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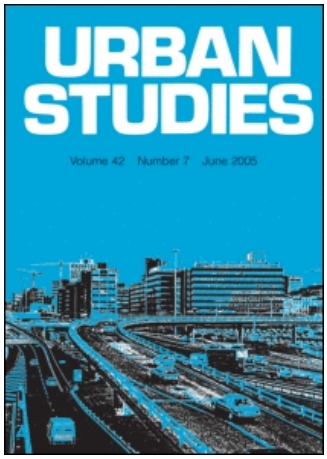

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Valuing Urban Lakeview Amenities Using Implicit and Contingent Markets

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Valuing Urban Lakeview Amenities Using Implicit and Contingent Markets*

Glenn Blomquist

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Summary. Amenities influence individual location decisions and affect overall social well being. This comparative study focuses on the potential complementarity of implicit and contingent market approaches to valuing amenities. Lakeshore residents in Chicago were surveyed to collect data to estimate implied housing hedonic values and contingent values for two view-related amenities. The consumers in the housing market and the bidders in the contingent market are the exact same people. Presumably differences in estimates are primarily due to the different approaches. For willingness to pay, contingent values are found to be within a factor of two of implicit values. The difference is consistent with sorting which occurs in the housing market. The results provide further evidence of progress in valuing amenities.

Introduction

Reliable measurement of amenity values is essential to efficient private location decisions and public policy. Despite the exigency of better information about individuals' values of amenities, only a modest amount of 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 few attempts have been made to co-ordinate them for purposes of comparison.[1]

A notable exception is the comparative study of Los Angeles air quality done by Brookshire, Thayer, Schulze and d'Arge (1982). They obtain implicit values of cleaner air through analysis of 634 sales of single family houses in several area communities and obtain contingent values through a survey of 290 households in the same communities. People were 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 for improvements beyond the optimal quantity of air quality chosen by the household. They find that the implicit values are greater than the average contingent values, as expected. The average implicit values are approximately three times as large as the average contingent values.

Another exception is the comparative study of Desvousges, Smith and McGivney (1983) who estimate the benefits of cleaner water in the

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[1] In his review of approaches to benefit estimation Freeman (1979) emphasizes, as many economists emphasize, the traditional implicit market approaches.

In assessing the state of the art of contingent valuation Cummings, Brookshire and Schulze (1986) discuss eight comparative studies. A recent study by Loehman (1984) considers values of cleaner air in San Francisco. Few of these studies were designed to compare approaches; most emphasize specific estimated values.

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 they 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 one quarter of the average contingent value.

This paper attempts to further the development of amenity valuation by investigating the potential complementarity of implicit and contingent market approaches for two view-related amenities. Although neither set of values is necessarily equal to the unknown true values, the traditional implicit values from the housing market are the basis for comparison in this study. Advantages include exact sample (same individuals) comparisons and a systematic search (over power transformations) of functional forms for the housing hedonic equation. The results have implications for valuation of urban amenities and the broader challenge of estimating the benefits of public good provision.

A Comparative Study of View-Related Amenities

This comparative study focuses on the valuation 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, which is established via the survey instrument, are the same goods traded implicitly in the housing market for most individuals. The bidders in the contingent market are exactly the same people who are also housing consumers. During the period May through September 1981, a team of 6 interviewers collected 208 responses from residents of 10 high-rise buildings located in Chicago's Loop or along Lake Shore Drive. The lakefront area is somewhat special. The residents have an average household income which is somewhat higher (35 per cent) than other Chicago residents and are presumably more sensitive to view-related amenities.

Through direct questioning during face-to-face interviews, three contingent market values (CMV) were obtained. Residents of dwelling units with unobstructed views of Lake Michigan were presented a proposition to elicit the minimum amount they were willing to accept through reduced housing costs to relinquish their view (CMVLA). Residents of dwelling units which did not have an unobstructed view of Lake Michigan were presented a proposition to elicit the maximum amount that they were willing to pay through increased housing costs to obtain a view (CMVLP).[2] All residents were presented a proposition to elicit the maximum amount that they were willing to pay through increased housing costs to obtain an identical dwelling unit which is 10 floors higher (CMVH). A higher unit affords a broader vista and so height is a view-related amenity.[3]

Expected Relative Sizes of Contingent and Implicit Values

Based on a theory of implicit markets it is straightforward to demonstrate that the contingent

[2] The following statement was read to residents with a view of the lake:

> 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 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/month less.

