.15)	(17.20)	(17.22)	(17.26)	(17.23)	(17.24)	(17.19)
EXP	0.5634	0.0823	0.0822	0.0819	0.0819	0.0819	0.0822
	(15.80)	(15.82)	(15.81)	(15.73)	(15.74)	(15.74)	(15.80)
SEX	0.3388	0.3390	0.3397	0.3994	0.3391	0.3394	0.3386
	(20.01)	(20.01)	(20.06)	(20.03)	(20.03)	(20.03)	(20.00)
RACE	0.0921	0.0904	0.0914	0.0910	0.0918	0.0910	0.0919
	(4.97)	(4.88)	(4.94)	(4.92)	(4.96)	(4.91)	(4.96)
MIGR	−1.2977	−1.4629	−1.1625	−1.4415	−1.5374	−1.3192	−1.2772
	(−1.50)	(−1.72)	(−1.36)	(−1.69)	(−1.80)	(−1.55)	(−1.50)
UNEMPL	0.0340	0.0248	0.0349	0.0314	0.0413	0.0274	0.0313
	(1.19)	(0.75)	(1.07)	(0.96)	(1.25)	(0.84)	(0.96)
WEEKS79	−0.0209	−0.0209	−0.0213	−0.0211	−0.0212	−0.0210	−0.0208
	(−5.40)	(−5.38)	(−5.49)	(−5.44)	(−5.46)	(−5.41)	(−5.36)
JAN	0.0619	0.0676	0.0697	0.0647	0.0701	0.0565	0.0414
	(1.43)	(1.64)	(1.69)	(1.56)	(1.70)	(1.36)	(1.00)
SUN	−0.1225	−0.1352	−0.1088	−0.1150	−0.1193	−0.1246	−0.0981
	(−1.10)	(−1.22)	(−0.99)	(−1.04)	(−1.09)	(−1.13)	(−0.90)
MURDER	0.0061	0.0039	0.0061	0.0047	0.0050	0.0046	0.0046
	(1.12)	(0.74)	(1.12)	(0.87)	(0.93)	(0.90)	(0.85)
MAJORBB	−0.0092	−0.0081	−0.0094	−0.0081	−0.0075	−0.0086	−0.0096
	(−1.64)	(−1.46)	(−1.69)	(−1.47)	(−1.37)	(−1.56)	(−1.74)
SIZE	1.19E-4	9.02E-5	1.05E-4	8.66E-5	9.71E-5	9.94E-5	1.04E-4
	(4.01)	(3.26)	(3.67)	(3.13)	(3.46)	(3.48)	(3.67)
SIZESQ	−1.39E-8	−8.34E-9	−1.08E-8	−8.37E-9	−1.04E-8	−1.08E-8	−1.15E-8
	(−2.23)	(−1.51)	(−1.39)	(−1.51)	(−1.86)	(−1.92)	(−2.05)
SP.FISH	−0.0975	−0.0885	−0.0944	−0.0930	−0.0970	−0.0883	−0.0908
	(−3.90)	(−3.61)	(−3.84)	(−3.76)	(−3.93)	(−3.60)	(−3.71)
BEACH	0.0016	0.0023	0.0026	0.0035	0.0024	0.0028	0.0025
	(0.64)	(0.89)	(1.04)	(1.36)	(0.93)	(1.09)	(1.00)
HOUSE[b]	0.0571	0.0733	0.0563	0.0776	0.0689	0.0675	0.0746
	(0.73)	(0.94)	(0.72)	(0.99)	(0.88)	(0.86)	(0.96)
GROCERY	0.6534	0.6769	0.6083	0.7392	0.7254	0.6729	0.7128
	(2.50)	(2.68)	(2.39)	(2.89)	(2.87)	(2.66)	(2.82)
SO2MAX	0.0174	0.0153	0.0179	0.0165	0.0171	0.0141	0.0179
	(1.51)	(1.35)	(1.58)	(1.46)	(1.51)	(1.23)	(1.59)
MUSEUM	−0.0034	−0.0165	—	—	—	—	—
	(−0.39)	(−2.46)					
DANCE	−0.0067	—	−0.0109	—	—	—	—
	(−1.40)		(−2.55)				
OPERA	0.0016	—	—	−0.0041	—	—	—
	(0.37)			(−1.10)			
ZOO	−0.0072	—	—	—	−0.0098	—	—
	(−1.57)				(−2.38)		
THEATER	−0.0006	—	—	—	—	−0.0076	—
	(−0.13)					(−1.92)	
SYMPHONY	−0.0096	—	—	—	—	—	−0.0152
	(−1.50)						(−2.95)
R^2_{adj}	0.34	0.34	0.34	0.34	0.34	0.34	0.34
F-stat.	43.22	47.66	47.71	47.51	47.67	47.60	47.75
Excluded control variables	30	30	30	30	30	30	30

[a]All variables except dummies are in natural logs. The sample size = 4,301 observations.

