CHAPTER 7. VIEW-ORIENTED AMENITIES

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7.1. IMPLICIT AND CONTINGENT MARKET VALUATION AND COMPARISON

7.1.1. Valuation Approaches

One approach to benefit estimation is to analyze explicit market transactions for observable private activity related to a public good in order to estimate the implicit demand for the nontraded good itself. Rosen's (1974) model of hedonic prices and implicit markets provides a useful framework. Analysis of market transactions for traded goods is based on the idea that consumers perceive both the public good tied to the purchased good and the advantages of the public good. Part of the price paid for the traded good then can be attributed to the nontraded good.

There have been several applications of Rosen's model of hedonic prices and implicit markets to estimation of the value of environmental public goods, including Harrison and Rubinfeld's (1980) estimates of the value of clean air through analysis of the housing market, Blomquist and Worley's (1981) estimates of the values of urban amenities through analysis of the housing market, Smith's (1983) estimates of the value of clean air through analysis of labor markets, and Rosen's (1979) estimates of the value of clean air through a combined labor market and housing market analysis.

A related technique is to analyze travel expenditures to recreation sites with different or changing environmental characteristics. Travel costs reflect the willingness of individuals to pay for enjoyment of recreation sites. Differences in travel expenditures can, in some cases, be attributed to the environmental goods. Recently, Smith, Desvousges and McGivney (1983) have applied this variant of

in George Tolley & Robert Fabian, eds., The Economic Value of Visibility (Mt. Pleasant, MI: The Blackstone Co., 1988).

the implicit market approach to estimate the value of improving water quality at recreation sites.

An alternative approach to valuing public goods is to elicit persons' stated values directly in the context of a contingent market. Through a survey interview or laboratory experiment, a hypothetical market is established and individuals are asked to purchase various quantities of public goods contingent upon the existence of the market. There are several advantages to this approach. Contingent markets can better place the individual in a context where the choice can be made on the good. Pertinent information can be provided, distortions in the price structure of marketed goods can be avoided, information can be gained even when the choice is new and no explicit or implicit markets exist.

Notable early studies by Randall, Ives and Eastman (1974), and Acton (1973) use contingent markets to estimate the benefits of visual air quality and improved health care, respectively. For a review of implicit market studies which estimate the value of clear air see A. Myrick Freeman (1979). For a review of implicit market studies which estimate the value clean water see Blomquist (1983). Recent experience with contingent valuation is considered encouraging in that if the good is well defined, then the potential problems with strategic bias, vehicle bias and starting point bias do not appear to be great. See, for example, Schulze, d'Arge, and Brookshire (1981). Robert Rowe and Lauraine Chestnut (1983) review the same studies, however, and note that there is still concern with potential bias and inaccuracy in value estimates due to the context and operation of the hypothetical market. The most extensive treatment of contingent valuation is given in Cummings et al. (1986). Theodore Groves and John Ledyard (1977) and T. Nicolaus Tideman and Gordon Tullock (1976) describe demand-revealing mechanisms which solve the free rider problem for public goods. These have not been integrated into contingent valuation surveys.

7.1.2. Comparison of Implicit and Contingent Market Approaches

Potentially, implicit market and contingent market approaches both can be useful in measuring the benefits of public policy, for each has its relative advantages. The implicit market approach assumes that people correctly perceive differences in the quantity and quality of the implicit traded goods and know why they are valuable. If individuals cannot detect differences or are ignorant of beneficial affects, then the implicit market will not develop. When the market does exist, the data requirements for analyzing the implicit market are substantial since the data must be sufficiently detailed to isolate the effect of the implicitly traded good. For housing markets there must be detailed information on the structure, the neighborhood, and the publicly provided services. These requirements are rarely met outside of urban areas with secondary data. Estimates may still be sensitive to functional form and multicollinearity. Similar comments can be made about wage studies, where detailed information on job characteristics, job location, and workers is required. Travel cost estimates may be sensitive to the assumed value of time and the availability of substitute recreation sites. In spite of these potential limitations, the implicit market approach attracts considerable attention. The attraction stems from the fact that estimates are derived from observable behavior and involve the expenditure of personal resources. The approach is considered to be a natural extension of consumer theory.

Despite the exigency of better information about individuals' values of goods provided through the public sector, little research has compared and examined the potential complementarity of the implicit and contingent market approaches. Numerous studies have followed one approach or the other but little attempt has been made to coordinate them for purposes of comparison.

A notable exception is the previously mentioned comparative study of Los Angeles air quality done by Brookshire et al. In the Los Angeles study, implicit values of cleaner air are obtained through analysis of 634 sales of single family houses in several area communities and contingent values are obtained through a survey of

290 households in the same communities. People are asked to bid on air quality represented by photographs depicting good, fair, and poor conditions. The housing hedonic values are expected to be greater than the contingent values because the compensating surplus will be less than the change in the housing hedonic rent curve away from the optimal quantity of air quality chosen by the household. Brookshire et al. find that the implicit values are greater than the average contingent values, as expected. Also they find that on average the implicit values are approximately three times as large as the contingent values, a difference which is statistically significant given their reported t values.