Respondents were then asked to think and state the very smallest reduction which would induce them to chose the viewless unit to obtain CMVLA. Similar statements were read to obtain CMVLP and CMVH with appropriate changes. Starting bids of $30 per month were used in these last two abbreviated bidding games. All three starting bids were chosen arbitrarily.

The good which people bid for is exactly the same as the good purchased in the housing market for those people with a lakeview (CMVLA) and for height (CMVH). The good which people without a view bid (CMVLP) for is less well defined since people with different tastes and experience may envision different quality views, say, with or without a view of the Loop. The implicit value for these people without views is estimated from the housing hedonic assuming the view (LAKW) is one standard deviation better than the average of those people who have views. We could speculate that a partial Loopview would be included for most people since it is not specifically precluded by the description of the lakeview.

[3] 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.

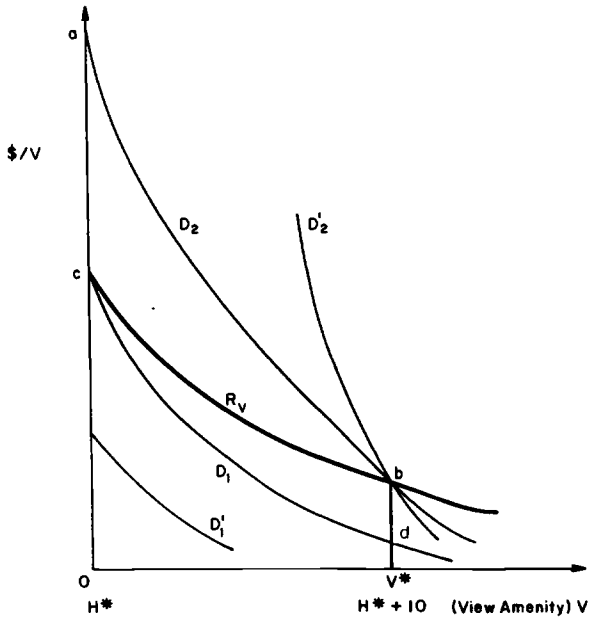

Fig. 1. Residents' Implicit Demand Curves and the Marginal Hedonic Price Curve.

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) and assume that the marginal implicit (hedonic) price curve (R_v) slopes downward to the right as shown in Figure 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 CMVLA is given by the area abV*O. The implicit market value for the same lakeview (IMVLA) is given by the area cbV*O. CMVLA is greater than or equal to IMVLA because the resident who chooses V* will have a demand curve 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*O which is less than or equal to the implicit market value again given by the area cbV*O. The market for lakeviews implicit in the housing market sorts the residents so that CMVLA $\geq$ IMVLA $\geq$ CMVLP. Notice that other individual's demand curves for those with a view, such as D'_2 may be much higher than D_2, but that other individual's 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 there is an expected relative size for each comparison. Consideration of 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.[4]

The primary explanation of expected relative sizes can be thought of more simply in terms of peoples' values of a good (CMV) compared to the price which must be paid (IMV). For a given view, view lovers will pay the price and most would have paid even more if they had been forced; CMV IMV for those residents with a view. For a given view, lovers of nonview goods will not pay the price because it is too high; CMV < IMV for those residents without a view. For height people are offered more than they want at the going price. For additional height the price is too high; CMV < IMV for all residents.

Contingent Market Values

The sets of contingent values for the two view-related amenities are described by the mean values and other summary statistics reported in Table 1.

[4] 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 $\geq$ CMV. The income effect in commodity space is discussed by Randall and Stoll (1980).

