The Price of Aesthetic Externalities

Steven C. Bourassa[*], Martin Hoesli[**] and Jian Sun[***]

This draft: November 14, 2003

Abstract

This paper explores the prices of three aesthetic externalities (the presence of a water view, the appearance of nearby improvements, and the quality of landscaping in the neighborhood) in residential property markets. In particular, we focus on how the implicit prices of such characteristics change with the residential real estate cycle. Given that the supply of these attributes is limited, one would expect their implicit prices to vary with the real estate cycle, contrary to what would be expected for the prices of property characteristics that are in relatively elastic supply. We also examine how the price premium for a water view varies across cities with the supply of such views. The empirical analyses are performed using hedonic models and a rich database of all residential sales transactions from 1986 to 1996 for the three largest urban areas in New Zealand—Auckland, Christchurch, and Wellington. Our results suggest that implicit prices of the aesthetic externalities move with the real estate cycle. We find also that the percentage premiums for water views are greatest in Christchurch, which has the smallest percentage of properties with water views, and lowest in Wellington, which has the highest percentage of properties with views. A good understanding of the impact of these variables is important for the valuation of residential properties.

Keywords: hedonic models; aesthetic externalities; views; real estate valuation; New Zealand

JEL codes: R31; R21

[*] School of Urban and Public Affairs, University of Louisville, 426 W. Bloom Street, Louisville, KY 40208, U.S.A., Email: steven.bourassa@louisville.edu

[**] HEC and FAME, University of Geneva, 40, boulevard du Pont-d'Arve, CH-1211 Geneva 4, Switzerland, and University of Aberdeen Business School, Edward Wright Building, Dunbar Street, Aberdeen AB24 2QY, U.K., Email: martin.hoesli@hec.unige.ch

[***] School of Urban and Public Affairs, University of Louisville, 426 W. Bloom Street, Louisville, KY 40208, U.S.A., Email: j0sun002@gwise.louisville.edu

The Price of Aesthetic Externalities

1. Introduction

Many real estate textbooks refer to the dictum stating that the three most important features of a property are (1) its location, (2) its location, and (3) its location. Although this is arguably somewhat of an overstatement, locational influences are key drivers of real estate values. In the context of residential properties, a desirable location is determined by proximity to schools, shops, public transportation, but by other externalities also. Boyle and Kiel (2001), for instance, provide a survey of research on the impact of environmental externalities on house prices. They consider the impact on property values of air quality, water quality, and undesirable land uses in the vicinity.

Several other externalities, such as accessibility to green areas, are important as well. Thorsnes (2002) shows, for example, that building lots that border forest preserves sell at premiums of 19% to 35%. Mahan, Polasky and Adams (2000) find that property values are influenced by size of the nearest wetland, but not by wetland type in the Portland, Oregon, metropolitan area. The analysis of the impacts of various view features such as a lake or the ocean has also been examined. A survey of such studies is contained in Bourassa, Hoesli and Sun (2004). These authors show that most studies examining the impact of views on property values consider a dummy variable for whether or not a given feature is visible from properties. Bond, Seiler, and Seiler (2002), for instance, report an 89.9% premium for a waterfront view. Some studies have used a set of dummy variables for various view scopes. Benson, Hansen, Schwartz, and Smersh

(1997) use three different scopes (ocean front, unobstructed ocean view, and partial ocean view) in their study of Point Roberts, Washington. Ocean frontage is found to add 147% to price, ocean view 32%, and partial ocean view 10%.

Analysis of aesthetic externalities should not be limited to the examination of the views on a specific feature. The quality of the surrounding landscaping and improvements generates aesthetic benefits and should be taken into account when analyzing the determinants of property values. Des Rosiers, Thérault, Kestens and Villeneuve (2002) find, for instance, that landscaped curbs increase value by 4.4% in Quebec City. Bourassa, Hoesli and Sun (2004) report that attractive buildings in a property's neighborhood on average add 37% to value in Auckland, New Zealand. They further report that particularly attractive improvements in the immediate surroundings of a property add another 27% to value on average. Properties in neighborhoods with only poor quality landscaping on average experience a -51% impact on price.

The price impacts of attributes depend on the supply and demand for these attributes. When changes in demand occur, the price of attributes whose supply is limited should change, whereas the price of elastic attributes should be relatively fixed. In the context of real estate valuation models, the prices of the former attributes should move with the real estate cycle, and the price of the latter attributes should remain by and large constant. Generally speaking, one would expect variables related to location and land values to be relatively inelastic, while factors affecting the value of structures should be more elastic. Empirical evidence on the former hypothesis is provided by Benson, Hansen, Schwartz, and Smersh (1998) for Bellingham, Washington. These authors report that "the estimated premium for an ocean view rises from about 50% in 1984 and 1986 to

approximately 60% from 1988 to 1993" (p. 66). Given the rise of real estate prices from the mid-1980s to the beginning of the 1990s, the implicit price of an ocean view thus rose over that period. As a matter of fact the price of a view rose at a faster rate than house prices, leading to an increase in the relative price impact of a view. Also, demand and supply characteristics will vary across cities, and hence one would expect across-city differences. All things being equal, the percentage price impact of a view should be less for instance in a city whose topography provides for various elevations than in a city with a relatively flat topography.

The aim of this paper is to provide evidence on two hypotheses: (1) in a market with changing demand, the price of attributes with a relatively inelastic supply is more likely to change than the price of characteristics with a relatively elastic supply and (2) higher percentage premiums are paid for aesthetic externalities where such attributes are scarce. The analysis is performed with a rich database of all residential sales transactions from 1986 to 1996 in the three largest urban areas in New Zealand—Auckland, Christchurch, and Wellington. We focus on three aesthetic externalities: whether or not a property has a water view; the appearance of nearby improvements; and the quality of landscaping in the neighborhood. The supply of properties benefiting from these externalities is relatively limited, whereas the supply of structures is relatively elastic. In particular, the supply of properties with water views could be completely inelastic under some circumstances.