Another major exception is the comparative study of Desvousges, Smith, and McGivney, who estimate the benefits of cleaner water in the Monongahela River basin. As part of an extensive study employing both contingent valuation and travel cost approaches, they were able to compare user values estimated through both approaches for 69 households. The implicit values and contingent values are expected to be almost equal since the only conceptual difference is a small income effect. Instead, Desvousges et al. find that for water quality deterioration, the average implicit value is as much as 12 times as large as the average contingent value, and for water quality improvements the average implicit value is as little as 1/4 of the average contingent value. No t tests are reported in the means comparisons. Comparing contingent values and travel cost values to actual cash payments, Richard Bishop and Thomas Heberlein (1979) find that contingent willingness to accept is greater than travel cost values and cash values and that contingent willingness to pay is less than any other value.

Comparative results depend, of course, on the set of implicit values and the set of contingent values, since neither is necessarily equal to the unknown true values. One possible explanation for the unexpected divergence found by Desvousges et al. is that the travel cost estimates are incorrect. A possible explanation for the small divergence found by Brookshire et al. is that the housing market values are close to the contingent values because of fortuitous specification of the housing hedonic equation. To facilitate a clearer understanding of the two approaches, a study of a market for view-related amenities has been designed and is presented here.

7.2. A COMPARATIVE STUDY OF VIEW-RELATED AMENITIES

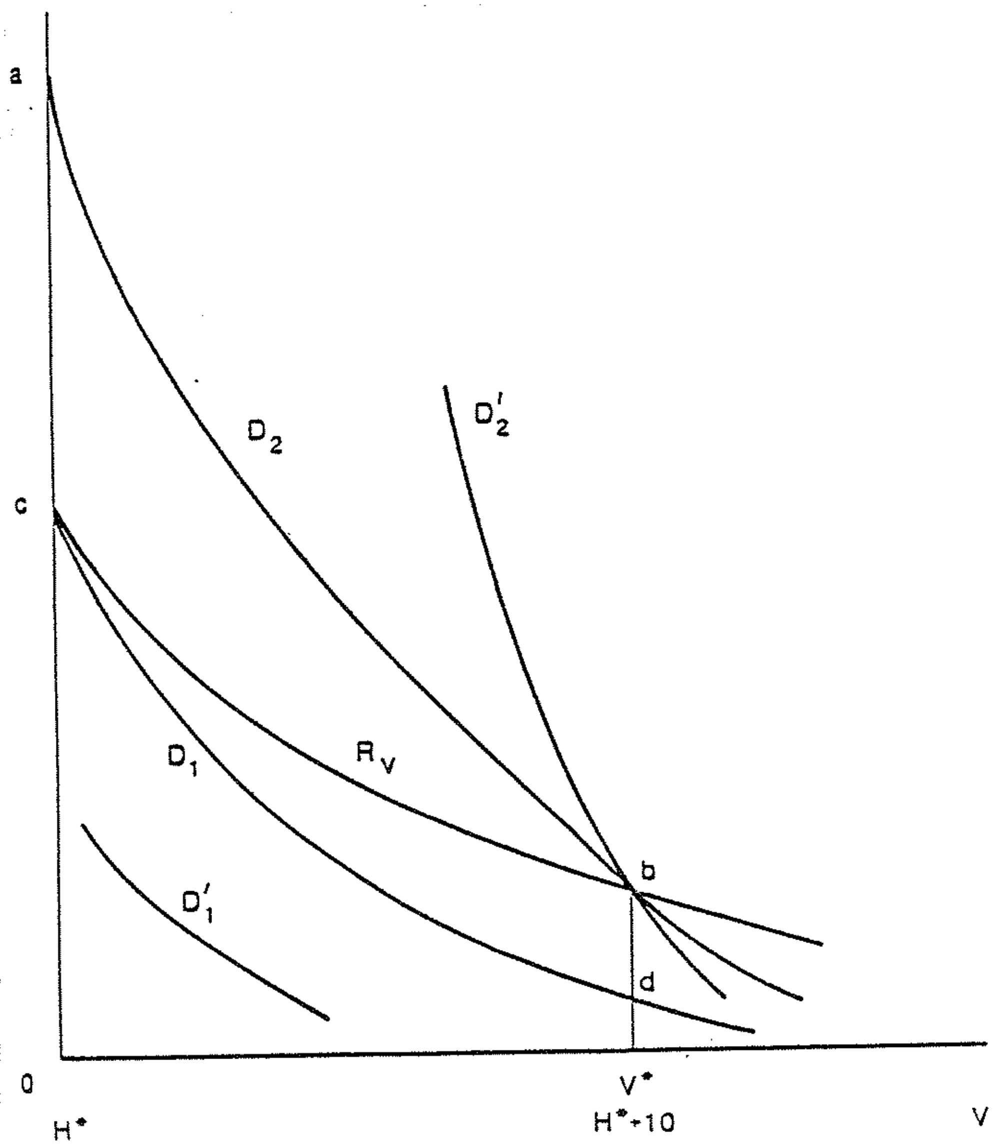
This comparative study focuses on the benefits of provision of pleasant views, using data collected from occupants of view-oriented residences along the shore of Lake Michigan in Chicago. The survey instrument is designed to elicit contingent values for views and view characteristics and to get from the same individuals sufficient information about their housing to estimate the values of the same amenities from their housing consumption. The goods described in the contingent market are the same goods traded implicitly in the housing market and the bidders in the contingent market are exactly the same people who are also housing consumers.