The next to last row shows that several bids were excluded from the samples because they were protest bids. These people bid zero because they thought someone else should pay for the change. Some respondents, especially those with a view of the lake, were able to determine how their bids compared to the dollar amount used as the starting point but were unable to specify a limiting bid. These uncertain bids are excluded although fortunately it turns out that the qualitative results of this paper are unaffected by the treatment of these bids.[5]

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 mean of CMVLA ($156.00) indeed is greater than the mean of CMVLP ($42.35) and t tests show these to be statistically significant at the 0.01 level. As illustrated above this difference is consistent with the income effect, but the large 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 functions to see if the contingent values depend on relevant economic variables and see if they are influenced by the method of elicitation. Basic and expanded bid functions for CMVLA and CMVLP for lakeview and CMVH for height were estimated. Of the six bid functions estimated, only the expanded bid function for CMVH is not significant at the 10 per cent level or higher. The estimated bid functions, which are not reported, 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

Table 1

Contingent Market Values (1981 dollars per month)

Amenity Welfare Measure	View of Lake WTA Loss CMVLA	View of Lake WTP for Gain CMVLP	Height WTP for Gain CMVH
Mean Value	$156.00	$42.35	$25.21
Standard Deviation	107.89	37.50	36.44
Median Value	150.00	40.00	7.50
Maximum Value	700.00	150.00	200.00
Minimum Value	0.00	0.00	0.00
Number of Zero Bids	1	8	72
Number of Bids in Sample	85	49	156
Number of Protestors Excluded[a]	0	0	6
Number of Uncertain Bids Excluded[b]	65	5	34

[a] Protest bids are zero bids from those who thought that others should pay for improvement. Protestors are excluded from all analysis.

[b] 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 an exact maximum or minimum amount as appropriate. Uncertain bidders are excluded from the analysis.

[5] Analyses of bids and comparisons were carried out also with the uncertain bids included. Several values were assigned tentatively including the 95th percentile value, median value and starting point for each of the three types of bids. The starting points were chosen based on the estimated bid functions. With the values of $50, $30 and $30 assigned for uncertain bids for CMVLA, CMVLP and CMVH the mean values are $110.07, $38.98 and $20.86.

their views. Tobit analysis for CMVLP and CMVH bid functions leaves these conclusions unchanged.[6]

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 in Table 2 are the variables and the results of the estimated housing hedonic equation. The dependent variable is transformed monthly housing expenditure in 1981 dollars. For owners, reported condominium value is converted to monthly imputed rent using a 7.85 per cent discount rate obtained from a user cost study by Peiser and Smith (1985). Monthly assessments, utility charges, parking charges and facility charges were added to both rent and imputed

Table 2

Housing Hedonic Equation, Means and Retransformed Coefficients (Monthly Housing Expenditures is the Dependent Variable)[a]

Independent Variable/Description	Retransformed[b]		
	Mean	Coefficient	t value
Rooms (excluding bathrooms)	3.30	108	6.79
Bathrooms	1.36	30.2	0.85
Area			
(Square metres of living area)	85.9	0.0137	2.63
Carpet			
(1 if carpeting included; 0 if not)	0.434	29.4	1.29
Dishwasher			
(1 if dishwasher included; 0 if not)	0.365	−19.2	0.56
Window Air			
(1 if window air conditioned; 0 if not)	0.390	0.492	0.02
Furnished (1 if furnished; 0 if not)	0.044	−5.77	−0.13
Floor (Stories up in dwelling [FLOOR])	14.8	3.14	2.44
Lakeview Area (sq. metres of unobstructed window view of Lake Michigan [LAKW])	9.38	0.0236	1.66
Total Window Area			
(sq. metres of window area)	13.5	−0.0114	−0.82
Owner (1 if owned; 0 if rented)	0.717	100	3.72
Building A (1 if Building A; 0 if not)	0.101	−134	−3.33
Building B (1 if Building B; 0 if not)	0.138	−143	−3.48
Building C (1 if Building C; 0 if not)	0.176	−48.8	−1.43
Building D (1 if Building D; 0 if not)	0.170	−22.2	−0.55
Building E[c] (1 if Building E; 0 if not)	0.239	−44.6	−0.88
$R^2 = 0.8468$	$F = 49.06$	$n = 159$	

