Conservation Status and Residential Transaction Prices: Initial Evidence from Dallas, Texas

Authors

Julian Diaz III, J. Andrew Hansz, Matthew L. Cypher, and Darren K. Hayunga

Abstract

The traditional mechanisms of private covenants and public restrictions may not meet the needs of residential property owners who want to preserve a certain neighborhood style. Privately initiated and publicly enforced conservation district regulations can preserve desirable neighborhood characteristics and signal to buyers that neighborhood conformity will likely persist. This study examined residential transaction prices in Dallas, Texas and finds premiums associated with residential properties within and buffering conservation district locations. These results are robust to the spatial autocorrelation common in residential transaction prices.

As neighborhoods age, concerned property owners and potential buyers anticipate that residential improvements will be in a manner consistent with the neighborhood's standards. Accordingly, private contracts and public regulations are used to control urban residential property. A prime example of a private contract that provides for some neighborhood aesthetics is the neighborhood's covenants, which are a land-use control typically initiated by the original developer.

As it relates to maintaining a neighborhood long-term, however, developers cannot reasonably be expected, and lack the incentive, to anticipate market conditions and consumer desires far into the future. Hence, on the private side, restrictive covenants typically do not meet the need of residents to maintain a neighborhood and extend the natural progression of the neighborhood's lifecycle.

On the public side, typical zoning requirements regulate property use and set minimal standards for land use intensity. Similarly, municipal construction codes are generally written with respect to structural integrity and occupant safety, and are not primarily concerned with architectural style and craftsmanship of a particular epoch. With the notable exception of historic district regulations, traditional public land use controls are concerned primarily with land-use and public safety standards.

Since private covenants and public restrictions do not help maintain long-term neighborhood aesthetics, property owners in neighborhoods that exude a style of a particular era may want to pursue the option of conservation status. A conservation designation is a local layer of land-use regulation that is initiated by the private land owners, but publicly enforced. Conservation regulations can be established to regulate external property modifications and establish new development standards that are complimentary with the existing neighborhood.

Many communities and property owners have used historic district designations to preserve historically significant properties, commercial districts, and neighborhoods. Although important differences exist, conservation districts have some fundamental similarities to historic district regulations. Historic regulations are similar to conservation regulations because they are typically pursued by private stakeholders but publicly enforced. Although several papers reviewed in this study suggest that there are price premiums associated with historically designated areas and properties, the impact of conservation regulations on residential property values has not been explored.

This paper examines the effects of conservation designation status on residential property values. The findings reveal a positive effect on residential sales prices for homes located within a conservation district. In addition, there is a positive effect on residential sales prices for homes located within 150 feet of the conservation district. These results are robust to the spatial autocorrelation common in residential transaction prices.

While the results demonstrate a positive effect for homes located within or near a conservation district, the long-term effects of the conservation regulations are not known. The conservation regulations are relatively new and are more narrowly implemented than other land control techniques. In the long-run, aggressive conservation regulations may restrict changes in highest and best use and stifle the natural progression of the neighborhood lifecycle.

The remainder of this paper proceeds as follows. Section 1 provides background on conservation districts and their location in the study sample. Section 2 discusses the extant literature. Section 3 details the research hypotheses. Section 4 presents the empirical models and sample selection criteria. Section 5 describes the data. The test results are in Section 6. The paper concludes with some final thoughts in Section 7.

Background

The area of study is the city of Dallas, Texas. Dallas is an ideal study sample because the community has been aggressive in establishing conservation districts. Additionally, Dallas is unique because numerous diverse architectural styles were introduced into neighborhoods in the early 1900s, and as the century progressed, many builders were more focused on square footage than adhering to a certain architectural style. While typical zoning regulates site usage and improvement placement, public restrictions do not address architectural style and community character. Hence, Dallas property owners undertook a movement to preserve the architecture and character of certain neighborhoods. Beginning in 1988, the property owners of the Oak Cliff area founded the first conservation district in Dallas and the second such district in the state of Texas.

This paper examines eleven conservation districts. Exhibit 1 presents a map of the location of the conservation districts. Exhibit 1 also notes the number of single-family residential sales transactions near each conversation district.

To establish a conservation district neighborhood, property owners initiate the designation process. The owners begin with a neighborhood petition. At least 50% of the property owners in the neighborhood must support and sign the petition. Next, a survey of the area determines what items of concern exist. Subsequently, the owners submit an application for a conservation district feasibility study to the city. If the application is granted, community and city leaders meet in a series of discussions to confirm community interest in establishing the conservation district and to draft the specific regulations. The entire process, from initial authorization of a study to the final adoption by city council, can take 12 to 18 months.