7.2.1. Expected Relative Sizes of Contingent and Implicit Values

Based on a theory of implicit markets, it is straightforward to demonstrate that the contingent values for the lakeview do not necessarily equal the value for lakeview implicit in the housing market, and that the contingent values for dwelling unit height do not necessarily equal the corresponding implicit market value. Consider the implicit market for a view-related amenity (V) in terms of Rosen's presentation in derivatives and assume that the marginal implicit price curve (R_V) slopes downward to the right, as shown in Figure 7-1. Let D_2 represent the demand (marginal bid) curve for lakeview for a resident who has a lakeview and chooses the quantity V^*. For such a utility-maximizing resident, the contingent market value for the lakeview, CMVLA,is given by the area abV^*0. The implicit market value for the same lakeview (IMVLA) is given by the area cbV^*0. CMVLA is greater than (or equal to) IMVLA by the area abc because the resident who chooses V^* will have a demand curve

Figure 7-1

Contingent and Implicit Market Value for a View-Related Amenity



which lies everywhere above R_v for quantities less than V^* (or is coincident with R_v). Let D_1 be the demand curve for a resident who has no lakeview. For such a resident CMVLP is given by cdV^*0, which is less than or equal to the implicit market value, again given by the area cbV^*0. The market for lakeviews implicit in the housing market sorts the residents so that CMVLA is greater than IMVLA or equal to CMVLP. Notice that other individuals' demand curves for those with a view, such as D'_2, may be much higher than D_2 but that other individuals' demand curves for those without a view, such as D'_1, are bounded from below by zero. This asymmetry suggests that CMVLA may be much larger than IMVLA and CMVLP.

For the view-related amenity height, the reasoning is the same as that for lakeview for those without a view. Replace the origin with the utility maximizing dwelling unit height H^*, and V^* by a unit which is ten floors higher (H^*+10). If D_1 is an individual's demand curve for height, then CMVH is given by the area $cd(H^*+10)H^*$. The implicit market value for height (IMVH) is given by the area $cb(H^*+10)H^*$ and is greater than or equal to CMVH. Again individual utility maximization and sorting in the housing market imply that the contingent value can be expected to differ from the implicit value for the same good, and that presumably small income effects, which are typically identified as sources of differences in benefit estimates, would simply reinforce the above analysis of expected relative sizes. Brookshire et al. focus on market sorting also but because they only consider increases in the quantity of the contingent good they expected that their comparisons would show IMV > CMV. The income effect in commodity space is discussed by Randall and Stoll (1980).

7.2.2. Contingent Market Values

A team of six interviewers collected 208 responses from residents of ten high-rise buildings located in Chicago's Loop or along Lake Shore Drive.

Three contingent market values (CMV) were obtained through interviews on two view-related amenities using an abbreviated bidding game technique. Residents of dwelling units with unobstructed views of Lake Michigan were presented the following proposition to elicit the minimum amount they were willing to accept through reduced housing costs to relinquish their view (CMVLA):

> Imagine a unit which is identical to your current unit except that it has no view. Perhaps it might be in the interior of the building, or perhaps its view might be almost entirely obstructed by the other buildings. Imagine the unit with no view would cost $50.00 per month less (for example, via lower rent or lower payments). If you were choosing today, would you take your current unit at its current price or monthly rent, or would you take the unit with no view at $50.00 per month less?

Respondents were asked to think a bit and state the very smallest reduction which would induce them to choose the viewless unit.

Residents of dwelling units which did not have a relatively unobstructed view of Lake Michigan were presented a different proposition to elicit CMVLP:

> Imagine a unit which is identical to your current unit, except that it has large windows providing an unobstructed view of Lake Michigan shoreline and the lake. Imagine that the unit with unobstructed lake view would cost $30.00 per month more than your current unit (for example, via higher rent or higher payments.) If you were choosing today, would you take your current unit at its current price or monthly rent or would you take the unit with unobstructed lake view at $30.00 per month more?

Respondents were asked to state the very largest increase in monthly costs they would pay to get an unobstructed view of the lake.

All residents interviewed were asked to state their values of dwelling unit height, which is related to breadth of view. The contention is that the higher the floor on which the dwelling unit is located, the better the view. Thus, height is a view- related amenity. The following proposal was presented to elicit CMVH:

> Now, imagine a unit which is identical to your current unit, except that it is 10 floors higher. (For example, if you live on floor 8 the alternative would be on floor 18; if you live on floor 31 the alternative would be on floor 41. If necessary, imagine that this building is tall enough to have floors 10 or more higher than your current unit.) Imagine that the unit 10 floors higher would cost $30.00 per month more than your current unit (for example, via higher rents or payments). If you were choosing today, would you take your current unit at its current price or monthly rent, or would you take the unit 10 floors higher at $30.00 per month more?

Respondents were asked to state the very highest increase in monthly costs they would pay to get 10 floors higher. To the extent height is valued--positively or negatively--for reasons unrelated to viewing, the estimate of value of height for viewing is biased. Presumably in view-oriented residences, nonview factors are not crucial.

The sets of contingent values for the two view-related amenities are described by the mean values and other summary statistics reported in Tables 7-1a and 7-1b. Two things were done to define what is called in Chapter 2 a "solid core of valid information." Some respondents were able to determine how their bids compared to the dollar amount used as the starting point in the abbreviated bidding game, but were unable to specify a maximum. Since it is not totally clear what the value is for these uncertain respondents, several values were assigned in estimating the bid curves. As a result of searching over bid curves in which the 95th percentile, median, and starting point values were assigned for the uncertain bids, the starting point value was used because it produced the highest coefficient of

determination for the bid curves. (The bid curves are estimated by regressing the contingent values on variables such as age, sex, education, income, window area and height.) Mean values are reported with the uncertain bids included as well as excluded. The last row shows that seven bids were excluded from the sample for CMVH because they were protestors. These people bid zero because they thought someone else should pay for the change.