[b]The value per acre for 500–999-acre farms, averaged for the years 1978 and 1982 is used as an instrument to get consistent estimates on this parameter.

lower confidence, the parameter estimates remain unbiased since a larger amenity set is included. That is, the specifications including only one amenity capture the effect of excluded amenities in the included amenity's coefficient, to the extent that they are correlated. Because the coefficients change only slightly and in a predictable fashion, the combined equation is deemed preferable and is used to estimate second-stage structural equations.[20] Among the amenities, only *OPERA* tends to perform poorly, being generally insignificant and of the incorrect sign in the combined specification. Intuitively, this appears to be reasonable since the conventional wisdom suggests that the subset of people interested in opera and related vocal groups is relatively small. As a result the marginal impact on the *market wage* is also expected to be small. Thus, *OPERA* is not evaluated in the second stage. Regarding the other cultural amenities, the results are remarkably robust and, hence, willingness-to-pay functions are estimated.

The Second-stage Model

Henderson (1982) suggests that discontinuities in the wage opportunity locus may cause biases in the determination of implicit prices. An examination of amenity levels suggests that discontinuity is not a serious problem. Once the wage opportunity locus is estimated, implicit prices are determined as $\gamma = \partial W/\partial A$. In the log-linear specification, $\gamma = \beta W/A$ where β is the coefficient on the amenity and W, the predicted wage. Since implicit prices, γ, and marginal willingness to pay, δ, are identical in equilibrium, the implicit price estimates are used to estimate the willingness-to-pay function given by Equation (12).

$$\delta = \delta\,(SEV, A) \tag{12}$$

SEV represents a vector of socioeconomic variables including *INCOME*; *AGE*; marital status, *MSTAT*; the presence of children, *CHILD*; and education, *EDUC*. In addition, the *ZOO* and *MUSEUM* equations also include the climatic amenity *RAIN*, since such amenities are often consumed during the daytime and often outdoors.[21] By comparison, *DANCE*, *THEATER*, and *SYMPHONY* are typically indoor activities consumed at night. Other amenities are proxied by city size, *SIZE*, due to the small number of available instruments. Finally, taste differences are controlled using a dummy variable for location of resident in the city, *CCITY*, and a super-city dummy variable, *SUPER*.

Regression Findings. Table 3 contains the estimated willingness-to-pay functions. Briefly, some general observations can be made. *CHILD* appears to be most important in increasing willingness to pay in the *ZOO* and *THEATER* amenities, the latter including children's theater companies. *EDUC* increases willingness to pay in the *DANCE*, *THEATER*, and *SYMPHONY* equations; and *MSTAT* increases willingness to pay in all equations. Suburban residents have

[20]It should be noted that the predicted wage, which is used in determining the implicit price, is nearly identical on average among all specifications. Thus, the only difference in prices derived using the different specifications is in the parameter estimates on the amenities. The equation including all amenities is, therefore, preferred since misspecification bias is avoided.

[21]*MUSEUM* includes historic sites and historical reconstructions.

TABLE 3: Willingness-to-Pay Function Dependent Variable: Log of Implicit Price
(t-statistics in parentheses)

Independent Variable	Museum Equation	Zoo Equation	Dance Equation	Theater Equation	Symphony Equation
Intercept	−13.9436	−12.3066	−13.4369	−17.6256	−13.6694
	(−5.12)	(−5.58)	(−7.54)	(−8.95)	(−6.05)
AMENITY[a]	−0.9774	−0.9783	−0.9794	−1.0300	−0.9900
	(−30.62)	(−36.08)	(−36.74)	(−31.40)	(−36.03)
INCOME[a]	0.9157	0.8295	0.9121	0.9240	0.9409
	(5.12)	(5.41)	(5.18)	(4.85)	(4.41)
EDUC[a]	0.5058	0.4993	0.7854	0.9749	0.7353
	(0.71)	(0.78)	(1.69)	(2.10)	(1.61)
CHILD[a]	0.0192	0.0901	0.0073	0.0364	−0.0024
	(1.24)	(6.53)	(0.43)	(1.97)	(−0.14)
AGE[a]	−0.0289	0.0332	−0.1318	0.0291	−0.0513
	(−1.23)	(1.60)	(−5.14)	(1.05)	(−2.04)
MSTAT[a]	0.3420	0.2986	0.4633	0.5187	0.3693
	(23.29)	(22.95)	(28.78)	(29.74)	(23.36)
RAIN[a]	−0.0186	−0.0160	—	—	—
	(−0.56)	(−0.54)			
CCITY	−0.1928	−0.0477	−0.1625	−0.1999	−0.2205
	(−11.81)	(−3.30)	(−9.08)	(−10.31)	(−12.55)
SUPER[a]	0.0489	0.1594	0.1492	0.0156	0.0688
	(0.33)	(1.09)	(0.93)	(0.09)	(0.44)
SIZE[a]	−0.0083	−0.0440	−0.0464	0.0376	−0.0118
	(−0.15)	(−0.69)	(−0.66)	(0.51)	(−0.18)
F-statistic	345.88	746.80	810.90	416.37	627.27
R^2_{adj}	0.45	0.64	0.63	0.49	0.57
No. Observations	4301	4301	4301	4301	4301

