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Pricing Residential Amenities: The Value of a View

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Abstract

This study provides estimates of the value of the view amenity in single-family residential real estate markets. A focus on Bellingham, Washington, a city with a variety of views, including ocean, lake, and mountain, allows for differentiation of the view amenity by both type and quality. Results from a hedonic model estimated for several recent years suggest that depending on the particular view, willingness to pay for this amenity is quite high. The highest-quality ocean views are found to increase the market price of an otherwise comparable home by almost 60%; the lowest-quality ocean views are found to add about 8%. For ocean views of all quality levels, the value of a view is found to vary inversely with distance from the water.

Key Words: views, amenity values, hedonic estimation

1. Introduction

A scenic view is a residential amenity associated with the location of a dwelling site. A number of studies have found that buyers are willing to pay a premium for sites with a view (see, for example, Do and Sirmans, 1994; Rodriguez and Sirmans, 1994; Cassel and Mendelsohn, 1985; Gillard, 1981; Plattner and Campbell, 1978). With few exceptions, these studies are based on a highly generalized formulation of the view amenity. Properties are commonly classified as ‘‘view’’ property or ‘‘no view’’ property, with no attempt to distinguish between different views. Views are not uniform, of course, but vary by type (water, mountains, valleys, and so on) and by quality. Such variation may exist not only between real estate markets but within markets as well. Water views, for example, may range from high-quality full views to low-quality partial views, even within the same neighborhood.

This study estimates the value of a view for a variety of view types and quality levels in a single-family residential market. To carry out the analysis, the study uses data for the city of Bellingham, Washington, a small city in the northwest corner of the contiguous United

States. Located on the coast, the city affords many ''ocean'' views—more specifically, views of Bellingham Bay and the San Juan Islands. In 1993, over 20% of single-family real estate transactions involved oceanview property. A smaller number of Bellingham sites provide a lake view or a view of snow-capped mountains in the North Cascades or Canadian Coast Range. The variation in view types available in Bellingham, as well as variation in quality created by hills and tall trees, make this city a good candidate for an analysis of intramarket variation in the value of the view amenity.

Based on a classification system incorporating quality as well as type, the authors collected view data for a large number of single-family properties in Bellingham. These data were matched to an assessor's database, including sale price and property characteristics. View premiums were then estimated from a standard hedonic model for eleven individual years beginning in 1984. Results indicate that the value of a view varies substantially depending on type and quality. In this area, high-quality oceanview properties are found to command the largest market premium, one that is several times larger than the premium attached to a low-quality ocean view. For ocean views of all quality levels, the value of a view is found to vary inversely with distance from the water. Results suggest that if a hedonic pricing model is utilized to value view homes, even for a single market, a simple view or no view specification can be inadequate.

The following section provides a review of the literature on the value of view amenities. Methodology and data are described in section 3. Section 4 presents the empirical results when view dummy variables are added to a basic hedonic model, while section 5 presents results when view and distance interaction variables are included. A final section provides a summary and conclusions.

2. Previous Research

A relatively small number of studies have examined the value of the view amenity, either as a primary or secondary focus of analysis. Because the type and quality of view are often not specified, and because results are often reported in dollar terms only, it is very difficult to make comparisons across studies. In an early paper, Darling (1973) investigated the impact of distance from three urban water parks (lakes) in California on property values. Distance from the lake was a significant determinant of property value in several of his models. For two of the parks (Lake Murray in San Diego and the Santee Lakes area), a dummy variable for view was included. Results for Lake Murray showed a significant increase in value (adding $2,362 to sales price) for properties with a lake view. The Santee Lakes regression also showed that view was a significant explanatory variable (adding $2,756 to sales price); in this case, however, the author did not know whether the view was a mountain view or a lake view.

Davies (1974) examined factors affecting house prices in Nottingham, England, and found that view, as measured only be degrees of panorama, was not a significant determinant. Morton (1977) studied the determinants of the value of 400 single-family residences in Orange County, California. A dummy variable for ''view lot'' was highly significant. The estimated view premium was approximately $20,000. (Means of variables were not given, so this value could not be compared to average sales price.)

Brown and Pollakowski (1977) looked at the value of living near a lake in Seattle, Washington. They estimated two separate regression models: one for Green Lake, which is surrounded by a greenbelt, and another for two lakes for which houses are built to the lake's shore, Lake Washington and Haller Lake. In their regression model on selling price (in 1967 dollars) they included a measure for distance to the waterfront and a dummy variable for view. In both models they found that greater distance significantly reduces selling price and that view was not statistically significant (though it had a positive sign in both models). Shortcomings of this study are that *view* is not defined anywhere in the study and the sample sizes were small (ninety sales for the Green Lake model and eighty-nine sales for the other).

Correll, Lillydahl, and Singell (1978) investigate the impact on the sales price of single-family properties of distance from a greenbelt in three neighborhoods in Boulder, Colorado. In one neighborhood they found that sales price decreased by $10.20 for every foot of distance from the greenbelt. In addition, the authors looked at view of the valley, classifying property into excellent, moderate, and no view property. They report that the coefficients on the view variables were statistically insignificant. The authors speculate that view was not significant due to small sample size (thirty-six properties), the difficulty of defining views, and the fact that some of the best view properties were subject to ''severe'' winds.

Plattner and Campbell (1978) examine new condominium sales at two developments in western Massachusetts. These projects contained units with similar characteristics except that some units had views of adjacent ponds or small lakes and the remaining units did not have any water view. By comparing average sales prices of units with and without water views, the authors conclude that a water view does add value. Results suggest that the incremental value of a water view is 4 to 12% above that of nonwater view units. They also find a lower percentage premium for high-priced property than for low-priced property. This is consistent with a view premium that is either a fixed-dollar amount or a percent of lot value only.