As can be seen on Exhibit 1, the evolution in real house prices was quite different over the 1986-1996 period in the three markets that we consider in our paper. These price series are based on the official New Zealand government indices, which were

converted to real terms using the CPI net of housing costs (see Bourassa, Hendershott and Murphy, 2001, and Valuation New Zealand, 1998). Prices in Christchurch rose quite steadily over the period. In Wellington, real house prices followed more of a cycle, although the magnitude of prices changes was less than in the other two residential markets. Price changes in Auckland were quite similar to those observed in Wellington during the 1986-1994 period, but prices soared during the latter years of our observation period. These differing real house price behaviors across cities provide an ideal setting for investigating price changes of attributes with both inelastic and elastic supplies. The aesthetic externalities constitute an important subset of variables whose supply is relatively inelastic and which should move with the overall market. With respect to the levels of relative premiums across cities, we expect these to be greatest in Christchurch and lowest in Wellington, reflecting the availability of water views in these cities. The premiums in Auckland should be somewhat intermediate. Supply of water views across these three urban areas varies according to availability of coastline locations, as well as the proportion of elevated sites.

The paper is organized as follows. In the next section, we discuss our method and hypotheses, while our data are presented in the following section. Then, we discuss our results. Finally, we provide some concluding remarks.

2. Method and Hypotheses

For each city, we perform one hedonic regression model for each year of the 1986-1996 period. This yields a total of 33 regressions. The dependent variable in each regression is the sale price (net of personal property), and the independent variables are the attributes of the properties. The list of variables included in the hedonic regressions is

reported in Exhibit 2. The variables pertain to aesthetic externalities, other factors that affect land values, as well as aspects of structures and other improvements to the properties. Dummy variables for neighborhoods are included to control for local geographical variations in socioeconomic and other characteristics not measured directly by the variables included in the models. The numbers of neighborhoods for Auckland, Christchurch, and Wellington are 115, 27, and 26, respectively.

Ideally, one would want to consider different scopes of water views. Despite the fact that data for three different scopes (wide, medium, narrow) are available for the three cities, the number of observations in a given year for a given category was often found to be small. Therefore, we had to combine these three scopes into one single dummy variable for presence of a water view.

Several transformations were applied to the variables. To make the distribution of the dependent variable (and the disturbances) more normal, we use the natural logarithm of the net sale price. We use the logarithms of floor size and land area to reflect diminishing returns to scale. The logarithms of distance to the central business district (CBD), distance to the coast, and distance to a subcenter (for Auckland only) are used to capture the expected negative exponential relationships between residential real estate values and these variables. Finally, we use up to the fourth power of the age variable to capture the cycles of depreciation and refurbishment that take place over the life cycle of dwellings and neighborhoods.

The first objective of this paper is to examine the time-varying nature of the implicit prices on the three aesthetic externalities. Given the relatively fixed supply of the aesthetic externality attributes, their prices in real terms should change with changes in

real house prices. The real prices of attributes are calculated by taking the antilog of the estimated regression coefficients on the dummy variables, subtracting one, and then multiplying the result by the real mean sale price (for the interpretation of coefficients on dummy variables, see Halvorsen and Palmquist, 1980).

Looking at Exhibit 1, we are expecting the price of aesthetic externalities in real terms to vary in years 1986 and 1987 in Auckland and Wellington, and these changes to be substantial in years 1994 to 1996 in Auckland. For Christchurch, the implicit prices should increase over the period given the trend in real estate prices in that city. For comparison purposes, we also examine four other attributes. Three of these variables pertain to land values (the land area and distances to CBD and to the nearest coast), and one to structure values (floor size). As these four variables are expressed in logs and the dependent variable is also in logs, the reported coefficients are elasticities. The former three variables should be of relatively limited supply, whereas the latter should be more elastic. Therefore, we expect the elasticity to change with the cycle for the land value variables and to remain by and large constant through time for the structure value variable.

The second aim of the paper is to examine how the price impact of water views varies across the three urban areas. The supply of this attribute varies markedly across cities, making the New Zealand data set well suited for this analysis. Exhibits 3 through 5 show the properties with and without a water view in the three cities for year 1996. The Wellington residential real estate market has the highest percentage of properties with a water view (18.4% in 1996). As can be seen on Exhibit 5, the city of Wellington has extensive coastline. Moreover, the topography of the city is such that many elevated

sites with views exist. On the contrary, Christchurch is relatively flat in topography and the coastline is quite limited (see Exhibit 4). Hence, Christchurch has a relatively low supply of properties with water views (2.2% in our sample for 1996). Exhibit 3 shows that the Auckland urban area has a wide availability of coastline locations. However, its topography is relatively flat, leading to the proportion of properties having a view (11.4% in 1996) being lower than in Wellington, but higher than in Christchurch. We thus hypothesize the price impacts for presence of a view to be highest in Christchurch and lowest in Wellington.

3. Data

The main source of data for this study is the official database of all real estate transactions in New Zealand. We selected transactions involving residential detached and semi-detached properties in the Auckland region (including five local government areas: Auckland, Manukau, North Shore, Papakura, and Waitakere), the City of Christchurch and the City of Wellington. From the subset of residential properties, we further selected those properties for which a special set of mass appraisal variables was provided. We deleted transactions for properties that were classified as subdivisible (because the sale price might represent potential for redevelopment), had floor sizes of less than 30 square meters or greater than 360 square meters (probably errors in data entry), or had missing data for any of the variables of interest. We also deleted transactions that were not considered to be "arm's length" by the appraisers or were otherwise flagged as being unsuitable for mass appraisal. This yielded sample sizes for the 11-year period of 128,982, 73,851, and 28,357, for Auckland, Christchurch, and Wellington, respectively.

To the variables in the official database, we added several calculated with the aid of geographic information systems (GIS): distance to the CBD, distance to the nearest coastline, and distance to the nearest commercial subcenter (for Auckland only). We also constructed a new dummy variable identifying "cross-leased" or "strata-titled" properties. Although a positive land area is provided for a majority of the transacted properties, a significant percentage have a land area of zero. These properties are generally cross-leased, which means that the land is owned collectively by the owners of dwellings on that site, and leased to each owner for a nominal rent. Alternatively, the properties may be condominiums ("strata-titled" in New Zealand terminology).