[a] The dependent variable (HEXP) was transformed as follows: $(1/(HEXP)^{0.5}-1)/(-0.5)$. In 1981 dollars the sample mean of HEXP is $642.09.
[b] The coefficients are retransformed at the mean of HEXP by multiplying the estimated coefficients by the mean of HEXP raised to the 1.5 power. The retransformation facilitates interpretation since the changes are in arithmetic values.
[c] Building F is omitted.

[6] The bid functions are estimated by regressing the contingent values on variables such as age, sex, education, income, window area and height. In a combined bid function for CMVLA and CMVLP with a sample of 94 the coefficient for a dummy variable for CMVLA is positive and significant at the 0.01 level. This result is consistent with the results of the t test on the difference of the means. Regression results are available upon request.

[7] 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. A hedonic regression similar to the one reported above was re-estimated using this market-based housing value instead of the owner's estimated value. The results are quite similar but the coefficient of determination is slightly less than that for the owner's estimates. The indication is that owners are relatively knowledgeable about housing market conditions.

rent.[7] The building variables are proxies for building-specific and location-specific housing characteristics. These would include building age and security system and neighbourhood access and crime.

Since the implicit values may be sensitive to the functional form of the housing hedonic, a limited maximum-likelihood search was made using Box-Cox transformations, $(Y^{\lambda}-1)/\lambda = b_0 + \Sigma_i[b_i(X_i^{\lambda i} - 1)/\gamma_i] + e$. Since the iterations did not converge for a full search over λ and γ_i, and since the log likelihood function was more sensitive to λ than the γ_i, the search was limited to: Box (λ only) in levels ($\gamma_i = 1$) which includes linear ($\lambda = \gamma_i = 1$) and semi-log ($\lambda = 0$, $\gamma_i = 1$) and Box (λ only) in logs ($\gamma_i = 0$) which includes the doublelog ($\lambda = \gamma_i = 0$) form. The dichotomous variables remain untransformed in all specifications. In the systematic search λ was varied from $+3.0$ to -3.0 and γ was either 1 (linear) or 0 (log). The best functional form was $\lambda = -0.5$ and $\gamma = 1.0$ with a log likelihood value of -947.9. Based on χ^2 tests using the statistic, -2 times the likelihood ratio, it is found that this functional form is significantly different from the linear, semilog and doublelog forms at the 0.01 level.

The coefficients of interest for the comparative analysis are those for lakeview (LAKW) and height (FLOOR). Notice in Table 2 that they are both significantly positive (one-tail test) at the 0.05 level. For comparison the implicit market values are approximated by extrapolating from 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 per cent on average) increases in height. If the implicit demand curves could be estimated with confidence such extrapolations would be unnecessary.[8]

The implicit market value for lakeview for those who have a view (IMVLA) is: $IMVLA_i \cong$ (retransformed coefficient of LAKW)$(LAKW_i) \cong 0.0236 LAKW_i$ where $LAKW_i$ is the square metres of window view individual i enjoys. The implict market value for those who do not enjoy a good view is: IMVLP $\cong$ (retransformed coefficient of LAKW)$(\overline{LAKW} + 1$ S.D.) $\cong$\$43.77 where the second bracketed term is the value of LAKW which is one standard deviation above the mean for those who have a view.[9] The implicit market value for more height is: IMVH $\cong$ (retransformed coefficient of FLOOR)(10 floors higher) $\cong (3.142)(10) =$ \$31.42.