Gillard (1981) utilizes a hedonic pricing model to estimate the increase in home value associated with a view lot. His database consists of 392 single-family homes sold in Los Angeles in 1970. Gillard adds a dummy variable for view lot (the type and quality of view are not specified) to a multiple-regression model that includes nine other hedonic variables and four variables for neighborhood characteristics, with property selling price as the dependent variable. He concludes that a home situated on a view lot has about a 9.2% greater value than a nonview home. Additionally, Cassal and Mendelsohn (1985) find mountain, lake and Puget Sound views to be significant determinants of housing prices in a study of 423 homes in Seattle.

More recently, Rodriguez and Sirmans (1994) use a hedonic pricing model to examine the impact of view on value with a sample of 194 home sales in Fairfax County, Virginia. A classification of houses according to whether or not they provided a good view was obtained from the county tax appraiser. The type of view is not specified. Estimation results suggest that a good view adds about 8% to a home's value. For a sample of 645 homes sold in southwestern San Diego County, estimation of a hedonic pricing model by Do and Sirmans (1994) indicates that properties with a view command a premium of $9,180. This is relatively small given a mean selling price of $233,420.

Finally, Benson, Hansen, Schwartz, and Smersh (1997) use view as an explanatory variable in a study of 397 residential properties in Point Roberts, Washington. They use a four-way view classification system of oceanfront, oceanview, partial oceanview, and no view, determined by personal inspection of each sample property. They find that ocean frontage adds 147% to selling price, an ocean view adds 32%, and a partial ocean view adds 10%, relative to no view. While this study attempts to differentiate views by quality, it is based on a small sample size, it focuses on an area with a limited variety of views, and it does not attempt to measure the impact of distance on view premiums.

A number of previous studies thus find that view adds significantly to the value of residential real estate. In most cases, the estimated view premium is fairly modest. However, only a few studies attempt to distinguish between views on the basis of quality; in some cases, the type of view (mountain, ocean, lake, valley, and so on) is not identified. This generic treatment of the view amenity is likely due to the difficulty of obtaining data that allow for distinctions to be made. To overcome this problem, the authors of this study conducted field research specifically designed for the purpose of differentiating between views. In an attempt to avoid the small sample problems encountered by some previous researchers, view data were collected for a large number of single-family properties.

3. Methodology and Data

3.1. Methodology

A hedonic pricing model was used to estimate the impact of several variables on single-family housing prices in Bellingham. Theory gives little guidance with respect to the appropriate functional form for the hedonic model. To determine the best functional form, a maximum-likelihood Box-Cox hedonic model was estimated for each year of the data. The Box-Cox model provides a flexible functional form. The Box-Cox transformation of a variable z is written $z^{(\lambda)}$ and is defined as follows:

$$z^{(\lambda)} \equiv \frac{z^{\lambda} - 1}{\lambda}.$$

The following variant of the Box-Cox model was estimated:

$$y^{(\lambda)} = \alpha + \beta\mathbf{D} + \gamma\mathbf{X}^{(\lambda)} + \varepsilon,$$

where y is the dependent variable (in this case sales price), $\mathbf{D}$ is a vector of dummy variables, $\mathbf{X}$ is a vector of continuous variables, β and γ are parameter vectors, and λ is the Box-Cox parameter. Special cases involve values of λ equal to 0, 0.5, and 1, which correspond to the log-linear, square-root, and linear transforms, respectively.

As described below, our database includes properties sold over an eleven-year period. In order to obtain more efficient parameter estimates, pooling of the data across time periods was considered. In the housing price index literature, hedonic estimation commonly utilizes the explicit time-variable approach, in which data on dwelling characteristics are pooled across time periods and time is included as an independent variable (see, for example, Clapp and Giaccotto, 1992, and Gatzlaff and Ling, 1994). A disadvantage of this approach is the implicit assumption of constant coefficients with respect to hedonic characteristics over time. Over an eleven-year period, in particular, it is likely that relative prices of at least some hedonic characteristics will have changed in response to changing market conditions. To test for the appropriateness of pooling, we employed standard statistical tests for structural change in the vector of hedonic coefficients. Results of these tests, and the final model estimated, are discussed below.

3.2. Data

The sample of Bellingham properties used in this study is drawn from a computer data file provided by the Whatcom County Assessor's Office in Bellingham, Washington. The original file contained 12,075 real estate sales transactions in Bellingham for the period January 1984 through June 1994. For each transaction, the file provides the sales price and date of sale, and a set of variables describing each property's current (1994) characteristics, such as year built, year remodeled, square footage, condition of the structure, and type of sale. Prior to estimation, a number of invalid or inappropriate transactions were omitted. These included those involving multiple property sales, multiple dwellings on the same lot, raw land, non-arm's-length transactions, and so on.[1] After removing such transactions, the data set was reduced to 7,305 single-family residential property sales. Adjusting for repeat sales, this represents 5,095 properties.

A major shortcoming of the assessor's data is that it provided no information on the view amenity, the focus of this study. To obtain view information, the authors conducted a personal inspection in August and September of 1995 of all potential view properties in the sample. (A small number of properties did not have to be examined because, given their location, it could be determined a priori that no view was possible.) To judge the view from a home's living area, each potential view property was inspected from street level and from above and along the side where possible. When necessary to ascertain the view, the inspection included walking onto the property.

View properties were initially classified by type of view—ocean, lake, or mountain. These are the primary view types in the Bellingham market and are the categories commonly used by the local real estate sales and development community.[2] A large number of properties in the area provide ocean views, while lake and mountain views are less common. Oceanview properties, therefore, were further classified into four quality categories ranging from full ocean view to poor partial ocean view. In general, quality was determined on the basis of degree of obstruction, with quality judged to be lower for more obstructed views. In some cases, the authors made a subjective adjustment for visual impact. Thus for example, a view with some but not significant obstruction would ordinarily be classified as a superior partial ocean view. If a portion of the view looked directly toward Georgia Pacific's waterfront industrial facility, however, it was adjusted downward to good partial ocean view.

While there are no oceanfront properties in the sample, there are a number of lakefront properties. Because lakefront properties provide recreational amenities in addition to view amenities, these properties were categorized separately, with the remainder of lakeview properties classified as either full lake view or partial lake view. Given the small number of properties designated as full lake view (from one to five sales per year), the full and partial lakeview categories were ultimately combined for estimation purposes. Mountain-view properties were not differentiated by quality, as the number of such properties in the sample is small.