4. Results

Exhibits 6 through 8 contain selected results from the hedonic regressions. The explanatory power of our models is very good, with *R*-squared statistics ranging from 0.72 to 0.86. The mean sale prices are reported in both nominal and real terms. For aesthetic externalities, we report the price of the characteristic in real terms (i.e., in 1996 NZ$), evaluated at the mean real house price for each year and city. "Attractive immediate surroundings" refers to good appearance of nearby improvements. The results for very attractive immediate surroundings are not reported in the three exhibits as the number of observations is often too small to yield meaningful results. For the quality of landscaping in the neighborhood, we report the results for only the good quality category. Exhibits 9 through 11 show indices of house prices, water views, attractive immediate surroundings, and good landscaping in the neighborhood. Indices of implicit prices of characteristics are generally more volatile than house price indices given the measurement errors on the estimated coefficients in hedonic regression models.

The real price indices of water views and good landscaping in Auckland track the index of real house prices. The price of attractive immediate surroundings rises even more than real house prices, with very large increases in the beginning and the end of the time period. These periods correspond to periods in which a bubble has been reported for the Auckland residential market (Bourassa, Hendershott and Murphy, 2001). Demand for that attribute thus appears to have increased quite substantially during these "bubble" periods in Auckland. The results for Auckland provide strong evidence for the fact that the implicit price in real terms that is being paid for aesthetic externalities that are in limited supply is sensitive to demand changes. As far as the other variables are concerned, Exhibit 6 shows that only the elasticity of land area is somewhat sensitive to demand changes, but not the other two variables that are related to land values. The elasticity of floor size appears to be quite constant, a result which is consistent with our hypothesis that the supply of floor size should be relatively more elastic than that of locational factors.

The pattern of real house price changes in Christchurch is quite different from that in Auckland as real house prices rose steadily during the period under review. The price of water views and attractive immediate surroundings in real terms also rose quite substantially (see Exhibit 10). In contrast, good landscaping did not experience such a rise in price. This is possibly because the supply for the latter characteristic is less inelastic than that of the two other aesthetic externalities that we consider. Exhibit 7 shows that the elasticities of land area and distance from the CBD vary during the period, whereas the elasticity of floor size is relatively constant. Again, these results are consistent with expectations.

Wellington house prices experienced a cycle, but the magnitude of changes in real house prices were less than in the other two cities. For 1988, however, Bourassa, Hendershott, and Murphy (2001) identify a strong departure of real house prices from equilibrium, suggesting that a bubble was developing on this market. This is exactly when the price of a water view increased dramatically in Wellington (see Exhibit 11). The price of a water view in Wellington almost doubled in real terms over the 1986-1996 period, suggesting large increases in the demand for that attribute. The price trends for the various aesthetic externalities are roughly similar to that for real house prices, providing further evidence for the fact that the prices of such attributes are affected by changes in demand. The elasticities of the other variables are constant.

We now turn to examining whether the levels of percentage price impacts for water views varies across cities given the varying supply of water views across the three urban areas. As discussed in the method and hypotheses section, water views are most prevalent in Wellington, averaging 18.6% of the properties that transacted during the 1986-1996 period. The comparable figures for Auckland and Christchurch are 12.5% and 2.5%, respectively. The varying levels of supply have a direct impact on the prices that are being paid implicitly in the three residential markets. As expected, prices are negatively related to supply, with average percentage price impacts of 6.6% in Wellington, 9.7% in Auckland, and 10.9% in Christchurch.

5. Concluding Remarks

The purpose of this paper is to examine in detail the price of aesthetic externalities. We focus on three such externalities: presence of a water view, appearance of surrounding improvements, and quality of landscaping in the neighborhood. We

examine both the time-varying nature of the real prices of these three attributes, and how the percentage premium for a water view varies across cities depending on availability of such views. The empirical investigation is conducted using all residential transactions in the three largest cities of New Zealand during the period 1986-1996. This dataset is well suited to test our hypotheses as real house prices have experienced varying patterns during the period considered. Moreover, the availability of water views varies substantially across the three cities.

We find that real prices of the aesthetic attributes vary with changes in demand. This is because of the limited supply for such attributes, in the short and medium term anyway. In contrast, supply of floor size is more elastic, and the elasticity of that attribute is found to be quite constant over time. Percentage price impacts for water views are found to be inversely related to availability of such views, a result that is consistent with theory.

Three implications emerge for real estate valuers. First, varying premiums should be considered when valuing a property with a view, depending on the supply of views in a given city. Second, for a given city, these premiums are found to vary over time, suggesting that hedonic valuation models should be updated on a regular basis. If the more traditional sales comparison method is used, then comparable sales should have a similar view feature, and these comparables should have sold recently. Third, the dollar amount of a view feature exhibits even more variation over time. Thus, the use of a fixed dollar amount for the presence of a view should not be considered for valuation purposes.

Much work remains to be done in this area. Obviously, more comparative analysis of various cities needs to be undertaken to explore further the relationship

between availability of views and their price. Also, further research is warranted to explore the relationships between some of these variables. What is the relationship for instance between the average income of households, the quality of their neighborhoods, and aesthetic externalities? Finally, it would be of interest to investigate how demand for the aesthetic attributes changes as cities develop and socioeconomic characteristics change.

References

Benson, E. D., J. L. Hansen, A. L. Schwartz, Jr and G. T. Smersh, The Influence of Canadian Investment on U.S. Residential Property Values, *Journal of Real Estate Research*, 1997, 13:3, 231-249.

Benson, E. D., J. L. Hansen, A. L. Schwartz, Jr and G. T. Smersh, Pricing Residential Amenities: The Value of a View, *Journal of Real Estate Finance and Economics*, 1998, 16:1, 55-73.