The contingent valuation is internally consistent with respect to the expected differences in the values of lakeview. Since CMVLA is a measure of willingness to accept (WTA) for a loss of view, it should be greater than CMVLP, which is a measure of willingness to pay (WTP) for gaining a lakeview. The means of CMVLA ($110.07 and $156.00) indeed are greater than the means of CMVLP ($38.98 and $42.34) and t tests show these to be statistically significant at the .01 level. As illustrated above, this difference is consistent with the income effect, but the size of the difference is better explained by differences in the two groups of bidders. Given the existence of the implicit market, the bidders without a lakeview will have demand curves which are below (to the left of) demand curves for bidders with a lakeview. The presence of the implicit market for a view of the lake leads to a systematic sorting process among the bidders so that the amount that CMVLA exceeds CMVLP is greater than that due to the income effect alone.

Another check for internal consistency of contingent values comes through estimating bid curves to see if the contingent values depend on relevant economic variables and if contingent values are influenced by the method of elicitation. Basic and full (i.e. containing building and interviews dummies) bid curves for CMVLA and CMVLP for lakeview and CMVH for height were estimated. The estimated bid curves, shown in Tables 7-2 and 7- 3, are quite reasonable. For example, for CMVLA, the complementary amenities window area and height (floor of building), increase the amount necessary to compensate people for the loss of the lakeview. While there is little evidence of interviewing problems, it does appear that people interviewed in a group, not individually, required more to relinquish their views.

Table 7-1a

Contingent Market Values for View of Lake (1981 dollars per month)

Contingent Value Welfare Measure	CMVLA WTA loss		CMVLA WTP for gain	
Uncertain Bids[a]	Included	Excluded	Included	Excluded
Mean Value	$110.07	$156.00	$38.98	$42.34
Standard Deviation	$96.64	$107.89	$37.42	$37.50
Median Value	$50.00	$150.00	$30.00	$40.00
Minimum Value	0.00	0.00	0.00	0.00
Maximum Value	$700.00	$700.00	$150.00	$150.00
Number of Bids	150	85	54	49
Zero Bids	1	1	12	8
Protestors Excluded[b]	0	0	1	0

Table 7-1b

Contingent Market Values for Height (1981 dollars per month)

Contingent Value Welfare Measure	CMVH WTP for gain	
Uncertain Bids[a]	Included	Excluded
Mean Value	$20.86	$24.28
Standard Deviation	$34.36	36.07
Median Value	$0.00	$5.00
Minimum Value	$0.00	$0.00
Maximum Value	$200.00	$200.00
Number of Bids	190	162
Zero Bids	105	78
Protestors Excluded[b]	8	6

[a] Some respondents were able to determine how their bids compared to the dollar amount used as the starting point in the abbreviated bidding game, but were una[ble] to specify an exact maximum or minimum amount as appropriate. For uncertain bi[ds] a value was assigned based on the starting point as explained in the text. For CMVLA and CMVH the first column gives distributional information with uncertain bids included while the second column excludes the uncertain bids. There are n[o] uncertain bids for those with no view, CMVLP.

[b] Protest bids are zero bids from those who thought that others should pay for improvement.

Table 7-2

Bid Curves for Lake View and Height

Least Squares Summary Statistics

	CMVLA Base	CMVLA Full	CMVLP[b] Base	CMVLP[b] Full	CMVH Base	CMVH Full
R^2	.173	.446	.406	.528	.114	1.45
F	2.02	2.63	2.51	0.97	2.68	1.32
SSE	584947	392099	21403	16988	163005	157266
n	65	65	29	29	132	132
Bid Mean	$147.46	$147.46	$40.00	$40.00	$26.84	$26.84

Variable	Coefficients[a]					
	CMVLA		CMVLP[b]		CMVH	
	Base	Full	Base	Full	Base	Full
Constant	52.391	76.577	43.762	89.733	41.300	44.895
	(0.49)	(0.58)	(0.95)	(0.86)	(1.64)	(1.38)
Age	-1.078	-1.262	-0.623	-0.679	-0.363	-0.346
	(-1.29)	(-1.49)	(-1.62)	(-1.24)	(-1.71)	(-1.44)
Sex	21.645	12.771	-12.603	-0.614	-12.772	-11.398
	(0.82)	(0.50)	(-0.93)	(-0.03)	(-1.95)	(-1.66)
Education	1.502	1.552	1.290	1.239	-0.228	-0.682
	(0.28)	(0.31)	(0.50)	(0.25)	(-0.18)	(-0.50)
Income	0.377	-1.787	0.796	1.071	0.344	0.351
	(0.40)	(-1.82)	(1.88)	(1.80)	(2.40)	(2.26)
Window Area	0.191	0.344	0.030	0.094	0.036	0.029
	(1.68)	(2.82)	(0.30)	(0.48)	(1.24)	(0.84)
Floor	3.801	2.213	-1.635	-2.672	-0.386	-0.295
	(2.05)	(1.01)	(-1.44)	(-1.61)	(-0.90)	(0.59)
Building A		25.455		-23.104		7.943
		(0.31)		(-0.35)		(0.37)
B		4.035		-59.683		-5.201
		(0.06)		(-0.75)		(-0.27)
C		83.787		-31.169		-10.619
		(1.83)		(-0.54)		(-0.69)
D		-77.627		22.202		4.442
		(-1.94)		(0.84)		(0.38)
E		20.385		-104.646		5.058
		(0.29)		(-0.96)		(0.21)