The following vector of view dummy variables was created:

OCNVIEW1 = 1 if the dwelling has a full (unobstructed) ocean view, otherwise 0;

OCNVIEW2 = 1 if the dwelling has a superior partial ocean view (some obstruction by buildings, trees, and so on), otherwise 0;

OCNVIEW3 = 1 if the dwelling has a good partial ocean view (significant obstructions), otherwise 0;

OCNVIEW4 = 1 if the dwelling has a poor partial ocean view (some water could be seen), otherwise 0;

LAKEFRNT = 1 if the dwelling has a lake view from lakefront property, otherwise 0;

LAKEVIEW = 1 if the dwelling has a lake view from nonlakefront property, otherwise 0;

MTNVIEW = 1 if the dwelling has an unobstructed view of snow-covered mountains, otherwise 0,

with the omitted category containing properties with no view.

For oceanview properties, variables capturing a possible additional dimension of a view—distance from the water—were derived using geographic information systems (GIS) techniques.[3] A variable measuring the shortest distance in miles from Bellingham Bay (DISTW) was created for all properties. (While it is likely that in some cities, a distance variable would measure proximity to oceanfront amenities as well as view quality, this is not the case in Bellingham. This point is discussed further below.)

Table 1 provides descriptive statistics for all variables, for 1993 (the most recent full year in the sample) as well as for the entire eleven-year sample. Definitions of variables other than view and distance are found in Appendix A. In the sample as a whole, the average property was approximately forty-four years old at the time of sale, and the mean square footage is 1378. Almost a quarter of the transactions involved the sale of view property. The majority of views are ocean views. While 6.4% of all transactions were for

Table 1. Summary statistics of sample variables.

	Full sample ($n = 7305$)				1993 ($n = 687$)			
Continuous variables:	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum
PRICE	90,220	59,619	15,000	761,615	129,984	61,383	30,000	615,000
AGE	44	28	1	93	46	29	1	92
TOTSF	1378	538	509	5732	1367	530	520	4946
Dummy variables:[a]	Mean	n			Mean	n		
OCNVIEW1	0.064	468			0.064	44		
OCNVIEW2	0.019	139			0.023	16		
OCNVIEW3	0.042	307			0.052	36		
OCNVIEW4	0.068	497			0.076	52		
LAKEFRNT	0.006	44			0.003	2		
LAKEVIEW	0.023	168			0.026	18		
MTNVIEW	0.009	66			0.016	11		
REMODEL	0.041	300			0.042	29		
ACREAGE	0.007	51			0.006	4		
QUAL1	0.008	58			0.013	9		
QUAL2	0.398	2907			0.397	273		
QUAL4	0.051	373			0.044	30		
QUAL5	0.003	22			0.001	1		
QUALM	0.101	738			0.093	64		
QUALP	0.230	1680			0.237	163		
COND1	0.009	66			0.019	13		
COND2	0.165	1205			0.176	121		
COND4	0.216	1578			0.223	153		
COND5	0.029	212			0.054	37		
HEATFA	0.547	3996			0.582	400		
HEATHWHP	0.073	533			0.061	42		
ROOFCSSB	0.977	7137			0.984	676		
ROOFTILE	0.011	80			0.003	2		
GARAGE	0.598	4368			0.616	423		
FINBASM	0.080	584			0.090	62		
DECK	0.321	2345			0.295	203		

[a]The mean for the dummy variables indicates the proportion of sample transactions for which this attribute exists.

houses with an unobstructed ocean view, 1.9% were for houses with a superior partial ocean view, and 4.2 and 6.8% for houses with a good or poor partial ocean view, respectively. An additional 0.6% of transactions were for lakefront property, 2.3% for lakeview property, and 0.9% for mountain view property.

4. Empirical Results Prior to Inclusion of Distance

4.1. Preliminary Tests

This section reports results of estimating a standard hedonic model with view dummy variables. As discussed above, a Box-Cox model was estimated for each of the eleven years, in order to determine the best functional form. In every year, both the linear and square-root transforms were rejected. For some of the years, the estimated lambda was not significantly different from zero, pointing to a log-linear form as the best fit. For other years, the estimated lambda was significantly different from zero, but closer to zero than to 0.5 (a square-root form) or 1 (a linear form). For the eleven years, the estimated lambda ranged from 0.01 for 1988 to 0.20 for 1992. On the basis of these results, we chose to use a log-linear functional form.[4]

To test for the appropriateness of pooling, we estimated both a pooled model with annual time dummies and separate models for each of the eleven years. Standard statistical tests for structural change in the vector of hedonic coefficients (see Johnston, 1984) were then applied. Based on the computed F-statistic, the hypothesis of equal slope vectors across eleven annual time periods was rejected. This is similar to results obtained by Knight, Dombrow, and Sirmans (1995), Gatzlaff and Ling (1994), and Palmquist (1982) in studies that tested time periods ranging from five to twenty years. On the basis of this result, the pooled model was not used. In the following subsection, we report estimation results for 1993. We then report results for selected years over the eleven-year period and discuss trends over time in the value of various views.

4.2. Estimation Results for 1993

This section focuses on estimation results for 1993. While the most recent year included in the dataset is 1994, the 1994 transactions extend through June only. Results of ordinary least-squares estimation of three specifications of our hedonic model for 1993 are reported in table 2. Continuous variables, including the sales price, were transformed prior to estimation by computing the natural log. Thus for these variables, the names in the table are preceded by *LN.* The coefficients on the continuous variables are estimated elasticities, measuring the percentage change in sales price associated with a 1% change in the property characteristic. For the dummy variables, the percentage impact on sales price is computed as $100*(e^{\beta} - 1)$, where β is the coefficient value for the particular characteristic.[5] The coefficients for the dummy variables in all models are reproduced in table 3, along with the calculated percentage impact on sales price.