Bond, M. T., V. L. Seiler and M. J. Seiler, Residential Real Estate Prices: A Room with a View, *Journal of Real Estate Research*, 2002, 23:1/2, 129-137.

Bourassa, S. C., P. H. Hendershott and J. Murphy, Further Evidence on the Existence of Housing Market Bubbles, *Journal of Property Research*, 2001, 18:1, 1-19.

Bourassa, S. C., M. Hoesli and J. Sun, What's in a View?, *Environment and Planning A*, 2004 (forthcoming).

Boyle, M. A. and K. A. Kiel, A Survey of House Price Hedonic Studies of the Impact of Environmental Externalities, *Journal of Real Estate Literature*, 2001, 9:2, 117-144.

Des Rosiers, F., M. Thériault, Y. Kestens and P. Y. Villeneuve, Landscaping and House Values: An Empirical Investigation, *Journal of Real Estate Research*, 2002, 23:1/2, 139-161.

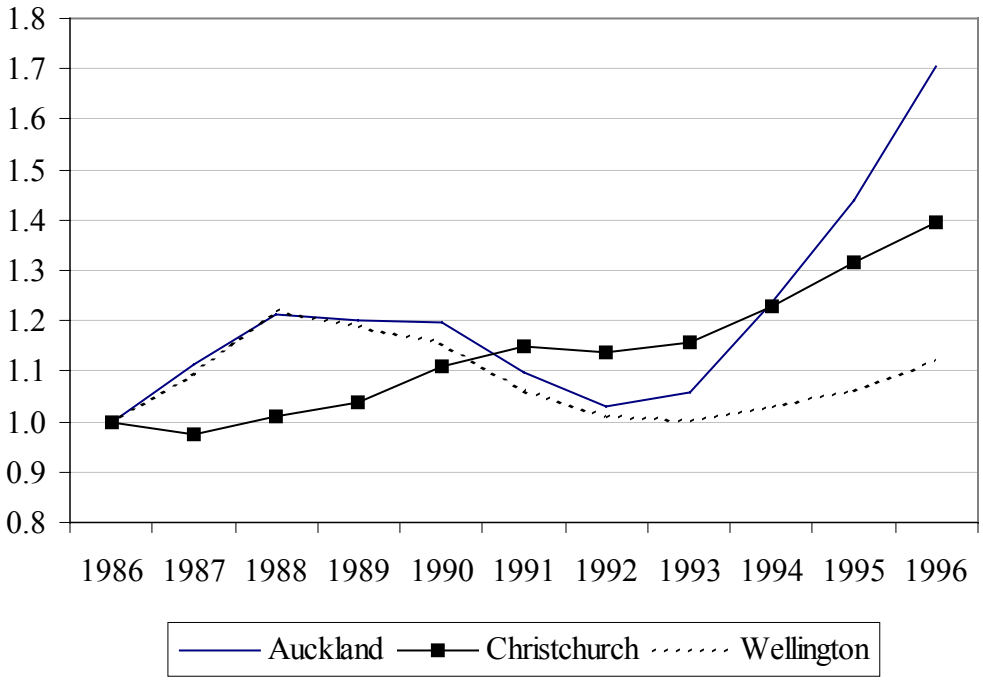
Halvorsen, R. and R. Palmquist, The Interpretation of Dummy Variables in Semilogarithmic Equations, *American Economic Review*, 1980, 70:3, 474-475.

Mahan, B. L., S. Polasky and R. M. Adams, Valuing Urban Wetlands: A Property Price Approach, *Land Economics*, 2000, 76:1, 100-113.

Thorsnes, P., The Value of a Suburban Forest Preserve: Estimates from Sales of Vacant Residential Building Lots, *Land Economics*, 2002, 78:3, 426-441.

Valuation New Zealand, *Urban Property Sales Statistics: Half Year Ended 31 December 1997*, Wellington, NZ, 1998.

Exhibit 1
Real House Price Indices, Auckland, Christchurch, and Wellington, 1986-1996 (1986=1)



Source: Bourassa, Hendershott and Murphy (2001); Valuation New Zealand (1998).

Exhibit 2
Definitions of Variables

Variable	Definition
Dependent variable	
Sales price	Natural logarithm of sale price net of chattels (NZ$). 'Chattels' refers to any personal property included in a transaction
Aesthetic externalities	
Water view	Dummy variable for whether or not a property has a water view
Appearance of nearby improvements	Set of three dummy variables measuring the quality of the structures in the immediate vicinity of the property (default category = Average)
Poor	
Good	
Very good	
Quality of landscaping in the neighborhood	Set of two dummy variables measuring the quality of landscaping in the neighborhood of the property (default category = Average)
Poor	
Good	
Other variables related to land value	
Land area	Natural logarithm of size (in m^2) of the lot
Leased	Dummy variable indicating whether or not the land is owned collectively by the owners of the dwelling. In such a case, the land area is zero
Distance to the nearest subcenter	Natural logarithm of distance in meters to the closest of five commercial subcenters (applies to Auckland only)
Distance to the CBD	Natural logarithm of distance in meters to the CBD
Distance from coast	Natural logarithm of distance in meters to the nearest coast
Elevation of the property	Set of two dummy variables measuring the elevation of a property relative to the street (default category = Sunken)
Elevated	
Level	
Suburb	A series of dummy variables indicating the neighborhood in which a property is located
Variables related to the value of improvements	
Floor size	Natural logarithm of floor size (in m^2)
Age	A set of four variables measuring the age of the property, and the age squared, cubed, and to the fourth power
Quality of the structure	Set of two dummy variables measuring the quality of the structure (default category = Average)
Poor	
Superior	
Modernized	Dummy variable indicating whether or not a property has been modernized
Deck	Dummy variable indicating whether or not a property has a deck
Driveway	Dummy variable indicating whether or not a property has a driveway

Exhibit 3
Location of Houses Sold in Auckland Region,
with and without Water Views, 1996