(Table 7-2 continued on next page)

Table 7-2 (continued)

Variable	CMVLA Base	CMVLA Full	CMVLP[b] Base	CMVLP[b] Full	CMVH Base	CMVH Full
	Coefficients[a]					
Group Interview		93.577		-56.418		0.819
		(1.49)		(-0.78)		(0.05)
Interview A		-113.189		-32.185		-7.856
		(-1.48)		(-0.67)		(-0.39)
B		12.505		-15.011		9.785
		(0.27)		(-0.30)		(0.82)
C		60.020		19.839		8.135
		(1.10)		(0.51)		(0.63)

[a] t values in parentheses

[b] For CMVLP there were no uncertain bidders without missing values for explanatory variables.

Table 7-3

Combined Bid Curve for View of Lake

Least Squares Summary Statistics		
R^2	.197	.399
F	4.70	5.18
SSE	888196	665141
n	142	142
Bid Mean	$92.57	$92.57

Variable	Coefficients[a] Base	Full
Constant	56.121	-12.026
	(1.13)	(-0.19)
Age	-1.119	-0.742
	(-2.73)	(-1.73)
Sex	-11.957	-18.992
	(-0.82)	(-1.41)
Education	1.133	0.377
	(0.45)	(0.16)
Income	-0.241	-0.667
	(-0.77)	(-2.20)
Window Area	0.123	0.131
	(1.92)	(2.00)
Floor	1.266	0.431
	(1.43)	(0.46)
Building A		75.637
		(1.70)
B		66.713
		(1.60)
C		96.837
		(3.05)
D		-42.483
		(-1.78)

(Table 7-3 Continued on next page)

Table 7-3 (Continued)

E			51.807 (1.20)
Group Interview			119.997 (3.16)
Interviewer A			-44.872 (-1.19)
B			-13.291 (-0.52)
C			-3.542 (-0.17)
CMVLA Dummy	1 = have view, WTA 0 = have no view, WTP	57.074 (3.04)	71.935 (4.12)

*t values in parentheses

7.2.3. Housing Market Valuation

Before the contingent valuation bidding, questions were asked about housing characteristics in order to estimate a housing hedonic equation. Based on the marginal implicit prices of lakeview and height, implicit market values (IMVs) comparable to the contingent market values can be estimated. Shown below is the estimated hedonic equation in logs, one of the candidate functional forms:

$$\underset{(5.98)}{\text{HEXP} = 3.466} + \underset{(3.89)}{0.223}\ \text{ROOMS} + \underset{(3.12)}{0.245}\ \text{BATHS} + \underset{(4.17)}{0.373}\ \text{AREA}$$

$$+ \underset{(1.15)}{0.047}\ \text{CARPET} + \underset{(0.96)}{0.053}\ \text{DISHW} + \underset{(0.56)}{0.024}\ \text{WAIR}$$

$$- \underset{(-0.37)}{0.023}\ \text{FURN} + \underset{(1.82)}{0.047}\ \text{FLOOR} + \underset{(1.93)}{0.017}\ \text{LAKW}$$

$$- \underset{(-2.25)}{0.031}\ \text{TOTW} + \underset{(5.45)}{0.239}\ \text{OWNER} - \underset{(-2.12)}{0.133}\ \text{BA}$$

$$- \underset{(-1.98)}{0.140}\ \text{BB} - \underset{(-1.94)}{0.106}\ \text{BC} - \underset{(-1.35)}{0.084}\ \text{BD} - \underset{(-1.79)}{0.138}\ \text{BE}$$

$R^2 = .8439$ $F = 47.99$ $n = 159.$

HEXP is monthly housing expenditure in 1981 dollars; ROOMS is number of rooms excluding bathrooms; BATHS is number of bathrooms; AREA is square feet of living area; CARPET is one if carpeting is included and zero if not; DISHW is one if a dishwasher is included and zero if not; WAIR is one if there are window air conditioners and zero if not; FURN is one if the unit was furnished and zero if unfurnished; FLOOR is number of stories high the dwelling unit is; LAKW is square feet of unobstructed window area with a view of Lake Michigan; TOTW is square feet of total window area; OWNER is one if the resident owns the unit and zero if the resident rents; and the BX variables are one when the building designation is X and zero otherwise for buildings A, B, C, D, and E. A set of buildings F is omitted. All continuous variables are in natural logarithms in this equation. The t values are shown below the coefficients.

Both owners and renters are included in the housing hedonic by converting the owner-estimated current market value of a condominium into an annual and then monthly implicit rent. A discount rate of 9 percent was chosen to convert the market value to a rent equivalent based on a search over discount rates from 3 percent to 12 percent. The coefficients of determination ranged from .553 for 3 percent to .811 for 9 percent and back down to .800 for 12 percent. Monthly assessments, utility charges, parking charges and facility charges were added to both rent and imputed rent. Owners were also asked when they purchased their units and for what price. The home purchase component of the Consumer Price Index was used to convert all purchase prices to 1981 dollars and an imputed monthly rent was calculated. The same hedonic regression as the one reported above was re-estimated using the market-based housing value instead of the owner's estimated value. The results are quite similar but the coefficient of determination is .813, which is slightly less than the .834 for the regression using the owner's estimates. The indication is that owners are relatively knowledgeable about housing market conditions.