Model 1 is the basic hedonic valuation model with a generic view variable, VIEW, included. VIEW is a 0–1 dummy, coded 1 if the property has a view (any one of the seven views described above) and 0 if no view. (Model 1 is designed only to be compared to previous studies that used a single view dummy variable; the authors are not suggesting that this is a suitable model to use in a city containing multiple views.) As hypothesized, the property's exposure has a large and significant effect on value. The coefficient of

Table 2. Hedonic regressions, 1993 (dependent variable is LNPRICE).

	Model 1		Model 2		Model 3	
Variable	Coefficient	*T*-Statistic	Coefficient	*T*-Statistic	Coefficient	*T*-Statistic
C	8.5612	34.97	8.5374	37.22	8.4987	37.50
VIEW	0.2301	11.34				
OCNVIEW1			0.4625	13.95	0.5448	11.30
OCND1					– 0.2527	– 2.35
OCNVIEW2			0.2686	5.31	0.4758	5.32
OCND2					– 0.3125	– 2.83
OCNVIEW3			0.2578	7.51	0.3259	6.16
OCND3					– 0.1139	– 1.71
OCNVIEW4			0.0784	2.70	0.2459	3.66
OCND4					– 0.1855	– 2.80
LAKEFRNT			0.8182	6.02	0.8197	6.13
LAKEVIEW			0.1665	3.49	0.1656	3.52
MTNVIEW			0.0853	1.45	0.0755	1.30
LNAGE	– 0.0299	– 3.06	– 0.0438	– 4.78	– 0.0469	– 5.16
REMODEL	0.0854	2.12	0.0844	2.24	0.0740	1.98
ACREAGE	0.3926	3.76	0.4088	4.21	0.4251	4.43
QUAL1	– 0.2836	– 3.65	– 0.2453	– 3.40	– 0.2410	– 3.39
QUAL2	– 0.1017	– 4.46	– 0.0867	– 4.08	– 0.0905	– 4.29
QUAL4	0.2709	6.21	0.2330	5.66	0.2305	5.68
QUAL5	0.0898	0.44	– 0.1502	– 0.78	0.0002	0.00
QUALM	– 0.0695	– 2.44	– 0.0692	– 2.60	– 0.0739	– 2.82
QUALP	0.0286	1.40	0.0160	0.84	0.0136	0.72
COND1	– 0.1671	– 2.67	– 0.1591	– 2.74	– 0.1661	– 2.90
COND2	– 0.0864	– 3.91	– 0.0840	– 4.09	– 0.0817	– 4.04
COND4	0.0530	2.49	0.0508	2.57	0.0547	2.80
COND5	– 0.0190	– 0.46	– 0.0004	– 0.01	0.0192	0.50
HEATFA	0.0402	2.14	0.0331	1.89	0.0221	1.27
HEATHWHP	0.1359	3.66	0.1004	2.90	0.0859	2.49
ROOFCSSB	0.1016	1.46	0.1182	1.82	0.1108	1.72
ROOFTILE	0.1367	0.84	0.2014	1.33	0.1892	1.27
LNTOTSF	0.4228	13.59	0.4306	14.80	0.4375	15.20
GARAGE	0.0215	1.23	0.0340	2.09	0.0370	2.30
FINBASM	0.1934	6.65	0.1484	5.39	0.1452	5.30
DECK	0.0577	3.02	0.0436	2.44	0.0461	2.60
R-squared	0.7485		0.7858		0.7933	
Adjusted R-squared	0.7402		0.7767		0.7832	
Standard error of regression	0.2041		0.1893		0.1865	
$n = 687$						

0.2301 suggests that in 1993 homes with a view sold for approximately a 25.9% higher price (see table 3), other characteristics constant, than those with no view. Most of the variables describing property characteristics are significant, with the expected sign. Sales prices are higher, the newer the house, the higher the quality and condition, the better the roof and heat source, and the larger the square footage.

Table 3. Transformed coefficients for dummy variables, 1993.

	Model 1		Model 2		Model 3	
Variable	Coefficient	Percent Impact	Coefficient	Percent Impact	Coefficient	Percent Impact
VIEW	0.2301	25.87				
OCNVIEW1			0.4625	58.80	see section 5	
OCNVIEW2			0.2686	30.81	see section 5	
OCNVIEW3			0.2578	29.41	see section 5	
OCNVIEW4			0.0784	8.16	see section 5	
LAKEFRNT			0.8182	126.64	0.8197	126.99
LAKEVIEW			0.1665	18.11	0.1656	18.01
MTNVIEW			0.0853	8.90	0.0755	7.84
REMODEL	0.0854	8.91	0.0844	8.81	0.0740	7.68
ACREAGE	0.3926	48.09	0.4088	50.49	0.4251	52.97
QUAL1	– 0.2836	– 24.69	– 0.2453	– 21.76	– 0.2410	– 21.42
QUAL2	– 0.1017	– 9.67	– 0.0867	– 8.30	– 0.0905	– 8.65
QUAL4	0.2709	31.11	0.2330	26.24	0.2305	25.93
QUAL5	0.0898	9.39	– 0.1502	– 13.94	0.0002	0.02
QUALM	– 0.0695	– 6.71	– 0.0692	– 6.68	– 0.0739	7.12
QUALP	0.0286	2.90	0.0160	1.61	0.0136	1.37
COND1	– 0.1671	– 15.39	– 0.1591	– 14.71	– 0.1661	– 15.30
COND2	– 0.0864	– 8.28	– 0.0840	– 8.05	– 0.0817	– 7.84
COND4	0.0530	5.44	0.0508	5.22	0.0547	5.63
COND5	– 0.0190	– 1.88	– 0.0004	– 0.04	0.0192	1.93
HEATFA	0.0402	4.10	0.0331	3.36	0.0221	2.24
HEATHWHP	0.1359	14.56	0.1004	10.56	0.0859	8.97
ROOFCSSB	0.1016	10.69	0.1182	12.55	0.1108	11.72
ROOFTILE	0.1367	14.65	0.2014	22.31	0.1892	20.83
GARAGE	0.0215	2.17	0.0340	3.46	0.0370	3.77
FINBASM	0.1934	21.34	0.1484	16.00	0.1452	15.63
DECK	0.0577	5.94	0.0436	4.45	0.0461	4.72