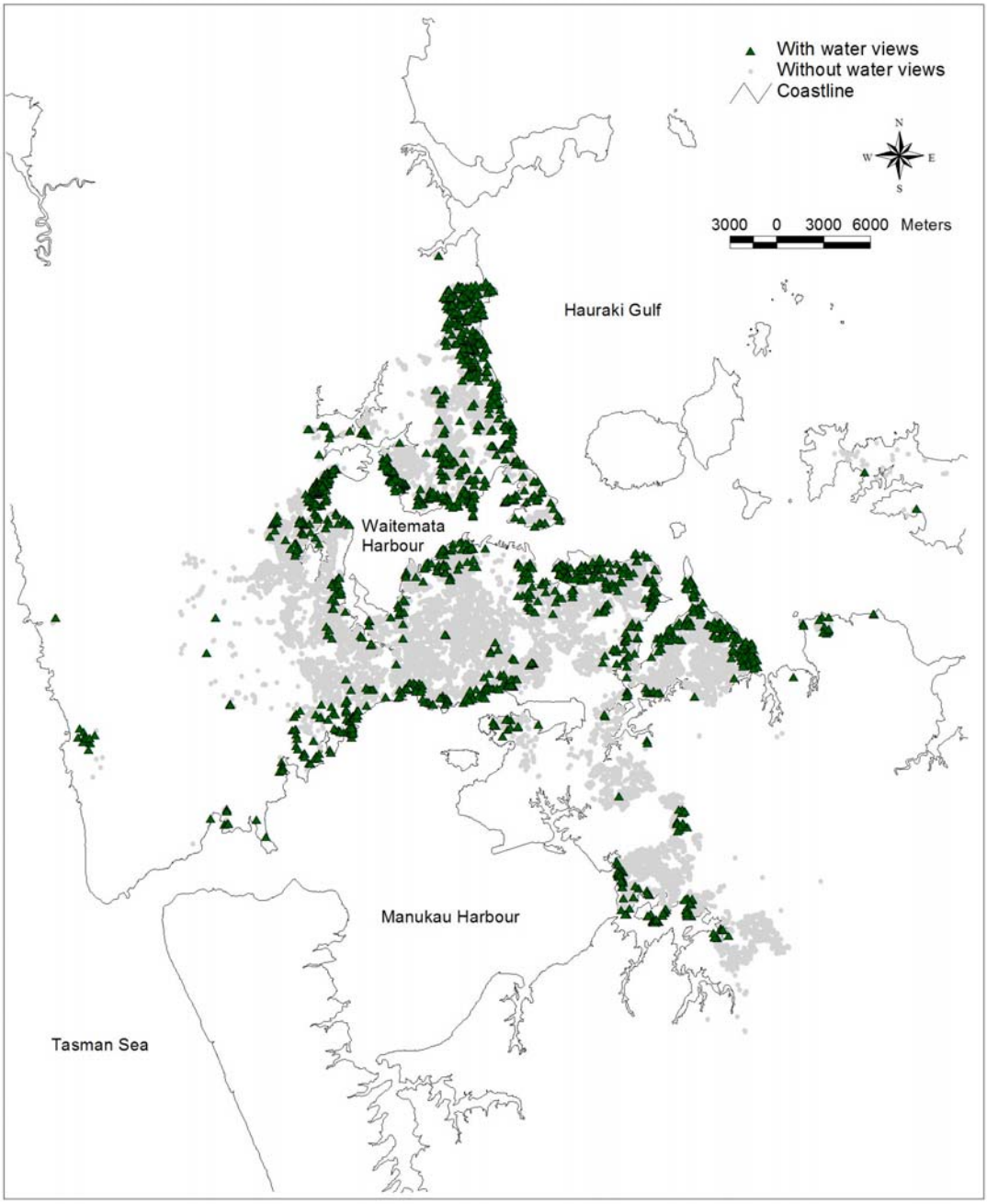


Exhibit 4
Location of Houses Sold in Christchurch City,
with and without Water Views, 1996

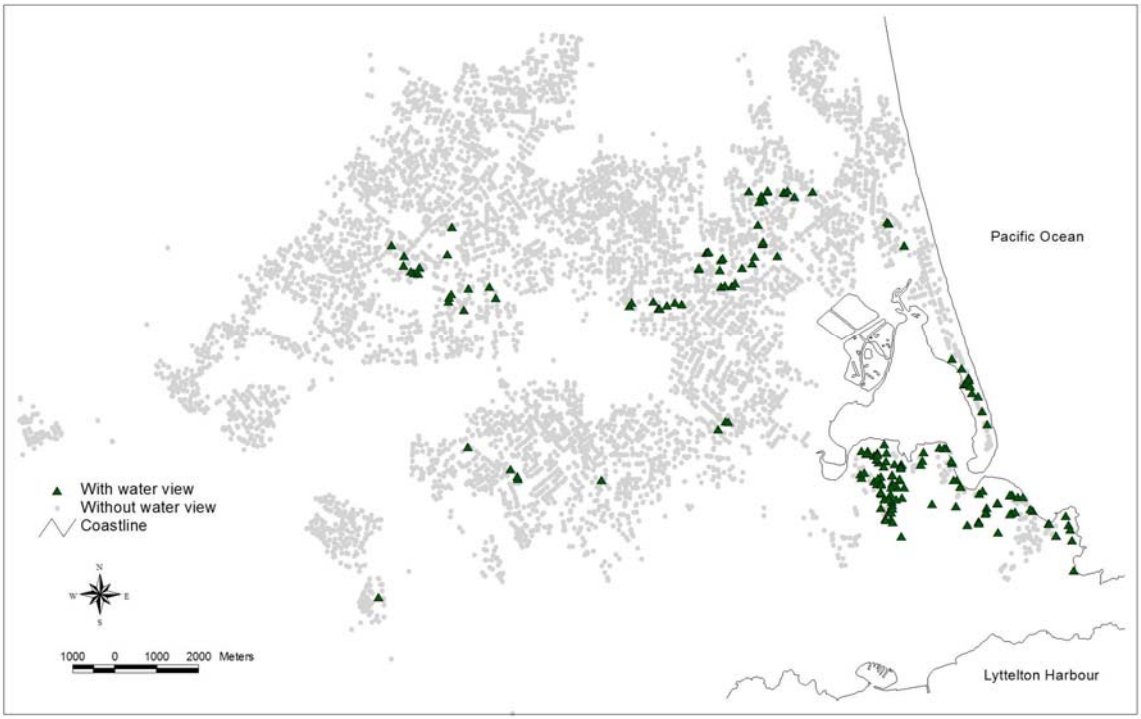


Exhibit 5
Location of Houses Sold in Wellington City,
with and without Water Views, 1996