Since the implicit values may be sensitive to the functional form of the housing hedonic equation, a limited maximum-likelihood search was made using Box-Cox transformations:

$$(Y^r - 1)/r = b_o + \Sigma_i (b_i (X^{g_i}_i - 1)/g_i) + e.$$

Since the iterations did not converge for a full search over r and g_i, and since the log likelihood function was more sensitive to r than the g_i, the search was limited to five forms: OLS in levels, OLS in logs, Box (r only) in levels, Box (r only) in logs, and Box (r only) on the $(X^{g_i}_i - 1)/g_i$ logs, and Box (r only) on the where the g_i were found by a Tidwell (g_i only) search over the continuous explanatory variables. The dichotomous variables remain untransformed in all specifications. Selected results for the three best equations are reported in Table 7-4, where it can be seen that the largest value of the log-likelihood function is for the hedonic in which (log HEXP)$^{-3.22}$ is regressed on the dichotomous variables and the logs of the continuous variables. Based on χ^2 tests using the statistic -2 times the log- likelihood ratio, it is clear that the Box-log specification is better than any of the other four; it is significantly different from any other at the .01 level.

The coefficients of interest for the comparative analysis are those for lakeview (LAKW) and height (FLOOR). Notice in Table 7-4 that they are both significantly positive (one-tail test) for at least the .05 level regardless of the transformation investigated. For comparison, the implicit market values are approximated by extrapolating from

Table 7-4

Results from the Housing Hedonic Equations with Different Functional Forms

Functional Form	Box log	OLS log	Box levels
g	-3.22	0.00	-0.52
Log-likelihood Value	75.95	-239.23	-948.16
R^2	.8733	.8439	.8725
F	61.19	47.99	60.72
n	159	159	159
Coefficient for View of the Lake (t value)	$.6413 \times 10^{-5}$ (2.13)	.01683 (1.93)	$.1298 \times 10^{-4}$ (1.66)
Coefficient for Height (t value)	$.2284 \times 10^{-4}$ (2.54)	.04733 (1.82)	$.1707 \times 10^{-3}$ (2.60)
UnBoxed Coefficient for View of Lake (units)	.01664[a] (elasticity)	.01683 (elasticity)	.2696[a] (levels) [.03966][b]

Table 7-4 continued on next page

Table 7-4 (continued)

UnBoxed Coefficient (units)	.05926[a] (elasticity)	0.04733 (elasticity)	3.545[a] for Height (levels) [.07583][b]

[a]The coefficients of the transformed variables are converted to coefficients which can be interpreted easily by finding the partial derivative of Y w.r.t X_i $= Y^{(1-\lambda)} b_i X_i^{(\theta_i - 1)}$ and evaluating at the means.

[b]The number in brackets is the elasticity calculated at the means.

the marginal hedonic (implicit) prices, which are correct for small changes, to large discrete changes involving total loss or gain of view or large (70% on average) increases in height. If the implicit demand curves could be estimated, such extrapolations would be unnecessary. James Brown and Harvey Rosen (1982) demonstrate that estimation of implicit demand curves from single market data is problematic.

The implicit market value for lakeview for those who have a view (IMVLA), for the Box log form is

$$IMVLA_i = (\log HEXP_i^{1-\tau})(b^* \text{ of } \log LAKW)\ (HEXP_i)$$

$$= (\text{approximately})\ (\log HEXP_i^{4.22})(.6413 \times 10^{-5})(HEXP_i)\ .$$

The mean value of IMVLA for the sample which includes uncertain bidders is $14.II per month. The value is an approximate estimate because it is based on an estimated coefficient and because it applies a constant elasticity to a 100% decrease. The other implicit market values, IMVLP for lakeview for those who have no view and IMVH for height, are estimated using similar formulae.

The other implicit market values are calculated as follows:

for OLS logs, $IMVLA_i$ = (approximately) (b^* of log LAKW) ($HEXP_i$),

for Box-levels, $IMVLA_i = (HEXP_i)^{1-\tau}$($b^*$ of LAKW) ($LAKW_i$), and

$IMVLA_i = (HEXP_i)^{1-\tau}$($b^*$ of LAKW)(LAKW for those with view),

and for Box-logs $IMVH_i$ = (log HEXP)$^{1-\tau}$ (b^* of log Floor)(10/$Floor_i$)($HEXP_i$), for OLS logs, $IMVF_i$ = (b* of log Floor)(10/$Floor_i$)($HEXP_i$), and for

Box levels, $IMVF_i$ = $(HEXP_i)^{1-r}$(b* of $Floor_i$) (10).