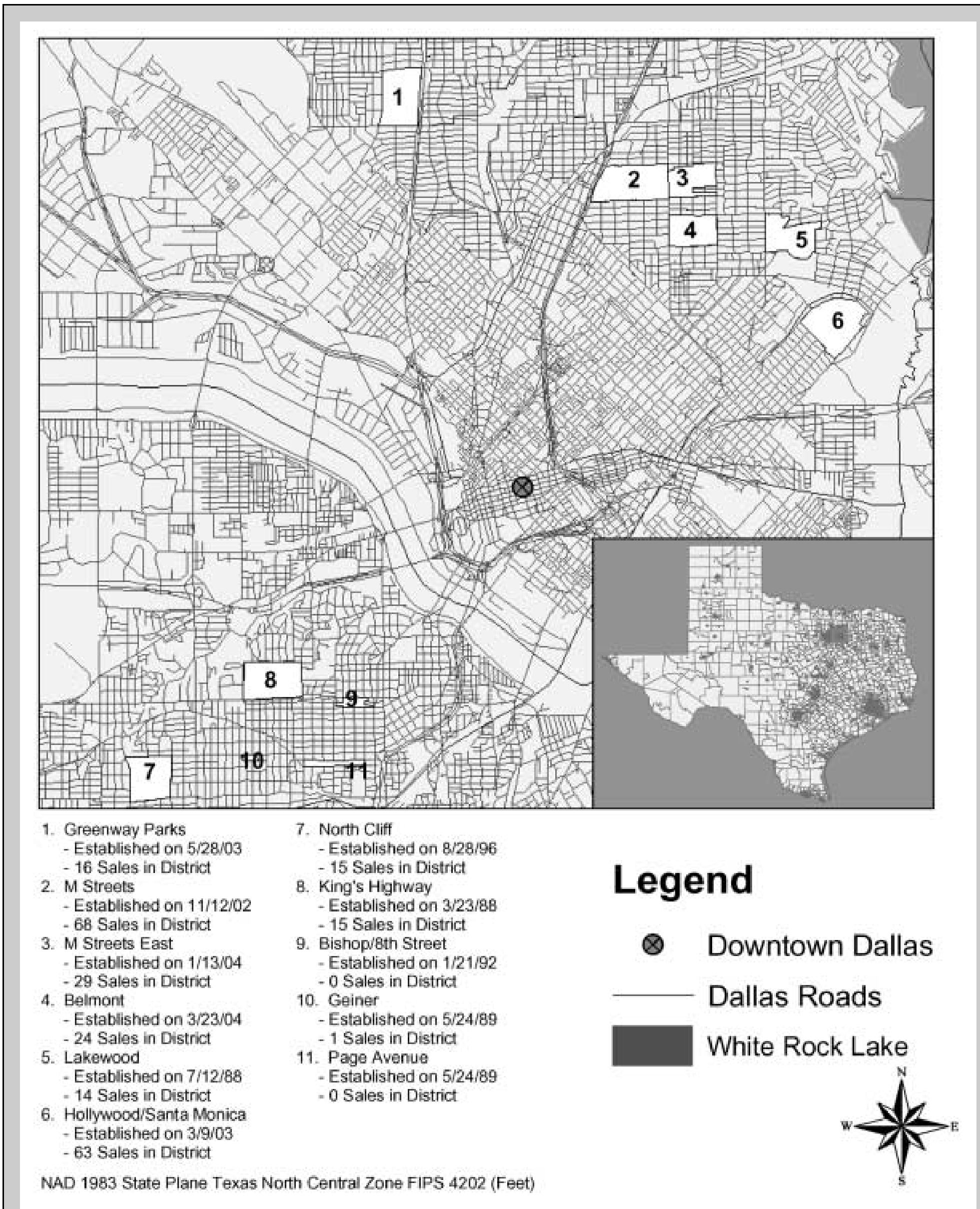
With the assistance of city planners, conservation districts strive to maintain certain area standards determined by the community. Residents set restrictions specific to their community with the intension of preserving and enhancing their neighborhood. Once a conservation district is in place, local city planners review subsequent exterior alterations and new construction. Although districts do not qualify for tax abatements and grants, district regulations are generally simpler to understand and follow, and are more focused than a similar set of neighborhood-specific restrictions, historic districts.

Both conservation and historic districts share goals of conserving or enhancing an area's character by protecting its architectural and cultural attributes, but there are important distinctions. One difference is that historic districts strive to preserve the original improvements exactly as constructed, including original materials, colors, and styles. Another distinction is the fact that, although each historic district overlay governs a specifics structure or a collection of buildings, historic district regulations result from a national template and common preservation standards. Also, a potential advantage of a historical property over a conservation district property is that the owner may qualify for certain tax abatements and grants.

Literature Review

This paper appears to be the first academic study of conservation districts. The studies that most closely resemble this paper examine historical district regulations and historically designated areas. Ford (1989) is one of the first papers addressing historic designations and residential property values. Based on samples of multiple

Exhibit 1 | Conservation Districts Dallas, Texas



listing service transactions in several Baltimore, Maryland neighborhoods, Ford finds that historic districts command price premiums over similar properties in non-historic districts. By studying several areas with differing historic designation tenures, and controlling for pre- and post-designations, Ford finds a positive impact on property prices. The author concludes that these premiums are not present prior to designation but phased into property values soon after designation. Along the same lines, Clark and Herrin (1997) and Asabere and Huffman (1994a) find premiums with historically-designated residential properties. Also, Leichenko, Coulson, and Listokin (2001) study nine Texas cities with historic districts and find, in most cases, that historic designations increase property values.

Not all the literature supports a premium for the historic designation. Schaeffer and Millerick (1991) find a premium on properties with the national historic designation but a discount associated with a local historic designation. The authors associate the national historic designation premium with prestige and the local designation discount a likely result of stringent local requirements. Asabere and Huffman (1994b) and Asabere, Huffman, and Mehdian (1994) discover historic-designation price discounts in apartment and condominium markets and attribute these findings to complicated restrictions and added renovation/remodeling costs.

Another interesting aspect of the Schaeffer and Millerick (1991) study is the acknowledgement of a ripple or spillover effect. Properties in close proximity to a historic district may enjoy positive externalities without incurring the costs of regulation. Neighboring property owners may be more willing to invest in their own properties with the assurance of knowing that nearby historic properties will not substantially deteriorate. Listokin, Listokin, and Lahr (1999) and Wojno (1991) also address this spillover effect and its potential to aid in urban development and renewal. Coulson and Leichenko (2001) not only find positive externalities associated with historic designations in Abilene, Texas, but robust internal and external net benefits. Alternatively, Clark and Herrin (1997) found no positive spillover effects on residential property prices buffering a historic district.

Research Hypothesis

Despite the mixed findings of Schaeffer and Millerick (1991) and the negative price impacts found in Asabere and Huffman (1994b) and Asabere, Huffman, and Mehdian (1994), the general perception is that historic designations are positively correlated with residential property values. Conservation districts do not enjoy the prestige or potential tax benefits of the national historic designation but are generally simpler, more lenient, and locally determined. Used properly, these restrictions on property rights may promote neighborhood conformity and buyer confidence in continued neighborhood stability, thus increasing property values within and possibly surrounding a designated area.