The complete set of view variables is added to the model in Model 2 of table 2. Results for this model confirm the expectation that the better views will command a higher market price. As seen in table 3, a full ocean view (OCNVIEW1) adds approximately 58.8% to market price relative to a similar house with no view. Estimated price premiums for superior, good, and poor partial ocean views (OCNVIEW2–4) are 30.8%, 29.4%, and 8.2%, respectively. For 1993 the difference between the coefficients for superior and good partial ocean views is not statistically significant. A lake frontage adds 126.7% to market price relative to a no-view house, while a lake view adds 18.1%. The large estimated premium for lake frontage reflects the fact that such locations provide not only view amenities, but recreational amenities as well, in the form of boat docks, for example. The coefficient on mountain view is positive as well, but not significant.

With the exception of mountain view, coefficients on all view variables are statistically significant at the 1% level. In dollars terms, results imply that a $200,000 residential property with no view would sell for $317,600 if it has a full ocean view and $453,280 if it is a lakefront home, all other characteristics remaining the same. The large variation in

Table 4. Hedonic regressions, selected years (dependent variable is LNPRICE)

	1984		1986		1988		1990		1991		1992		1993	
Variable	Coefficient	*T*-Statistic	Coefficient	*T*-Statistic	Coefficient	*T*-Statistic	Coefficient	*T*-Statistic	Coefficient	*T*-Statistic	Coefficient	*T*-Statistic	Coefficient	*T*-Statistic
C	7.79	28.41	7.54	29.56	8.17	35.87	8.51	33.98	8.66	39.38	8.65	35.91	8.54	37.22
OCNVIEW1	0.41	9.97	0.41	11.95	0.48	14.18	0.47	12.42	0.46	11.96	0.49	13.84	0.46	13.95
OCNVIEW2	0.18	2.78	0.23	3.84	0.30	4.86	0.32	4.02	0.37	6.21	0.33	5.40	0.27	5.31
OCNVIEW3	0.22	5.29	0.15	3.91	0.22	5.73	0.26	5.87	0.24	6.03	0.29	7.28	0.26	7.51
OCNVIEW4	0.05	1.60	0.07	2.43	0.09	2.74	0.16	4.46	0.12	3.76	0.13	3.88	0.08	2.70
LAKEFRNT	0.66	4.21	0.59	5.28	0.83	7.86	0.76	3.43	0.86	10.97	0.71	8.48	0.82	6.02
LAKEVIEW	0.05	0.85	0.08	1.51	0.17	3.38	0.10	1.59	0.08	1.83	0.14	2.18	0.17	3.49
MTNVIEW	0.02	0.30	0.11	0.89	0.07	0.61	0.22	2.01	0.08	1.46	0.06	0.66	0.09	1.45
LNAGE	− 0.07	− 6.70	− 0.08	− 7.54	− 0.10	− 10.53	− 0.05	− 4.31	− 0.06	− 5.51	− 0.04	− 3.75	− 0.04	− 4.78
REMODEL	0.06	1.26	0.14	2.96	0.05	1.12	0.14	3.79	0.06	1.82	− 0.02	− 0.60	0.08	2.24
ACREAGE	1.22	5.38	0.32	2.15	0.25	3.88	0.49	4.98	0.46	4.30	0.36	4.41	0.41	4.21
QUAL1	− 0.42	− 2.80	− 0.19	− 1.96	0.14	1.18	− 0.07	− 0.73	− 0.38	− 5.37	− 0.49	− 5.33	− 0.25	− 3.40
QUAL2	− 0.13	− 5.50	− 0.18	− 7.15	− 0.16	− 7.18	− 0.16	− 6.65	− 0.12	− 5.91	− 0.11	− 4.73	− 0.09	− 4.08
QUAL4	0.22	4.30	0.25	5.25	0.21	5.01	0.23	4.36	0.23	6.70	0.15	3.61	0.23	5.66
QUAL5	0.46	3.37	0.34	1.42	0.23	1.41	[a]		0.32	4.11	0.38	2.97	− 0.15	− 0.78
QUALM	− 0.03	− 0.81	− 0.02	− 0.62	− 0.09	− 3.41	− 0.06	− 1.95	− 0.07	− 2.96	0.01	0.24	− 0.07	− 2.60
QUALP	0.03	1.40	0.06	2.86	0.08	4.28	0.12	5.82	0.09	4.68	0.07	3.27	0.02	0.84
COND1	− 0.14	− 1.15	− 0.22	− 2.29	− 0.24	− 3.03	− 0.07	− 0.81	− 0.11	− 1.40	− 0.23	− 2.39	− 0.16	− 2.74
COND2	− 0.05	− 2.05	− 0.07	− 2.73	− 0.05	− 2.11	− 0.14	− 6.30	− 0.15	− 7.12	− 0.14	− 5.73	− 0.08	− 4.09
COND4	0.07	2.76	0.06	2.67	0.04	2.26	0.05	2.23	0.02	0.80	0.07	3.49	0.05	2.57
COND5	0.14	1.24	− 0.23	− 1.89	0.06	0.93	0.01	0.21	− 0.05	− 1.29	0.05	1.23	0.00	− 0.01
HEATFA	0.05	2.21	0.03	1.71	0.05	3.15	0.05	2.91	0.05	2.92	0.07	3.83	0.03	1.89
HEATHWHP	0.13	3.29	0.10	2.67	0.13	4.01	0.14	3.92	0.07	2.04	0.14	3.34	0.10	2.90
ROOFCSSB	− 0.07	− 0.64	0.16	2.27	0.09	1.24	0.01	0.06	0.02	0.20	0.10	1.37	0.12	1.82
ROOFTILE	0.01	0.05	0.28	2.32	0.21	2.21	− 0.12	− 0.80	0.09	0.78	0.03	0.27	0.20	1.33
LNTOTSF	0.46	12.81	0.47	14.55	0.41	14.07	0.42	13.43	0.41	15.43	0.40	12.98	0.43	14.80
GARAGE	0.07	3.61	0.06	3.08	0.06	3.95	0.07	4.07	0.02	1.37	0.05	2.93	0.03	2.09
FINBASM	0.22	5.74	0.23	7.59	0.15	5.27	0.21	5.79	0.17	6.15	0.15	4.51	0.15	5.39
DECK	0.04	1.72	0.02	1.18	0.06	3.42	0.07	3.66	0.06	3.48	0.03	1.30	0.04	2.44
R-squared	0.83		0.82		0.83		0.77		0.84		0.81		0.79	
Adjusted R-squared	0.82		0.81		0.82		0.76		0.84		0.80		0.78	
Standard error of regression	0.19		0.21		0.20		0.22		0.18		0.21		0.19	
n	500		668		763		747		722		720		687	