[a]These variables are considered endogenous. Instruments are regional dummy variables.

greater willingness to pay than central-city residents. The price and income elasticities for willingness to pay are derived from Table 3. The income elasticity is slightly less than one (between 0.83 and 0.94), and the price elasticity is approximately unity (0.97 to 1.03).

4. MEASURING THE BENEFITS OF CULTURAL AMENITIES

As mentioned earlier in the paper, cultural amenities have both private- and public-good aspects. A single measure of benefits can be derived by examining each amenity in a household production context. For example, a household produces a museum final-service flow, where the public-good aspect of the amenity and the private-good aspect of the amenity are combined with other inputs to produce the output or final-service flow.

Although the data do not exist to estimate the demand for the final-service flow, it is still possible to estimate the area under this demand curve. Bockstael and McConnell (1983) show that the area under an input demand curve is identical to

TABLE 4: Individual and Citywide Benefits from Amenity Improvements

		Change in Consumer Surplus from 10 Percent Increase in Quantity		Change in Consumer Surplus from 1 Unit Increase in Quantity	
Amenity	Mean Quality Level	Individual Benefits (dollars)	Citywide Benefits (millions of dollars)	Individual Benefits (dollars)	Citywide Benefits (millions of dollars)
MUSEUM	16.38	4.61	3.81	3.24	2.76
ZOO	1.04	9.22	7.82	68.10	57.90
SYMPHONY	4.00	15.71	13.36	36.80	31.30
DANCE	5.70	7.74	6.58	13.13	11.17
THEATER	9.81	1.03	0.88	1.00	0.85

the area under a demand curve for a final-service flow, provided the input is *essential* in the household product of the input. The definition of essential, here, is that zero levels of the input imply zero levels of the output. Access to the amenity can be defined as an input which is obviously essential. The willingness-to-pay functions estimated above can then be interpreted as inverse demand functions for the input of access to the specific amenity. The value of the amenity can then be derived as the area under these inverse demand curves.

The area under the input demand curve will be a lower bound on the total value of the amenity. The reason for this is that the final-service flow only includes private-good and local public-good aspects of the amenity. For example, if residents in Milwaukee have an existence value for the New York Philharmonic Orchestra, this will not be included in the above measure of benefits. However, the existence values of New Yorkers will be included. When examined from the perspective of the individual city, which may be engaging in cost-benefit analyses for various cultural amenities, the exclusion of national public-good values does not represent a shortcoming. In addition, it is also believed that these national public values will be small, except for a few elite cases.

Table 4 contains estimated changes in annual total willingness to pay, given several hypothetical changes. Values are presented for both the typical household and city. The cultural amenities and city size are set equal to their mean levels.[22] Each cultural amenity is then incremented both 10 percent above the mean and one unit above the mean.[23] The willingness to pay per household for a 10 percent change in the amenity level varies from a low of $1.03 per year for theater groups to $15.71 per year for instrumental music groups. Corresponding values for a city of 2.5 million are $0.88 million and $13.36 million dollars per year. Since 10 percent changes are sensitive to the base value, comparable estimates were derived for a change of one unit above the mean. On a household basis, these are between $1.00

[22] The data set used is stratified random and defined at the household level. As a result, the mean city size is weighted by the larger number of residents in larger cities. However, in the context of the sample, such a weighting scheme is precisely what is required to represent the "typical resident."

[23] The calculation of yearly benefits assumes 2,000 annual hours of work.

and \$68.10 yearly. The citywide benefits varied from \$0.85 million dollars to \$57.9 million dollars per year.

5. CONCLUDING REMARKS

This paper adapts the two-stage hedonic wage approach to the valuation of cultural amenities. In the first stage, it is shown that five of the six cultural amenities are important in the *intercity* choice of location. The second stage is used to derive the willingness-to-pay functions from which value estimates are derived. These estimates of value include both private-good benefits and public-good benefits and can be compared to the cost of improving the various amenities.

The primary weakness of the paper is that it explicitly considers only the quantity of cultural amenities and not the quality. However, control variables are expected to at least partially allow for quality differences. In addition, the extent to which quality and quantity move in concert, further mitigates this problem.

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