The generally positive perception concerning conservation districts leads to two research hypotheses: (1) the conservation designation increases residential property prices within the designated area, and (2) properties located near a conservation district experience a positive externality in the form of increased property prices. The statistical hypotheses are:

$$\begin{aligned} &Ho_1: \beta_{\text{conservation district}} \leq 0 \\ &Ha_1: \beta_{\text{conservation district}} > 0 \end{aligned} \quad \text{and} \quad \begin{aligned} &Ho_2: \beta_{\text{conservation buffer}} \leq 0 \\ &Ha_2: \beta_{\text{conservation buffer}} > 0, \end{aligned}$$

with the expectation that the null hypotheses will be rejected at the 5% significance level.

Sample Selection and Empirical Models

Property sales data were obtained from the local multiple listing service for the period from January 1, 2004 to December 3, 2004.[1] Exhibit 2 presents a map of the data. The collection area is the city of Dallas using an initial collection criterion of all detached single-family residential dwellings, excluding foreclosure transactions. Preliminary analysis indicates that the mean conservation district transaction is $322,837 and ranges from $35,000 to $2,395,000. In contrast, the average of the non-conservation district sale is $312,496 with a range from $35,000 to $2,350,000. In total, the dataset consists of 3,657 residential sales transactions.

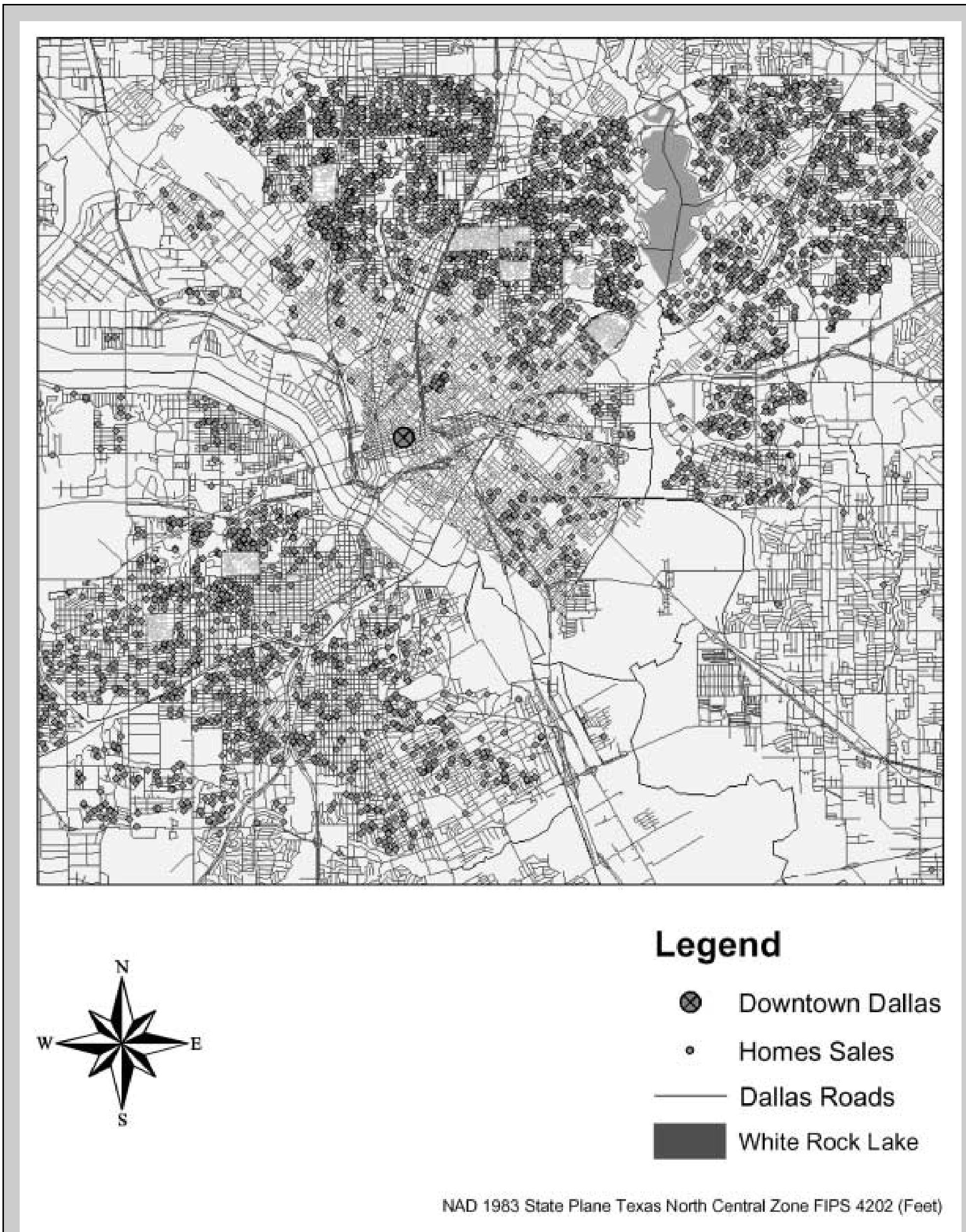
The following model is used to determine the effect of the conservation district on residential prices:

$$\ln(\textit{salesprice}) = \beta_0 + \sum_{i=1}^{N} \beta_i X_i + \beta_j CD + \beta_k \textit{Buffer} + \varepsilon_i, \qquad (1)$$

where X_i is an $(N \times k)$ matrix of traditional structural, site, quality, and location variables, *CD* is a qualitative variable indicating sales located within a conservation district, and *Buffer* is another qualitative variable that indicates sales transactions within 50 yards of a conservation district. Sirmans, Macpherson, and Zietz (2005) discuss the issue of the proper functional form in hedonic modeling. Although there is no one correct functional form, they outline the advantages of the semi-log specification as (1) allowing for variation in the dollar value of each characteristic; (2) easier interpretation of coefficients as the percentage change in the price given a one-unit change in the characteristics; and (3) helping to minimize the problem of heteroscedasticity.