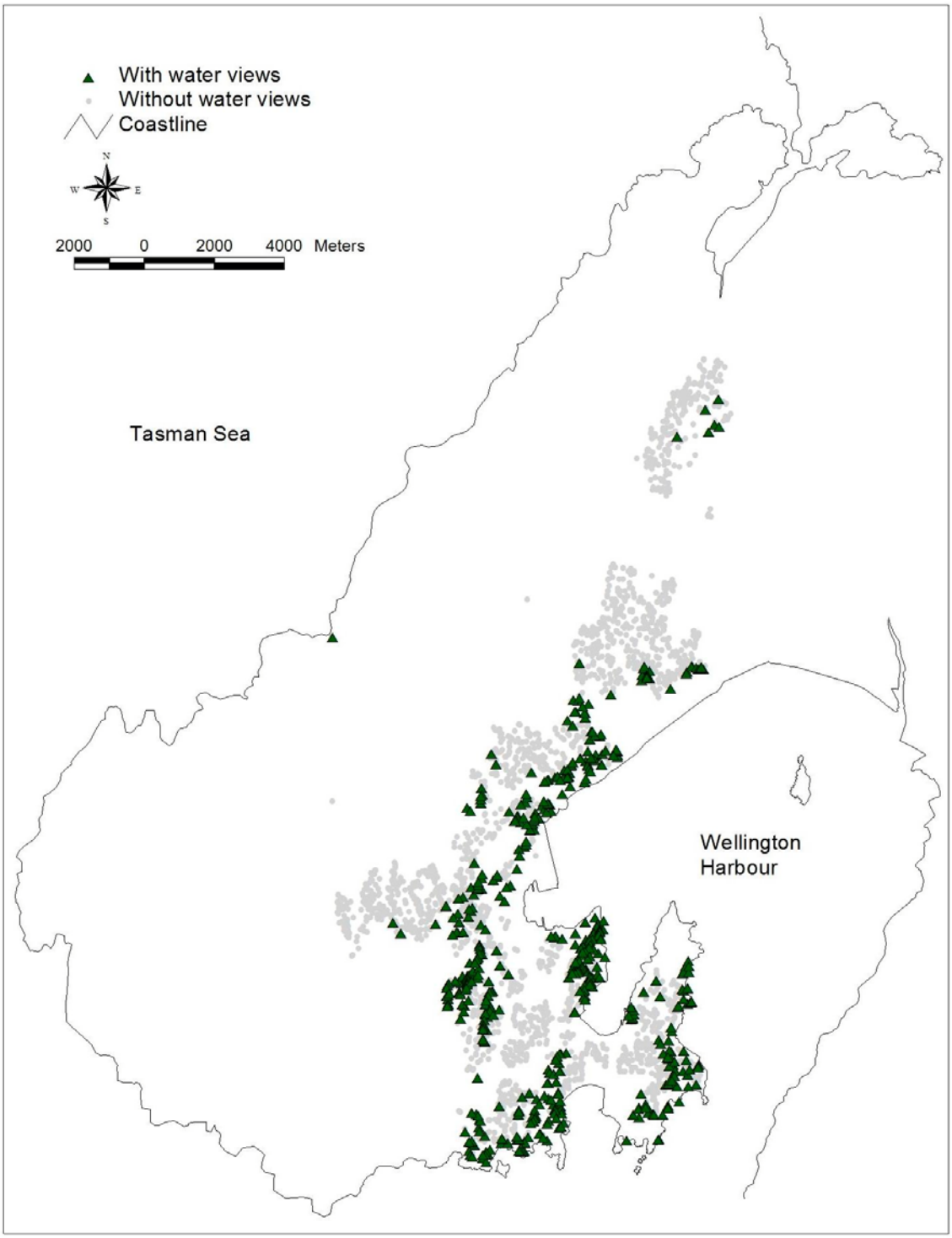


Exhibit 6
Selected Hedonic Regression Results, Auckland

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Model statistics											
R-squared	0.83	0.82	0.84	0.86	0.85	0.85	0.85	0.85	0.84	0.85	0.85
Sample size	12,038	11,574	11,095	12,054	9,469	7,570	8,622	11,475	15,196	14,942	14,947
Mean sale price											
Nominal $NZ	$113,744	$142,703	$150,777	$167,997	$165,674	$166,931	$171,541	$181,304	$211,547	$237,586	$269,425
1996 $NZ	$170,368	$185,478	$186,797	$196,791	$183,450	$179,264	$179,726	$187,669	$217,664	$241,565	$269,425
Aesthetic externalities (in 1996 $NZ)											
Water view	$15,425	$19,398	$16,629	$17,901	$17,845	$17,595	$15,509	$16,682	$20,725	$26,908	$30,047
Attractive immediate surroundings	$12,810	$20,382	$22,144	$20,853	$18,913	$19,522	$22,247	$21,759	$24,899	$32,789	$31,822
Good landscaping	$7,187	$6,753	$6,398	$9,734	$9,354	$8,144	$8,430	$9,575	$8,232	$11,397	$12,556
Other variables (elasticities)											
Land area	0.19	0.18	0.20	0.17	0.15	0.15	0.19	0.19	0.17	0.19	0.20
Distance to CBD	-0.07	-0.07	-0.10	-0.04	-0.06	-0.05	-0.06	-0.06	-0.03	-0.04	-0.04
Distance to coast	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02
Floor size	0.38	0.42	0.43	0.44	0.44	0.44	0.42	0.41	0.41	0.41	0.40

Source: Authors' calculations.