[a]There are no observations for QUAL5 in 1990.

estimated view coefficients by type and quality of view provides strong evidence that a simple specification of view such as that employed in Model 1 is not adequate. Discussion of other variables in the model will take place in the following section.

4.3. Trends in View Values: 1984 to 1993

As indicated above, the model was estimated separately for each of eleven years beginning in 1984. Table 4 presents estimates of Model 2 for selected years.[6] In all years, the estimated coefficients for ocean view, superior partial ocean view, and good partial ocean view (OCNVIEW1–3), as well as the coefficient for lakefront are significant at the 5% level or above. The remaining view variables—poor partial ocean view, lake view, and mountain view—are significant in some years and not in others. The mountain-view variable performs least well; the estimated coefficient is significant in only one of the years.

For the view variables that are consistently significant, the basic relationship between the coefficients is stable over time. With 1984 as the only exception, a lakefront commands the highest premium, followed by a full ocean view, a superior partial ocean view, and a good partial ocean view. With respect to the value of views over time, results suggest that the value of an ocean view rose in the late 1980s, a period of growing demand and rising prices in the overall market. The estimated premium for an ocean view rises from about 50% in 1984 and 1986 to approximately 60% from 1988 to 1993. A similar pattern exists for poor partial ocean view and lakefront, although there is more variation from year to year. At the same time, the coefficient for square footage is highly stable, varying from 0.40 to 0.47 over the time period. A rising price of a view combined with a stable square-footage elasticity is consistent with the expected difference in supply elasticities for these characteristics. In a market with increasing demand, characteristics with a relatively inelastic supply—view amenities, for example—are more likely to rise in price than characteristics with a relatively elastic supply.

5. Addition of View and Distance Interaction Terms

For oceanview and partial oceanview properties, the value of a view may vary depending on distance from the water. More specifically, it is hypothesized that the more distant the view, the smaller the view premium, holding the quality of the view constant. In this regard, it is important to point out that in Bellingham, few oceanfront amenities are available. Along much of the coastline, water access is blocked by either railroad tracks or commercial or industrial development. Thus, it is unlikely that proximity to the ocean is valued for its own sake, over and above the impact on views.[7] To test the hypothesis regarding the importance of distance, variables interacting each of the four oceanview variables with distance are added to the model. Interaction variables (OCND1–4) are defined as the natural log of (DISTW $+$ 1), where as defined above, DISTW is the shortest distance in miles from Bellingham Bay.

When interaction variables are included, the impact of a view on sales price is determined by the estimated coefficients on both the view dummy variable and the view and distance variable. More specifically, the total percentage impact of a particular type of ocean view on sales price is computed as

$$100 * [e^{(\beta+\gamma*(OCND)} - 1],$$

where β is the coefficient on the view dummy variable, and γ is the coefficient on the view and distance interaction variable.

Estimates for Model 3 in table 2 show that distance is a significant addition to the specification of ocean views in the model. Coefficients on all four view and distance interaction variables are negative and significant (at the 10% level in the case of OCND3). Thus, greater distance lowers the value of a view. While it is possible that in some cases greater distance could enhance a view, results suggest that such a relationship is the exception and not the rule. The coefficients on the view dummy variables are lower than in Model 2. As explained above, however, the impact of a view is now measured by a combination of the coefficient on view and the coefficient on the interactive distance variable. The percentage impact of view on sales price now depends on distance from the water. The estimated coefficients in table 2 yield the following percentage impacts for different types of ocean views, at distances of 0.1 miles, 0.5 miles, 1 mile, and 2 miles from the water.

Type of Ocean View	0.1 Miles	0.5 Miles	1 Mile	2 Miles
Full view	68.31	55.63	44.72	30.63
Superior partial view	56.21	41.78	29.59	14.16
Good partial view	37.03	32.28	28.01	22.23
Poor partial view	25.64	18.61	12.45	4.30

The percentage impacts for oceanview homes imply that a $200,000 home with no view would sell for $336,620 with an ocean view (a 68.31% increase) if located 0.1 miles from the water, $312,420 if located 0.5 miles from the water, $274,060 if located one mile from the water, and $251,280 if located two miles from the water with an ocean view.

Most other variables in Model 3 are significant, with the expected sign. Coefficient estimates indicate the following relationships between property characteristics and sales price. Sales price decreases with age of the property, each 1% increase in age reducing sales price by 0.05%. Remodeled homes sell for 7.7% more than those not remodeled, and acreage adds 53.0%. Relative to an average quality home (quality level 3), homes rated at below-average quality levels 1 and 2 sell for 21.4 and 8.7% less, respectively, and homes at quality level 4 sell for about 26.0% more. The estimated coefficient for quality level 5 or 6 is not significantly different from zero. (This is likely due to the small number of observations in these categories.) The ''quality minus'' rating subtracts 7.1% from value, while the ''quality plus'' rating does not add significantly to value. Relative to homes rated in average condition (condition level 3), homes judged to be below-average condition levels 1 and 2 sell for 15.3 and 7.8% less, respectively, and homes at condition level 4 sell for 5.6% more. The estimated coefficient for condition level 5 or 6 is not significant.