In addition to the using the semi-log specification, the simultaneous autoregressive (SAR) specification is also employed to account for spatial autocorrelation in the data. Consistent with the axiomatic importance of location to real estate, house prices tend to be correlated across space. The transaction prices of real estate properties that share common neighborhoods within a Metropolitan Statistical Area (MSA) tend to covary due to their close proximity to one another. Further,

Exhibit 2 | Subject Area Transactoins



the covariance between transaction prices tends to persist even though researchers have used extensive hedonic specifications that control for numerous structural, site, locational, and quality variables. Gillen, Thibodeau, and Wachter (2001) find that, despite using a hedonic model accounting for over 70 characteristics, the model residuals still demonstrate correlation across space. The effect of the spatial autocorrelation is potentially biased parameter estimates using ordinary least squares (OLS).

Since the sample is concentrated within the Dallas MSA, spatial correlation is controlled through the SAR specification (Griffith and Layne, 1999). The SAR model adds a term to Equation (1), which consists of a spatial weight matrix that accounts for the distance between each pair of home transaction and a scalar that identifies the spatial autocorrelation. The scalar coefficient and weight matrix are multiplied by the dependent variable to control for any spatial correlation. The result is a SAR model that consists of:

$$y = \rho Wy + X\beta + \varepsilon \tag{2}$$
$$\varepsilon \sim N(0, \sigma^2 I_n),$$

where y is an $(N \times 1)$ vector of dependent values and X is an $(N \times k)$ matrix consisting of all the explanatory variables in Equation (1) plus the qualitative variables for the conservation district and the conservation district buffer. W is the spatial weight matrix that captures spatial contiguity between the home sales using Delaunay triangles. The W matrix is row-standardize, as is common practice. The parameter, ρ, is the coefficient on the spatially lagged dependent variable, Wy.

Data Descriptions

Exhibit 3 provides definitions of model variables. In general, qualitative variables are used to control for many of the structure, site, and quality characteristics. Dummy variables are used to allow for nonlinear relationships for those characteristics that are not naturally dichotomous. For example, property age is a typical hedonic variable to explain home prices. Generally, older properties experience more deprecation and inferior conditions as compared to newer properties. Thus, one explanatory variable that records the age level should exhibit a negative relation with selling price. However, exceptionally older properties may be valued higher by the market due to their distinctiveness and the inability to reproduce the same structure. Further, many of the properties in the sample have been renovated, perhaps multiple times. Hence, age, defined as the year sold less the year originally constructed, is not expected to be linearly related to sale prices. Preliminary data analysis confirms the nonlinear relationship, therefore, property age is categorized into approximately equal categories and coded as indicator

Exhibit 3 | Variable Definitions

Property Characteristics	Description
Ln(*sale price*)	Natural logarithm of sale price.
Conservation District	Binary: 1 if located in a conservation district; 0 otherwise.
CD Buffer	Binary: 1 if located within 150 feet of a conservation district; 0 otherwise.
Size_1	Binary: 1 if dwelling size 546 to 1,044 square feet; 0 otherwise.
Size_2	Binary: 1 if dwelling size 1,045 to 1,190 square feet; 0 otherwise.
Size_3	Binary: 1 if dwelling size 1,191 to 1,300 square feet; 0 otherwise.
Size_4	Binary: 1 if dwelling size 1,302 to 1,426 square feet; 0 otherwise.
Size_5	Binary: 1 if dwelling size 1,427 to 1,547 square feet; 0 otherwise.
Size_6	Binary: 1 if dwelling size 1,548 to 1,690 square feet; 0 otherwise.
Size_7	Binary: 1 if dwelling size 1,691 to 1,852 square feet; 0 otherwise.
Size_8	Binary: 0 if dwelling size 1,854 to 2,060 square feet; 0 otherwise (default category).
Size_9	Binary: 1 if dwelling size 2,061 to 2,353 square feet; 0 otherwise.
Size_10	Binary: 1 if dwelling size 2,354 to 2,846 square feet; 0 otherwise.
Size_11	Binary: 1 if dwelling size 2,848 to 3,778 square feet; 0 otherwise.
Size_12	Binary: 1 if dwelling size 3,780 to 9,730 square feet; 0 otherwise.
Baths 1.5 or less	Binary: 1 if 1.5 baths or less; 0 otherwise.
Baths 2	Binary: 0 if 2 baths; 0 otherwise (default category).
Baths 2.5 or more	Binary: 1 if 2.5 baths or more; 0 otherwise.
Beds 2 or less	Binary: 1 if 2 beds or less; 0 otherwise.
Beds 3	Binary: 0 if 3 beds; 0 otherwise (default category).
Beds 4 or more	Binary: 1 if 4 or more beds; 0 otherwise.
Living area 1	Binary: 1 if 1 living area; 0 otherwise.
Living area 2	Binary: 0 if 2 living areas; 0 otherwise (default category).
Living area 3 or more	Binary: 1 if 3 or more living areas; 0 otherwise.
Dinning area 1	Binary: 0 if 1 or less dinning areas; 0 otherwise (default category).