Exact Sample Comparisons

The estimated implicit market values for lakeview and height are reported along with the contingent market values for the same groups in Table 3 for purposes of comparison. As expected, the mean of IMVLA is not greater than the mean of CMVLA, the mean of IMVP is not less than the mean of CMVLP, and the mean of IMVH is not less than the mean of CMVH. Approximate t values are calculated for the means tests and shown in Table 3. The hypotheses cannot be rejected that $\overline{IMVLA} \leq \overline{CMVLA}$, $\overline{IMVLP} \geq \overline{CMVLP}$ and $\overline{IMVH} \geq \overline{CMVH}$, where a bar indicates mean value. Each relationship is as expected.[10]

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. The hypotheses that the means of the implicit and contingent values are the same can be rejected for $\overline{IMVLA}$ and $\overline{CMVLA}$ only. The means for the willingness to pay values are easily within a factor of two in contrast to the willingness to accept value which is only within a factor of five.

Comparison of average values shows reasonably good agreement with respect to expected relative sizes. At the individual level the degree of agreement is less clear. For those with a lakeview, 95 per cent of the people had CMVLA > IMVLA. For those with no lakeview for whom the good was not as clearly defined only 53 per cent had IMVLP > CMVLP. For height, 70 per cent had IMVH > CMVH. Some idiosyncratic behaviour appears to be present.

[8] Palmquist (1984) has estimated implicit demand curves for a case involving spatially separate markets, but as he points out and as Brown and Rosen (1982) have shown, estimation is problematic for the case of a single market. The problem in this case is identification. For further discussion see Diamond and Tolley (1982).

[9] See footnote 2, second paragraph.

[10] Exact t values would account for variation in HEXP which is used to retransform the coefficients of the transformed variables. This can be done using a Taylor series expansion; see Berger (1983). The effect is to increase the standard deviation. Since the relative sizes of the means of the contingent and implicit market values are correct, larger standard deviations cannot lead to rejection of the null hypotheses stated in the text.

Table 3

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

	View of the Lake		Height
	Those with Lakeview	Those without Lakeview	
Contingent Market Values	CMVLA	CMVLP	CMVH
Mean	$147.06	$42.35	$25.21
Median	125.00	40.00	7.50
Standard Deviation	101.69	37.50	36.44
Implicit Market Values	IMVLA	IMVLP	IMVH
Mean	$31.85	$43.77	$31.42
Median	26.63	43.77	31.42
Standard deviation	24.02	0	0
Sample Size	73[a]	49	156
t value	9.42[b]	0.27	2.13[b]
Expected Order	CMVLA > IMVLA	CMVLP < IMVLP	CMVH < IMVH
Pairwise Comparison	95%	53%	70%

[a] The sample size is smaller than the 85 reported in Table 1 because of missing values necessary for calculating IMVLA.
[b] Significant at the 0.05 level for a one-tail test.

Concluding Remarks

To explore further known approaches to benefit estimation for public goods a comparative study was undertaken for two view-related amenities, lakeview and height. To a moderately large sample of residents in Chicago a survey was administered so as to elicit values and to obtain from the *same* individuals sufficient information to estimate the values of these amenities from their housing consumption. Through a systematic search of power transformations attention was paid to the effect which the functional form of the housing hedonic equation has on implicit market values.

Comparison of average values is somewhat encouraging, especially for willingness to pay. 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 only within a factor of five. The primary 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.[11] Comparisons of values for individuals are less encouraging. 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.[12]

In conclusion, this study provides further support that contingent markets and implicit markets can yield average values which are of the expected relative sizes for both WTP and WTA. For the view-related amenities, lakeview and building height, the values are roughly comparable for WTP. There is, however, little reason to be sanguine about the use of either approach. Research needs to be done to better understand the differences with micro data. Also, further research remains to be done on the relative reliability of the approaches comparing say

[11] Familiarity is one reason given for the convergence of WTA to WTP values in a recent experiment by Coursey, Hovis and Schulze (1987) using a Vickrey auction.
[12] For migration models which emphasize the degree of departure from optimal quantities see papers by Duffy (1979) and Linneman and Graves (1983).

the likely influence of misspecification on implicit market values to the likely influence of framing on contingent market values. While more research remains to be done, confidence in amenity benefit estimates is growing.

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