Results indicate that a better-quality roof adds to value, as does a better-quality heat source. For example, relative to a home that has wood or electric baseboard as a source of heat, forced air is associated with a 2.2% increase in value and hot water or heat pump add 9.0%. The estimated square footage elasticity of 0.44 implies that a 10% increase in total square footage results in a 4.4% increase in value, other things constant. All the remaining variables are found to add significantly to value, including those for garage, finished basement, and deck.[8]

6. Summary and Conclusions

Little research has focused on the impact of views, and ocean views in particular, on the value of single-family residential properties. Most studies that consider view use a generic view variable that combines all view property into a single category. In contrast, this study employs a detailed classification system that categorizes views on the basis of both *type* of view and *quality* of view. In addition, this study introduces spatial variables into the analysis of view, by allowing the impact of an ocean view to vary with distance from the water.

Hedonic estimation results for the city of Bellingham, Washington, suggest that when views in an area vary by type or quality, use of a generic view variable is not appropriate. For the 1993 sample, a simple specification of view generates the result that a view adds 25.6% to value. However, when views are classified into seven categories, the percentage increase in property value attributable to a view ranges from 8.2% for a poor partial ocean view, to 18.1% for a lake view, 29.4% for a good partial ocean view, 30.8% for a superior partial ocean view, and 58.9% for an unobstructed ocean view. Lake frontage property, which provides recreational as well as view amenities, is found to add 126.7% to value. There is evidence that the relative value of an ocean view rose in the late 1980s, a period of growing demand and rising prices for single-family housing in Bellingham. All estimated view amenity values are, of course, specific to the Bellingham market. The value of the view amenity in other real estate markets could vary widely from the values derived in this study depending on the quality and relative scarcity of different types of views.

Modeling the impact of ocean views is further improved by adding variables that interact view with distance. Estimated coefficients indicate, for example, that an unobstructed ocean view adds 68.3% to value if the property is located very close to the water (0.1 miles) but only 44.7% to value if the property is located a mile away from the water and then 30.6% if located two miles from the water. The impact of partial ocean views on value are found to decline in a similar fashion. In the case of ocean views, therefore, results suggest that the value of a view varies substantially depending on distance from the water. Based on these results, it appears that the use of spatial variables in addition to a detailed classification of view can add considerably to the estimation of residential property values in an area with views.

Appendix A: Variable Definitions

AGE = the year of sale minus the year built.

ACREAGE = a dummy variable equal to 1 if the property includes 1 or more acres, otherwise 0.

REMODEL = a dummy variable equal to 1 for houses that were remodeled after 1960, otherwise 0.

QUALITY = a vector of four dummy variables based on the assessor's classification value of 1, 2, 3, 4, 5, or 6 depending on the quality of construction of the dwelling, with 1 being the lowest quality and 3 being average quality; defined as
- QUAL1 = if the basic quality classification is a 1,
- QUAL2 = if the basic quality classification is a 2,
- QUAL4 = if the basic quality classification is a 4, and
- QUAL5 = if the basic quality classification is a 5 or 6.

The omitted category includes ''average'' quality, coded 3.

QUALPM = a vector of two dummy variables based on the assessor's additional quality classification of a plus or minus to refine the 1 through 6 classification given in QUALITY above, defined as
- QUALM = if the additional quality classification is a minus and
- QUALP = if the additional quality classification is a plus.

The omitted category includes properties with no plus or minus.

CNDTN = a vector of four dummy variables based on the assessor's classification value of 1, 2, 3, 4, 5, or 6 depending on the condition of the dwelling, with 1 being the lowest condition and 3 being average condition, defined as
- COND1 = if the condition classification is a 1,
- COND2 = if the condition classification is a 2,
- COND4 = if the condition classification is a 4,
- COND5 = if the condition classification is a 5 or 6.

The omitted category includes ''average'' condition, coded 3.

ROOF = a vector of two dummy variables defined as
- ROOFCSSB = if the roof is composite, wood shake, wood shingle or buildup and
- ROOFTILE = if the roof is tile.

The omitted category is roofs that are roll cover or metal.

HEAT = a vector of two dummy variables defined as
- HEATFA = if the heat is forced air and
- HEATHWHP = if the heat is hot water or heat pump.

The omitted category is electric baseboard, wood heat only, and ''other''.

TOTSF = total square feet in the dwelling, excluding the basement.

GARAGE = a dummy variable equal to 1 if garage square footage exceeds 100, otherwise 0.

FINBASM = a dummy variable equal to 1 if finished basement square footage exceeds 50, otherwise 0.

DECK = a dummy variable equal to 1 if deck square footage exceeds 100, otherwise 0.

Appendix B: 1993 Box-Cox Regression Results

Table 5 reports Box-Cox maximum-likelihood estimation results for 1993. With one minor exception, the specification is identical to that in table 2, Model 2. Both conditional *t*-values (calculated on the assumption that lambda is known), and the asymptotic *t*-values

Table 5. Box-Cox hedonic regression, 1993.