Exhibit 3 | (continued)

Variable Definitions

Property Characteristics	Description
Dinning area 2 or more	Binary: 1 if 2 or more dinning areas; 0 otherwise.
No Fireplace	Binary: 1 if no fireplace; 0 otherwise.
Fireplace 1	Binary: 0 if 1 fireplace; 0 otherwise (default category).
Fireplaces 2 or more	Binary: 1 if 2 or more fireplaces; 0 otherwise.
No garage	Binary: 1 if no garage; 0 otherwise.
Garage 1	Binary: 0 if 1 garage; 0 otherwise (default category).
Garages 2 or more	Binary: 1 if 2 or more garages; 0 otherwise.
No Carport	Binary: 0 if no carport; 0 otherwise (default category).
Carport 1 or more	Binary: 1 or more carports; 0 otherwise.
Stories 2 or more	Binary: 1 if 2 or more stories; 0 otherwise.
Lot size zero	Binary: 1 if a zero lot line site; 0 otherwise.
Lot size > 1/2 acre	Binary: 1 if lot size is greater than a 1/2 acre; 0 otherwise.
Q1	Binary: 0 if sold 1st quarter; 0 otherwise (default category).
Q2	Binary: 1 if sold 2nd quarter; 0 otherwise.
Q3	Binary: 1 if sold 3rd quarter; 0 otherwise.
Q4	Binary: 1 if sold 4th quarter (to 12/3/04); 0 otherwise.
Age_1	Binary: 1 if age from 'new' to 6 years; 0 otherwise.
Age_2	Binary: 1 if age from 7 to 26 years; 0 otherwise.
Age_3	Binary: 1 if age from 27 to 41 years; 0 otherwise.
Age_4	Binary: 1 if age from 42 to 47 years; 0 otherwise.
Age_5	Binary: 0 if age from 48 to 50 years; 0 otherwise (default category).
Age_6	Binary: 1 if age from 51 to 53 years; 0 otherwise.
Age_7	Binary: 1 if age from 54 to 55 years; 0 otherwise.
Age_8	Binary: 1 if age from 56 to 58 years; 0 otherwise.
Age_9	Binary: 1 if age from 59 to 64 years; 0 otherwise.
Age_10	Binary: 1 if age from 65 to 68 years; 0 otherwise
Age_11	Binary: 1 if age from 69 to 77 years; 0 otherwise.
Age_12	Binary: 1 if age from 78 to 104 years; 0 otherwise.
Vacant	Binary: 1 if vacant at time of sale; 0 otherwise.
HOA	Binary: 1 if homeowner's association; 0 otherwise.
Security	Binary: 1 if security system; 0 otherwise.
School District	Binary: 1 if Highland Park ISD; 0 otherwise (default Dallas ISD).
East	Binary: 0 if East Dallas market; 0 otherwise (default category).

Exhibit 3 | (continued)

Variable Definitions

Property Characteristics	Description
West	Binary: 1 if West (central) Dallas market; 0 otherwise.
South	Binary: 1 if South Dallas market; 0 otherwise.
CBD	Distance away from Downtown Central Business District in miles.
DART	Distance away from nearest DART light rail passenger station in miles.
Expressway	Distance away from nearest expressway in miles.
Lake	Binary: 1 if located within 1/2 mile of White Rock Lake; 0 otherwise.

variables. The baseline category is *Age_5*, which ranges from 48 to 50 years and has an average age of 49.7 years.

The size of the home is another example of allowing for the flexibility of a nonlinear relationship. Therefore, property size is divided into twelve approximately equal categories and each category is coded as a qualitative variable. The baseline category is *Size 8* because the size range of 1,854 to 2,060 square feet for this dummy variable contains the sample's average property size of 2,019 square feet. Overall, property size in this sample ranges from 546 to 9,730 square feet.

The same method is followed for lot size and number of bathrooms, bedrooms, fireplaces, and garages. Again, the flexibility allows for potentially greater explanation of house prices. For example, after controlling for differences in improvement size, more bedrooms may not necessarily increase property value. At a particular improvement size, more bedrooms will likely result in a smaller average bedroom size. In this situation, homes with more, but smaller, bedrooms, may not be desirable.

One of the independent variables that is naturally qualitative is the school district. The area of study contains two independent school districts (ISD) with most properties located within the Dallas ISD. The Highland Park ISD is the other ISD and is one of the top-rated school districts in Texas. The selling price of homes located within the Highland Park ISD will likely exhibit a positive relation between sales price and *School District*.

In general, the variables that are not qualitative are the location variables. One of these variables is the distance from the central business district (CBD) to each sale. It is posited that residential property values will generally decline as distance increases from the CBD, a traditional negative sloping land-value gradient. Using different methods, Coulson (1991) and McMillen (2003) find empirical evidence supporting negative price gradients.

Distance, in miles, from the nearest Dallas Area Rapid Transit (DART) commuter rail station and the nearest expressway, is also accounted for. Voith (1991) and McMillen (2004) find residential price premiums for proximity to commuter rail stations in Philadelphia and Chicago, respectively. Proximity to a DART rail station is an amenity in Dallas and property values, on average, are anticipated to decrease as distance from the nearest DART station increases. Alternatively, the expectation for the nearest expressway is not straightforward. Convenient access to the expressway is an amenity. However, particularly for residential properties, the traffic and noise associated with expressway proximity is a negative externality. Hughes and Sirmans (1992) find a negative relationship between residential values and traffic.

There are two location characteristics that are used as qualitative variables: submarket indicators and a dummy variable for any lake effect. Local realtors report that the study area generally contains three submarkets. Indicator variables, labeled *East*, *West*, and *South*, are used to identify sales within each of these submarkets. Exhibit 4 displays the submarket regions. With *East* as the baseline submarket, a premium is expected on the coefficient for identifying the *West* submarket, along with a negative correlation between the *South* submarket and house prices.

Finally, there is a rich body of literature documenting residential property values and proximity to bodies of water. For example, Darling (1973), Seiler, Bond, and Seiler (2001), and Bond, Seiler, and Seiler (2002) all find substantial price premiums for single-family residential property located in proximity to lakes [for a recent review the water proximity literature, see Nelson, Hansz, and Cypher (2005)]. The model presented here includes an indicator variable identifying sales located within a half mile of White Rock Lake. Exhibit 5 presents descriptive statistics on the dependent and explanatory variables.

Findings

OLS Model

Exhibit 6 presents the OLS coefficient estimates, standard errors, probability values (*p*-values), variance inflation factors (VIF), and evaluative statistics for the OLS specification. Overall, the explanatory power of both models is strong, with coefficients of determination of approximately 89%.