7.2.4. Exact Sample Comparisons

The estimated implicit market values for the lakeview and height for the three hedonic equations are reported along with the contingent market values for the same groups in Table 7-5 for purposes of comparison. Notice that the implicit market values are somewhat sensitive to the functional form of the hedonic, with the mean of IMVL varying by up to a factor of four and IMVH by up to a factor of two. Regardless of the functional form, however, as expected, the means of the IMVLA are not greater than the means of the CMVLA and the means of IMVH are not less than the means of CMVH. The unexpected result is that the mean of IMVLP is less than the mean of CMVLP. Tests to determine whether or not these relationships are statistically significant are complicated by the fact that any IMV is calculated from terms such as the b_i, which are themselves stochastic. To account for this additional source of error, approximate standard errors of the means of the IMVs (approximated by s_m) were calculated based on Taylor series approximations which treat each term in the IMVs as stochastic. Approximate t values are calculated for the means tests and shown in Table 7-5. For an application of the Taylor- series approximation to standard errors of elasticities of complementarity, treating factor shares and coefficients as stochastic, see Mark Berger (1983) or James Grant and Daniel Hamermesh (1981). The t tests reported in the text are not strictly correct because the distribution is unknown. The tests reported are offered as an improvement over simple means comparisons or t tests which treat as constant terms which are known to be stochastic. Based on these approximate t values, the hypotheses cannot be rejected that the mean of IMVLA is less than or equal to m of CMVLA, m of IMVLP is greater than or equal to the mean of CMVLP and the mean of IMVH is greater than or equal to that of CMVH, each as expected.

It is also of interest to ask whether or not the two measurement approaches yield different estimated values of the same good for the same people. Based on the same approximate t values, the hypotheses that the means of the implicit and contingent values are the same can be rejected for IMVLA and CMVLA only. The means for the willingness to pay values are easily within a factor of 2, in contrast to the willingness to accept values which are not even within an order of magnitude.

Comparison of average values shows reasonably good agreement, with the exception of the WTA values. At the individual level the degree of agreement is less clear. The simple correlation coefficients between the implicit and contingent values, shown as r's in Table 7-5, are extremely low and often of the wrong sign. Only for IMVLA and CMVLA for the sample with the uncertain bidders excluded are the correlations positive. If the implicit and contingent values are compared for individuals to determine if the order of the values is as expected, the picture is still unclear. For the Box-logs specification of the housing equation for the sample with uncertain bidders, 99% of the people had CMVLA > IMVLA; it is 100% for the sample without the uncertain bidders. For those with no lakeview, only 44% had IMVLP > CMVLP. For the Box-log specification for the sample with uncertain bidders, 69% of the people had IMVH > CMVH. If the uncertain bidders are excluded, then fewer--62%--had IMVH > CMVH. The reason for the disparity between the comparisons of the averages and the comparisons for individuals is not apparent.

Table 7-5
Exact Sample Comparisons of Contingent and Implicit Market Values for View-Related Goods (1981 dollars per month)

Sample Group Height	Lakeview			No Lakeview	
Uncertain Bidders [a]					
	Included	Excluded	-	Included	Excluded
Size	96	54	25	135	108
Contingent Market Values CMVH	CMVLA	CMVLA	CMVLP	CMVH	
Mean	$107.87	$152.87	$35.40	$23.10	$28.59
Median	$ 55.00	$137.50	$30.00	$ 3.00	$15.00
Standard Deviation	$ 97.56	$111.10	$31.09	$33.81	$35.66
Implicit Market Values	IMVLA	IMVLA	IMVLP	IMVH	IMVH
BOX logs					
Mean	$ 14.11	$ 10.56	-	$59.42	$59.64
Median	$ 10.14	$ 8.44	-	$26.59	$26.14
approx. s_m	$ 11.12	$ 7.39	-	$33.11	$39.16
approx. t	6.28	8.46	-	1.09	0.79
r	-.0119	.4721	-	-.0854	-.0936

Table 7-5 continued on the next page

Table 7-5 (continued)

OLS logs					
Mean	$ 11.96	$ 10.24	-	$37.88	$37.57
Median	$ 10.38	$ 9.29	-	$21.06	$21.05
approx. s_m	$ 8.47	$ 6.53	-	$22.22	$22.73
approx. t	7.34	8.66	-	0.66	0.39
r	.0258	.4869	-	-.0741	-0.769
Box Levels					
Mean	$ 48.96	$ 30.69	$28.52	$40.81	$40.09
Median	$ 29.19	$ 21.09	$25.89	$29.16	$27.86
approx. s_m	$ 51.76	$ 31.38	$23.60	$33.66	$34.61
approx. t	1.12	3.51	-0.28	0.52	0.33
r	-0.512	.3901	-.0083	-.0551	-.0589

[a] See footnote to Table 7-1.

7.3. CONCLUDING REMARKS ON THE COMPARISON

To explore further the relatively new contingent market approach to benefit estimation, a comparative study was undertaken for two view-related amenities--lakeview and height. A survey was administered to a moderately large sample of residents in Chicago to elicit values and to obtain from the same individuals sufficient information to estimate the values of these amenities from their housing consumption. Close attention was paid to the effect that the functional form of the housing hedonic equation had on implicit values and the effect that the stochastic nature of terms used to calculate the implicit market value had on the standard error of the estimated value.

Comparison of average values is somewhat encouraging. For willingness to pay measures, as expected, the contingent market values are not significantly greater than the implicit market values and are well within a factor of two of the estimated implicit market values. For willingness to accept measures, as expected, the contingent market values are not significantly less than the implicit market values, but they are not even within an order of magnitude. One explanation for the divergence is that the implicit market leads to a sorting of consumers so that the people who would have to give up views have implicit demand curves well above the implicit prices which they have to pay. Another explanation is that people are unfamiliar with such bribe offers, but that the WTA values would converge toward the WTP values (and in this study the IMVs) with market experience. The bid curves are estimated by regressing the contingent values on variables such as age, sex, education, income, window area and height.