Exhibit 7
Selected Hedonic Regression Results, Christchurch

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Model statistics											
R-squared	0.85	0.85	0.85	0.86	0.84	0.85	0.85	0.84	0.85	0.84	0.82
Sample size	5,816	5,639	6,093	6,464	6,539	5,739	5,855	6,884	8,263	8,152	8,407
Mean sale price											
Nominal $NZ	$75,884	$86,193	$92,793	$102,628	$114,488	$119,240	$125,161	$129,161	$141,167	$149,143	$157,799
1996 $NZ	$113,661	$112,029	$114,961	$120,218	$126,772	$128,050	$131,133	$133,695	$145,249	$151,641	$157,799
Aesthetic externalities (in 1996 $NZ)											
Water view	$12,205	$10,629	$14,949	$15,568	$12,989	$13,350	$15,279	$13,988	$11,734	$15,264	$19,886
Attractive immediate surroundings	$10,898	$14,873	$13,439	$13,908	$13,884	$14,239	$12,956	$14,692	$13,415	$13,163	$17,008
Good landscaping	$6,705	$5,916	$6,112	$7,236	$7,008	$7,420	$5,662	$6,170	$7,926	$6,187	$7,656
Other variables (elasticities)											
Land area	0.15	0.15	0.15	0.14	0.16	0.13	0.15	0.13	0.16	0.15	0.18
Distance to CBD	-0.02	-0.03	-0.01	-0.02	0.00	-0.01	-0.02	-0.02	-0.04	-0.08	-0.11
Distance to coast	-0.02	-0.01	-0.02	-0.01	0.00	-0.01	-0.02	-0.03	-0.01	-0.02	-0.03
Floor size	0.52	0.50	0.52	0.52	0.50	0.51	0.52	0.51	0.51	0.52	0.48

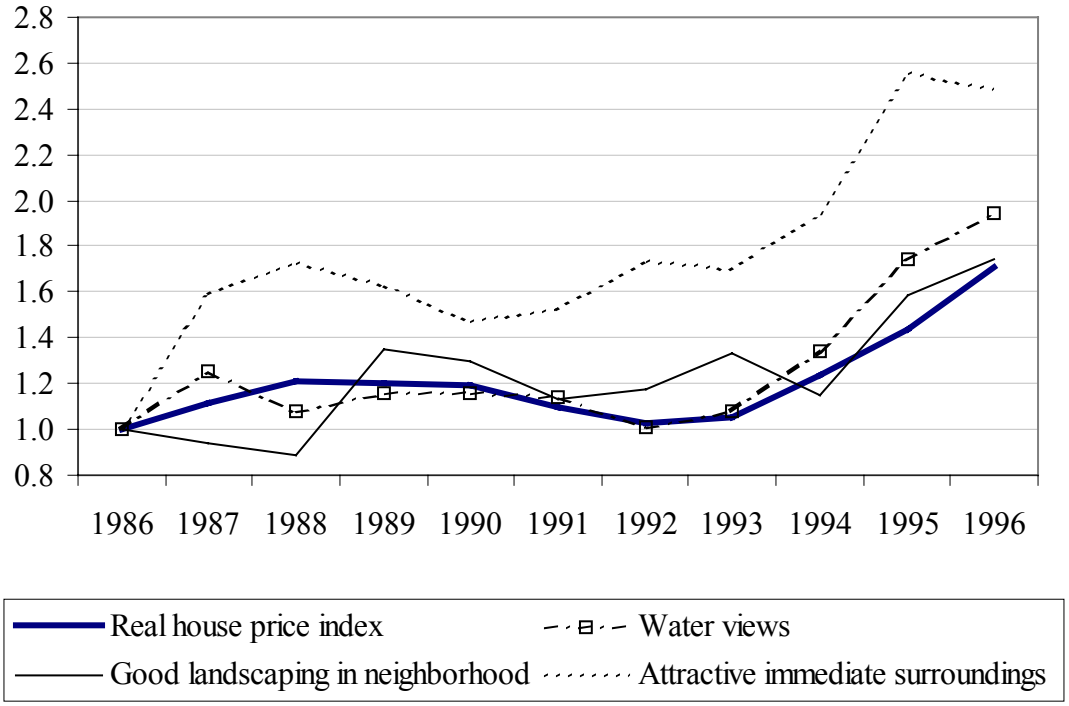
Source: Authors' calculations.

Exhibit 8
Selected Hedonic Regression Results, Wellington

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Model statistics											
R-squared	0.74	0.72	0.78	0.79	0.80	0.78	0.80	0.81	0.79	0.78	0.81
Sample size	2,947	2,592	2,652	2,721	2,231	2,012	2,180	2,404	2,892	2,705	3,021
Mean sale price											
Nominal $NZ	$107,231	$135,399	$151,412	$161,802	$168,432	$159,319	$163,829	$169,915	$174,154	$183,184	$200,623
1996 $NZ	$160,613	$175,985	$187,584	$189,534	$186,504	$171,090	$171,646	$175,880	$179,189	$186,252	$200,623
Aesthetic externalities (in 1996 $NZ)											
Water view	$7,359	$8,113	$14,157	$12,492	$13,211	$10,661	$14,303	$11,304	$10,752	$15,831	$13,675
Attractive immediate surroundings	$14,699	$18,351	$17,020	$17,543	$15,174	$18,380	$22,565	$14,994	$14,488	$15,367	$15,221
Good landscaping	$10,172	$12,492	$15,804	$14,923	$13,837	$12,861	$13,385	$11,834	$9,629	$12,801	$17,134
Other variables (elasticities)											
Land area	0.04	0.05	0.04	0.05	0.06	0.04	0.04	0.05	0.06	0.05	0.06
Distance to CBD	-0.08	-0.08	-0.10	-0.08	-0.08	-0.09	-0.11	-0.11	-0.08	-0.09	-0.12
Distance to coast	-0.02	-0.01	0.00	0.01	0.01	0.01	-0.01	0.00	-0.01	0.00	0.00
Floor size	0.38	0.42	0.43	0.44	0.44	0.44	0.42	0.41	0.41	0.41	0.40