The results in Exhibit 6 demonstrate a positive effect on residential prices on those homes that are in the conservation district. After controlling for differences in structure sizes, property qualities, and locations, the coefficient on the conservation

Exhibit 4 | Spatial Independent Variables

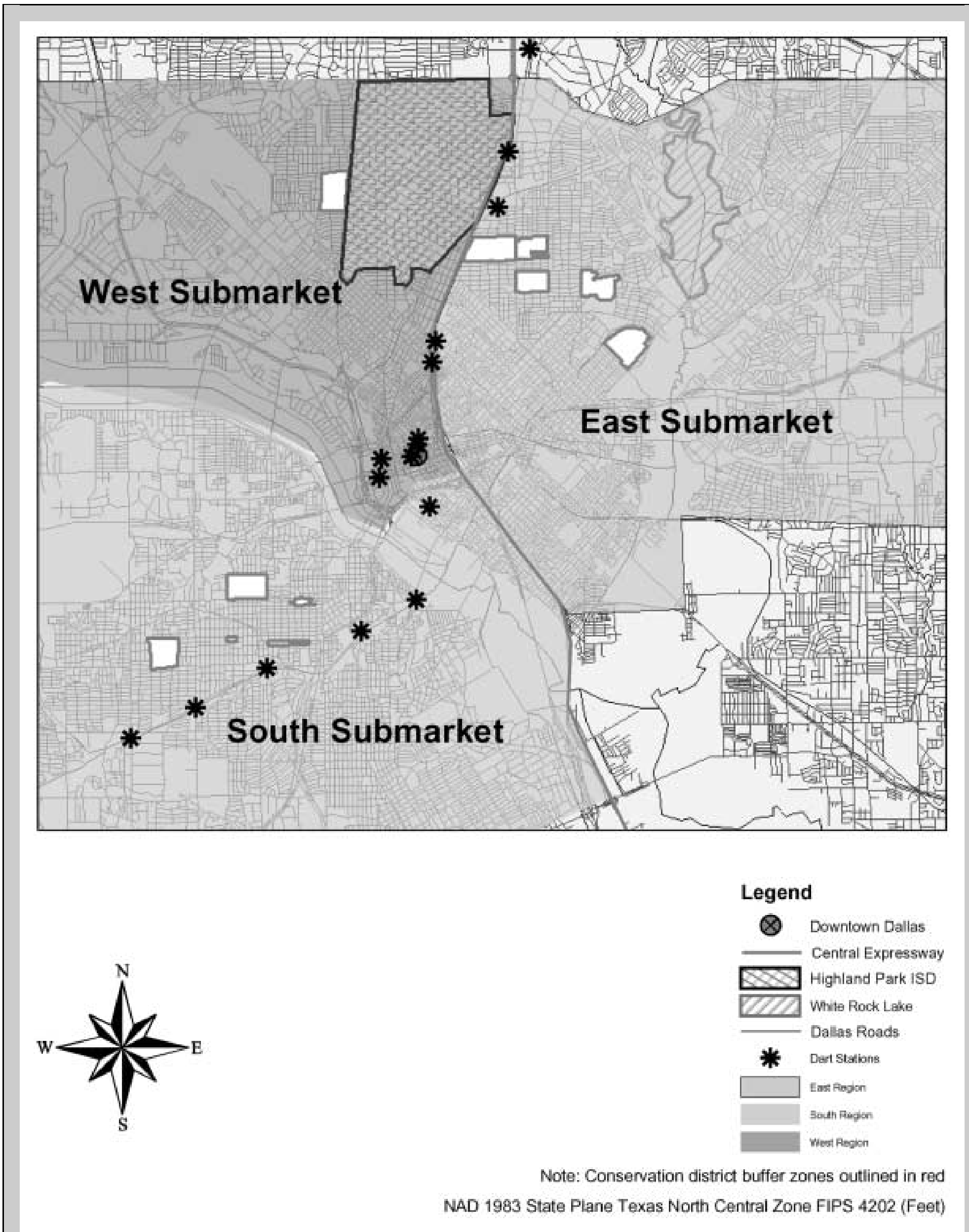


Exhibit 5 | Descriptive Statistics

Property Characteristics	Mean	Minimum	Maximum	Std. Dev.
Ln(*sale price*)	12.263	10.46	14.69	0.844
Conservation District	0.064	0.00	1.00	0.245
Conservation Buffer	0.112	0.00	1.00	0.316
Size_1	0.083	0.00	1.00	0.277
Size_2	0.083	0.00	1.00	0.277
Size_3	0.084	0.00	1.00	0.277
Size_4	0.082	0.00	1.00	0.274
Size_5	0.083	0.00	1.00	0.277
Size_6	0.083	0.00	1.00	0.277
Size_7	0.084	0.00	1.00	0.277
Size_8 (default)	0.084	0.00	1.00	0.277
Size_9	0.084	0.00	1.00	0.277
Size_10	0.083	0.00	1.00	0.276
Size_11	0.083	0.00	1.00	0.276
Size_12	0.083	0.00	1.00	0.276
Baths 1.5 or less	0.287	0.00	1.00	0.452
Baths 2 (default)	0.426	0.00	1.00	0.495
Baths 2.5 or more	0.287	0.00	1.00	0.453
Bedrooms 2 or less	0.246	0.00	1.00	0.431
Bedrooms 3 (default)	0.542	0.00	1.00	0.498
Bedrooms 4 or more	0.212	0.00	1.00	0.409
No fireplace	0.325	0.00	1.00	0.468
1 fireplace (default)	0.538	0.00	1.00	0.499
2 or more fireplaces	0.137	0.00	1.00	0.344
No garage	0.220	0.00	1.00	0.414
1 car garage (default)	0.205	0.00	1.00	0.404
2 or more car garage	0.576	0.00	1.00	0.494
No carport (default)	0.882	0.00	1.00	0.323
1 or more carports	0.118	0.00	1.00	0.323
2 stories or more	0.268	0.00	1.00	0.443
Zero lot line	0.021	0.00	1.00	0.144
Lot size > ½ acre	0.144	0.00	1.00	0.352
Q1 (default)	0.153	0.00	1.00	0.360
Q2	0.289	0.00	1.00	0.453
Q3	0.340	0.00	1.00	0.474
Q4	0.218	0.00	1.00	0.413