Variable	Coefficient	Conditional *t*-value	Asymptotic *t*-value	Hedonic price ($\delta \ln y/\delta x)^a$	Percent Impact	Elasticity
C	16.7112	25.07	3.86	—	—	
OCNVIEW1	1.9326	14.43	1.95	0.4704	60.06	
OCNVIEW2	1.1394	5.54	1.95	0.2773	31.96	
OCNVIEW3	1.0764	7.70	1.96	0.2620	29.95	
OCNVIEW4	0.3113	2.64	1.57	0.0758	7.87	
LAKEFRNT	3.5028	6.34	0.08	0.8526	134.57	
LAKEVIEW	0.6759	3.49	1.85	0.1645	17.88	
MTNVIEW	0.3538	1.48	1.28	0.0861	8.99	
AGE	– 0.1182	– 4.69	– 2.48	– 0.0010		– 0.0455
REMODEL	0.3547	2.31	1.25	0.0863	9.02	
ACREAGE	1.7098	4.33	1.88	0.4162	51.62	
QUAL1	– 0.924	– 3.15	– 1.91	– 0.2249	– 20.15	
QUAL2	– 0.3431	– 3.98	– 1.82	– 0.0835	– 8.01	
QUAL45[b]	0.9949	6.01	1.83	0.2422	27.40	
QUALM	– 0.2718	– 2.52	– 1.56	– 0.0662	– 6.40	
QUALP	0.0801	1.03	0.74	0.0195	1.97	
COND1	– 0.5880	– 2.49	– 1.83	– 0.1431	– 13.33	
COND2	– 0.3025	– 3.63	– 2.03	– 0.0736	– 7.10	
COND4	0.2281	2.85	1.36	0.0555	5.71	
COND5	0.0245	0.16	0.13	0.0060	0.60	
HEATFA	0.1411	1.99	1.26	0.0343	3.49	
HEATHWHP	0.4050	2.87	1.65	0.0986	10.36	
ROOFCSSB	0.4609	1.74	1.27	0.1122	11.87	
ROOFTILE	0.7884	1.28	0.53	0.1919	21.16	
TOTSF	0.7465	14.96	4.69	0.0003		0.4322
GARAGE	0.1383	2.09	1.48	0.0337	3.42	
FINBASM	0.6306	5.63	1.95	0.1535	16.59	
DECK	0.1688	2.32	1.41	0.0411	4.19	
Lambda (asymptotic standard error): 0.12(0.042)						
Adjusted R-squared: 0.782						
$n = 687$						

[a]Evaluated at mean of the data. For dummy variables, hedonic prices are directly comparable to estimated coefficients in table 2, Model 2.
[b]Includes quality levels 4, 5, and 6.

(calculated using the method of Berndt, Hall, Hall, and Hausman, 1974) that incorporate the statistical uncertainty regarding the true value of lambda, are shown. The latter are the appropriate values to use for hypothesis testing. The conditional *t*-values are included for purposes of comparison with other published results, that typically present only the conditional values (as these are easier to calculate and are the only values provided by many software programs).

As shown in table 5, the maximum likelihood estimates lead us to reject the hypothesis of log-linearity or linearity: λ is equal to 0.12, with a standard error of 0.042. To aid in interpretation of maximum likelihood coefficient estimates, the table shows implied hedonic prices (defined as the derivative of the log of price with respect to each independent variable, evaluated at the mean of the data). For the dummy variables, the hedonic price values are directly comparable to the coefficient estimates in table 2, Model 2. The transformed coefficients (percent of impact) are shown as well. For the continuous variables (AGE and TOTSF), the last column in the table shows implied elasticity values (the derivative of the log of the price with respect to the log of each continuous variable, evaluated at the mean of the data.)

Estimation results are similar to those obtained from the log-linear model. For most of the view variables, estimation of the Box-Cox model produces percentage effects on value that are slightly larger than those estimated from the log-linear model. Again, the estimated coefficient for mountain view is not significant. Taking into account uncertainty regarding the true value of lambda, the coefficient on lakefront is not significant, and the coefficient on poor partial ocean view (OCNVIEW4) is significant only at the 15% level. The remaining view coefficients are significant at the 10% level or above. Because it uses a flexible functional form, and because the estimated lambda is significantly different from zero (the log-linear special case), these results may be viewed as somewhat superior to those reported in the text. In the case of the view variables, then, the results reported in Model 2 of table 2 may be viewed as slight underestimates of the value of the various views. As stated above, log-linear results are presented in the text in order to facilitate comparison with Models 1 and 3.

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Notes

1. Omitted transactions include those in which (1) the sale used document types other than warranty deeds, such as those sold through trusts, receiverships, and quitclaim deeds, (2) transaction prices represented multiple property sales, (3) transaction prices were identified by the assessor as possibly not representing market prices because the sales were between family members, the sales were through a trust or estate, the sale represented a partial interest, or it represented a sheriff's sale, (4) the sales price appeared to be in error (off by several degrees of magnitude), (5) the property was remodeled after the date of sale, causing the current list of descriptive variables to be different from what they were at the time of sale, (6) the transactions appeared to be for raw land, and (7) the properties contained more than one dwelling.
2. A small number of homes may have an alternative type of view, such as a view of park land or hillsides. In the area of the study, however, trees are common and a tree view such as that provided by parks is not particularly scarce (and therefore unlikely to command a significant premium).
3. The GIS product employed was ATLAS GIS.
4. An alternative is to use estimates generated directly from the Box-Cox model. However, the model does not allow for continuous variables with zero values. Thus distance and view interaction variables added in the next section of the article could not be included. For this reason, we chose to use the log-linear model throughout the article. For purposes of comparison, Box-Cox maximum-likelihood results for 1993 are reported in Appendix B.
5. The correct interpretation of coefficients on dummy variables when the dependent variable is specified in logs was first pointed out by Halvorsen and Palmquist (1980).
6. While the sample includes transactions over the period 1984 through June of 1994, the characteristics data is for 1994. Although most characteristics do not change over time unless the structure is remodeled (a variable included in the database), a characteristic such as condition could have been different at the time of sale than in 1994. It is thus possible that for the earlier years in the sample, the condition variables used in the estimation do not accurately measure the condition of the property at the time of sale. While this may affect the estimated coefficients on the condition variables, it is not likely to affect the estimated view coefficients, given that there is very little to no correlation between the view and condition variables in our sample.
7. To test for the impact of proximity to the waterfront independent of the effect on views, we estimated a hedonic model for nonview properties only, including a variable measuring distance to the waterfront. This variable did not prove to be statistically significant, indicating that apart from the impact on view, distance from the water is not an important factor in sales-price determination.
8. The variables for garage, finished basement and deck are constructed as dummy variables in order to satisfy the restriction in our Box-Cox model that continuous variables be nonzero. We have also estimated the models with continuous variables for garage, finished basement, and deck square footage. Whether the variables are included as continuous or dummy variables has very little impact on estimated view coefficients.

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