Comparisons of values for individuals are less encouraging. Simple correlations are strongly positive for only one set of comparisons, and the percentage of individuals with correct ordering is sometimes as low as 62% and 44%. One explanation is that the assumption that each person is in equilibrium in each implicit market

and consuming the optimal quantity is too strong. If each person is in equilibrium with respect to moving, positive moving costs still can prevent consumption of otherwise optimal quantities, especially for one or two of several housing characteristics. For migration models which emphasize the degree of departure from optimal quantities, see papers by Michael Duffy (1979) and Peter Linneman and Phillip Graves (1983).

In conclusion, this study provides further support that contingent markets and implicit markets can yield comparable average values for WTP.

7.4. THE VALUE OF VISIBILITY IMPROVEMENT

Based on the favorable comparison of average contingent market values and implicit market values for willingness to pay for two view-related amenities, we now consider the contingent market values for a third view-related amenity, visibility. To the same group of occupants of view-oriented residences along Lake Michigan in Chicago, three color photographs were shown depicting good, intermediate, and poor visibility for three views common to the lakefront. Nine photographs in total were used at each residence. People were engaged in an abbreviated bidding game for a 67% reduction in the maximum number of consecutive poor visibility days. The good was the reduction in maximum number of consecutive days with poor visibility, from 12 days to 4 days. The reduction pertains to the string of poor visibility days shown in the poor-visibility photo.

A summary of the bids is shown in Table 7-6. The contingent values for improved visibility are as low as $0, as high as $100 per month, and have a mean value of $15.63 per month. The average value is significantly greater than 0 at the 1 percent level: $t = 11.97$. The average value for improved visibility is also significantly less than the average contingent values for lakeview (WTP) and height at the 1 percent level.

Table 7-6

Contingent Market Values for Visibility Improvement (1981 dollars per month)

Welfare Measure	WTP for gain
Mean	$ 15.63
Standard Deviation	17.91
Median Value	10.00
Minimum Value	0.00
Maximum Value	100.00
Total Number of Bids	188
Number of Zero Bids	26
Number of Protestors Excluded[a]	19

[a]Protest bidders are zero bidders who think that others should pay.

The estimated bid curves are reported in Table 7-7. There are only two variables which are statistically significantly different from zero. Those with more education bid more for visibility as do those who plan to remain at their current place of residence. There does not appear to be any problem of interviewer bias. At the same time, most of the variation in bids is unexplained. Nevertheless, the contingent market appears to have functioned reasonably well and yielded an average value suitable for benefit estimation.

Table 7-7

Bid Curves for Visibility Improvement

Least Squares Summary Statistics		
R^2	.0755	.1323
F	1.56	1.19
SSE	50574	47469
n	142	142
Bid Mean	$17.70	$17.70

Variable	Coefficient	
	Base	Full
Constant	-4.037	-6.480
	(-0.34)[a]	(-0.40)
Age	-0.0191	-0.094
	(-0.19)	(-0.79)
Sex	-2.757	-3.273
	(-0.80)	(-0.90)
Education	1.199	1.220
	(1.97)[b]	(1.83)[c]
Income	-0.027	-0.033
	(-0.38)	(-0.43)
Window Area	-0.000	0.001
	(-0.01)	(0.04)
Floor	0.154	0.087
	(0.76)	(0.37)
Future Residency	1.095	0.938
	(2.12)[b]	(1.75)[c]
Building A		0.872
		(0.07)
B		2.251
		(0.21)

(Table 7-7 continued on next page)

Table 7-7 (Continued)

Variable	Coefficient Base	Coefficient Full
C		7.939
(0.90)		
D		-3.224
		(-0.48)
E[d]		6.465
		(0.60)
Group Interview		4.428
		(0.49)
Interviewer A		4.676
		(0.37)
B		10.761
		(1.63)
C[e]		6.667
		(1.22)

[a] The t values are shown below each coefficient

[b] Significant at the 5 percent level.

[c] Significant at the 10 percent level.

[d] Building F is omitted from the regression.

[e] Interviewer D is omitted from the regression.

CHAPTER 8. AVIATION AND AUTO TRAFFIC SAFETY

Gideon Fishelson, Edward Mensah and Terrance Smith

The study presented below is part of an effort to evaluate visibility in two markets. Ideally, since visibility affects various aspects of daily life its evaluation should be done for each aspect and then an aggregation scheme should be designed to sum up the various effects. In this chapter we evaluate the effect of visibility on recreational air traffic. This is followed by a study of visibility and auto traffic accidents.

Recreational air traffic is a small segment of air traffic. Most air traffic is commercial. Undoubtedly the evaluation of the effects of visibility on commercial aviation, either man- made or natural, is very complex due to the extreme solutions it might require. For example, because of poor visibility, departures are cancelled and arrivals are diverted to various destinations.

The value of visibility in recreational air traffic is a priori expected to be relatively small. The main reason is that only a very small fraction of the population is involved in this activity. Hence, even if the per participant value were high, the total would still be low. The finding of this study when considering recreational aviation alone, is that an improvement of visibility by 10 percent would yield social benefits to the population living in DuPage County, Illinois, equal to $259,000 per year, at 1980 prices. An extrapolation of this figure to the whole U.S. population yields an estimate of the benefits equal to $43 million per year, at 1980 prices.

8.1. A MODEL OF AIR TRAFFIC COUNTS

A conventional demand and supply model for recreational aviation services, when linearized and solved for the reduced form equations, yields a relation between equilibrium quantity and each exogenous variable. In this case the quantity is not recreational