Exhibit 5 | (continued)

Descriptive Statistics

Property Characteristics	Mean	Minimum	Maximum	Std. Dev.
Age_1	0.083	0.00	1.00	0.275
Age_2	0.083	0.00	1.00	0.277
Age_3	0.078	0.00	1.00	0.268
Age_4	0.083	0.00	1.00	0.275
Age_5 (default)	0.092	0.00	1.00	0.289
Age_6	0.090	0.00	1.00	0.286
Age_7	0.075	0.00	1.00	0.263
Age_8	0.084	0.00	1.00	0.278
Age_9	0.101	0.00	1.00	0.301
Age_10	0.065	0.00	1.00	0.246
Age_11	0.077	0.00	1.00	0.267
Age_12	0.090	0.00	1.00	0.286
Vacant at time of sale	0.252	0.00	1.00	0.434
HOA	0.095	0.00	1.00	0.293
Security system	0.450	0.00	1.00	0.498
School district	0.140	0.00	1.00	0.347
East (default)	0.544	0.00	1.00	0.498
South	0.207	0.00	1.00	0.405
West	0.249	0.00	1.00	0.433
CBD	5.145	0.91	10.95	1.732
DART	2.349	0.07	10.66	1.647
Expressway	1.350	0.03	5.17	0.732
Lake	0.071	0.00	1.00	0.257

Note: The number of observations is 3,657.

district exhibit a coefficient of 0.163 with a 95% confidence interval between 0.119 and 0.204. The *p*-value on the conservation district coefficient is less than .001.

Based upon Kennedy (1981), the conservation district coefficient of 16.2% equates to an adjusted price differential of 17.6%.[2] This premium is comparable with the price premiums in the historic district literature. For example, Leichenko, Coulson, and Listokin (2001) find historic district premiums ranging from 4.9% to 20.1% in seven Texas cities.

The current study also finds a price premium for properties in close proximity to the conservation districts. The coefficient for the CD buffer variable is a positive

Exhibit 6 | OLS Parameter Estimates

	Coefficient	Standard Error	*p*-value	Variance Inflation Factor
Intercept	12.442	0.038	0.000	0.000
Conservation District	0.162	0.022	0.000	1.345
Conservation Buffer	0.110	0.016	0.000	1.259
Size_1	−0.636	0.030	0.000	3.202
Size_2	−0.502	0.028	0.000	2.813
Size_3	−0.363	0.026	0.000	2.427
Size_4	−0.296	0.025	0.000	2.230
Size_5	−0.236	0.024	0.000	2.042
Size_6	−0.149	0.023	0.000	1.944
Size_7	−0.049	0.023	0.030	1.890
Size_9	0.123	0.023	0.000	1.956
Size_10	0.322	0.026	0.000	2.371
Size_11	0.596	0.029	0.000	3.069
Size_12	1.025	0.035	0.000	4.418
Baths 1.5 or less	−0.074	0.015	0.000	2.203
Baths 2.5 or more	0.040	0.019	0.037	3.554
Beds 2 or less	0.057	0.013	0.000	1.557
Beds 4 or more	−0.108	0.016	0.000	1.983
No Fireplace	−0.107	0.013	0.000	1.835
Fireplaces 2 or more	0.078	0.018	0.000	1.896
No garage	−0.063	0.015	0.000	1.807
Garages 2 or more	0.068	0.014	0.000	2.343
Carport 1 or more	0.029	0.015	0.054	1.162
Stories	0.006	0.016	0.698	2.527
Zero lot line site	−0.045	0.036	0.211	1.263
Lot size > ½ acre	0.013	0.014	0.321	1.087
Q2	−0.024	0.015	0.101	2.081
Q3	−0.004	0.014	0.787	2.161
Q4	−0.051	0.015	0.001	1.925
Age_1	0.009	0.025	0.714	2.274
Age_2	−0.174	0.025	0.000	2.269
Age_3	−0.167	0.024	0.000	2.004
Age_4	−0.064	0.023	0.005	1.845
Age_6	0.018	0.022	0.421	1.888
Age_7	0.011	0.024	0.644	1.863
Age_8	0.016	0.024	0.506	2.127

Exhibit 6 | (continued)
OLS Parameter Estimates

	Coefficient	Standard Error	*p*-value	Variance Inflation Factor
Age_9	0.045	0.023	0.057	2.385
Age_10	0.074	0.026	0.005	2.002
Age_11	0.073	0.026	0.005	2.302
Age_12	−0.034	0.026	0.184	2.571
Vacant	−0.093	0.011	0.000	1.134
HOA	0.070	0.017	0.000	1.193
Security System	0.081	0.010	0.000	1.221
School District	0.355	0.023	0.000	2.957
South	−0.393	0.015	0.000	1.739
West	0.245	0.019	0.000	3.063
CBD (in miles)	−0.026	0.004	0.000	2.789
DART (in miles)	−0.069	0.004	0.000	2.400
Expressway (in miles)	0.069	0.008	0.000	1.557
Lake	0.187	0.020	0.000	1.258
F-Statistic	620.30		0.000	
R^2	0.894			
Adj. R^2	0.893			
Standard error of the estimate	0.277			

0.110 with a 95% confidence interval ranging from 0.080 to 0.143. The coefficient is statistically significant at a level less than .001. Again, based upon Kennedy, the adjusted price differential is 11.7%.

Overall, the size of the positive correlations between residential sales price and both conservation district variables are not only statistically significant but practically material. Given the hedonic model, the positive coefficients related to conservation districts are of a larger magnitude than the beta coefficients associated with having two or more bathrooms, a lot size greater than half an acre, a two or more car garage, two or more fireplaces, and proximity to public transportation, CBD, or DART. While a cost analysis of the conservation designation is not within the scope of this study, the marginal costs, to both the municipality and property owners, can be expected to be modest and it is doubtful that administrative and compliance costs will exceed the magnitude of the price premium.