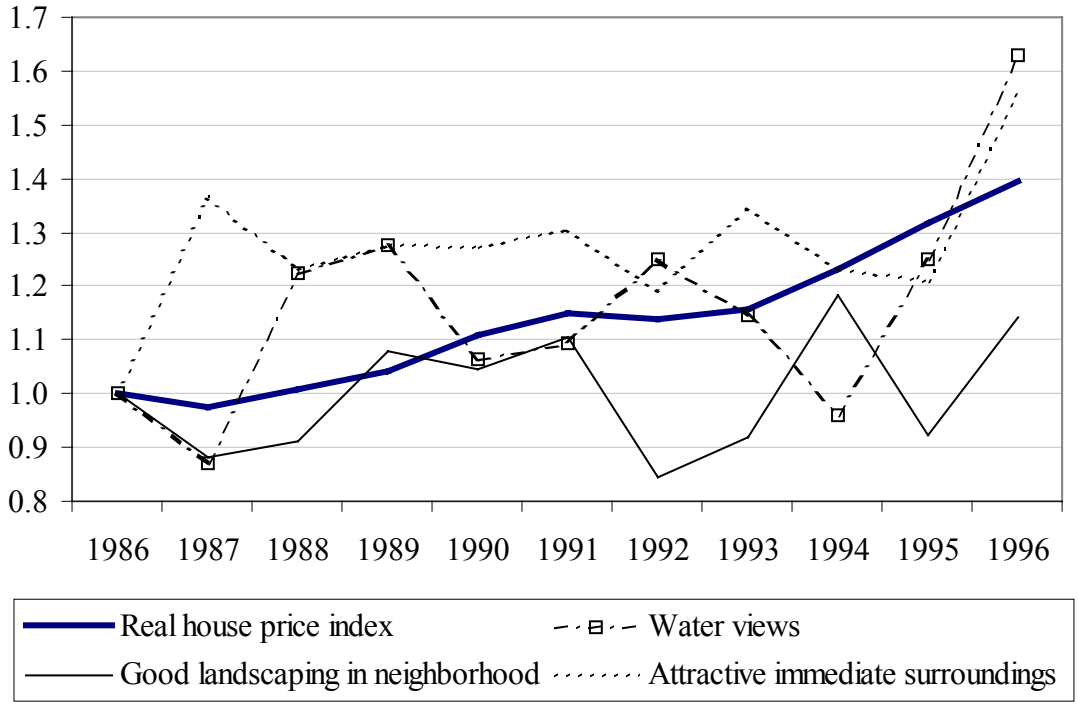
Source: Authors' calculations.

Exhibit 9
Real Price Indices for Aesthetic Externalities Compared with Houses, Auckland, 1986-1996 (1986=1)



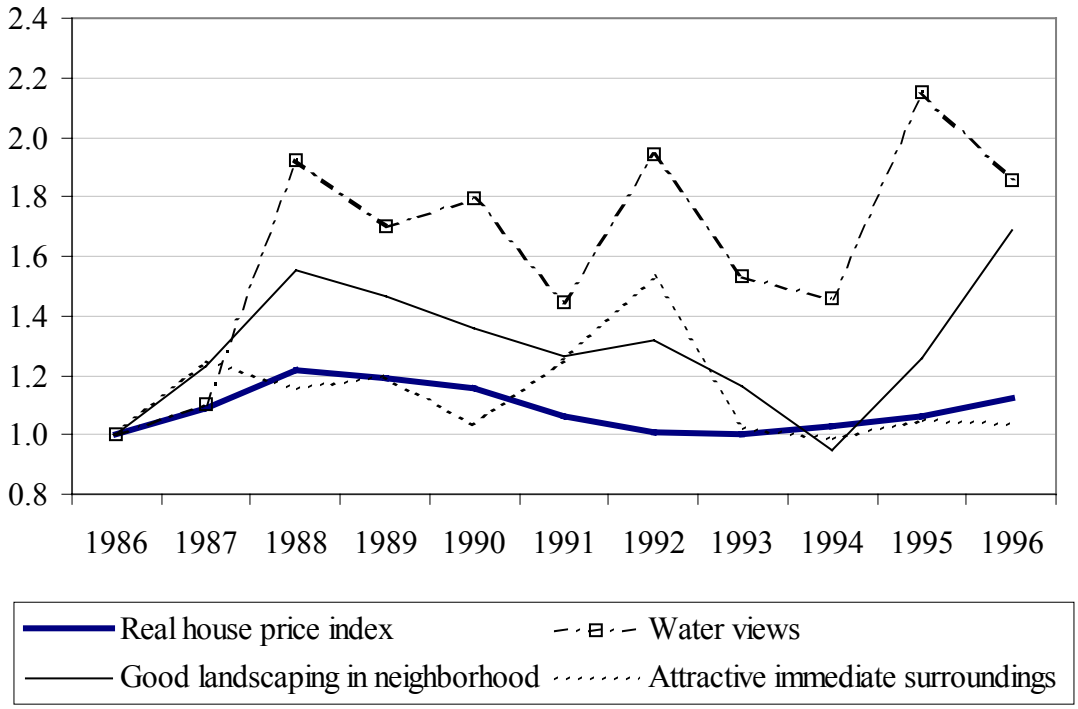
Source: Authors' calculations for aesthetic externalities; see Exhibit 1 for sources of house price index.

Exhibit 10
Real Price Indices for Aesthetic Externalities Compared with Houses, Christchurch, 1986-1996 (1986=1)



Source: See Exhibit 9 for sources.

Exhibit 11
Real Price Indices for Aesthetic Externalities Compared with Houses, Wellington, 1986-1996 (1986=1)



Source: See Exhibit 9 for sources.