There are some other interesting findings regarding the control variables. The results demonstrate positive correlations between transaction prices and homeowner association membership, the Highland Park ISD, the West area submarket, proximity to White Rock Lake, as well as distance away from an expressway. Additionally, there is a nonlinear relationship in the age variables. With the baseline age category of 48 to 50 years, the results demonstrate a material discount for properties with ages from 7 to 47 years, a price premium for home ages ranging from 59 to 77 years, and a discount for home ages 78 years and older. There are also price discounts for the absence of a fireplace, the absence of a garage, and location in the South submarket. Lastly, prices generally decrease as separation distance increases between both the CBD and DART stations and the particular house sale.

One last point about the OLS model merits discussion. Given the number of independent variables, the specification may suffer from multicollinearity. Exhibit 6 reports the VIF values for each of the independent variables. VIFs are based on the adjusted R^2 generated when one independent variable is regressed against the remaining independent variables in the regression equations. If any variable is orthogonal to all the other explanatory variables, then the VIF is 1.0. Judge et al. (1988) report a value of 5.0 as some indication of a severe multicollinearity problem. The results in Exhibit 6 exhibit VIF values less than 5.0 for all variables.[3]

SAR Model

While qualitative variables are used to control for the East, West, and South submarkets, the transaction prices in the sample are expected to be correlated across space. This is especially true given that the study is concentrated within a relatively small geographic space—the Dallas Texas MSA. Hence, the test is re-executed using the SAR model in Equation (2). ArcGIS is used to geocode the street addresses into latitude and longitude coordinates, and then use the Spatial Statistics Toolbox 2.0 developed by Pace (2003) is used to compute the SAR model.

Exhibit 7 presents the parameter estimates using the SAR model. Column 2 presents the variable coefficients, column 3 details the signed root deviances (SRDS), which are interpreted similar to *t*-Statistics, and column 4 presents the probability of obtaining a higher (SRDS) under repeated sampling, which is similar to the traditional *p*-value. In general, the SAR model refines the parameter estimates but does not materially affect either the sign or the magnitude of the parameter estimates. Nevertheless, the data contain a significant degree of spatial correlation. The spatial parameter, ρ, in the last line of Exhibit 7 exhibits a coefficient of 0.31, with a SRDS of 11.345 and a probability of a higher SRDS less than .000.

Using the SAR model, the coefficients on the conservation district variables maintain their positive and statistically significant correlations with the natural logarithm of sale price. The coefficient on the conservation district variable demonstrates a premium of 15.7% with a SRDS of 7.235. The coefficient on the

Exhibit 7 | SAR Parameter Estimates

	Coefficient	Signed Root Deviances	Probability of Higher SRDS
Intercept	12.476	105.991	0.000
Conservation District	0.157	7.235	0.000
Conservation Buffer	0.104	6.276	0.000
Size_1	−0.622	−21.044	0.000
Size_2	−0.489	−17.813	0.000
Size_3	−0.346	−13.706	0.000
Size_4	−0.280	−11.499	0.000
Size_5	−0.219	−9.516	0.000
Size_6	−0.150	−6.710	0.000
Size_7	−0.055	−2.482	0.013
Size_9	0.124	5.518	0.000
Size_10	0.297	11.966	0.000
Size_11	0.567	19.744	0.000
Size_12	0.974	27.301	0.000
Baths 1.5 or less	−0.086	−5.820	0.000
Baths 2.5 or more	0.043	2.317	0.021
Beds 2 or less	0.058	4.519	0.000
Beds 4 or more	−0.102	−6.737	0.000
No Fireplace	−0.107	−8.363	0.000
Fireplaces 2 or more	0.081	4.546	0.000
No garage	−0.056	−3.883	0.000
Garages 2 or more	0.066	4.813	0.000
Carport 1 or more	0.023	1.531	0.126
Stories	0.007	0.414	0.679
Zero lot line site	−0.071	−1.944	0.052
Lot size > ½ acre	0.014	1.086	0.278
Q2	−0.025	−1.782	0.075
Q3	−0.010	−0.671	0.502
Q4	−0.049	−3.312	0.001
Age_1	0.025	0.953	0.341
Age_2	−0.164	−6.643	0.000
Age_3	−0.148	−6.098	0.000
Age_4	−0.055	−2.480	0.013
Age_6	0.008	0.357	0.721
Age_7	0.003	0.114	0.909

Exhibit 7 | (continued)

SAR Parameter Estimates

	Coefficient	Signed Root Deviances	Probability of Higher SRDS
Age_8	0.013	0.534	0.593
Age_9	0.038	1.633	0.102
Age_10	0.062	2.380	0.017
Age_11	0.066	2.583	0.010
Age_12	−0.041	−1.582	0.114
Vacant	−0.093	−8.576	0.000
HOA	0.070	4.191	0.000
Security System	0.077	7.809	0.000
School District	0.369	15.759	0.000
South	−0.408	−25.353	0.000
West	0.238	12.437	0.000
CBD (in miles)	−0.030	−6.575	0.000
DART (in miles)	−0.071	−15.778	0.000
Expressway (in miles)	0.071	8.996	0.000
Lake	0.179	8.723	0.000
ρ	0.310	11.345	0.000

conservation district buffer variable demonstrates a premium of 10.4% with a SRDS of 6.276.

The biggest differences between the SAR and OLS parameter estimates are for the explanatory variables associated with *carport* and *zero lot line site*. Using OLS, the beta coefficient for *carport* is 0.029 with a *p*-value of .054. While the coefficient is a similar 0.023 using the SAR model, the probability of a higher SRDS (*p*-value) is .126. The opposite is true for *zero lot line*. Using OLS, the coefficient is −0.045 and statistically insignificant with a *p*-value of .211. The SAR model results in a more negative coefficient of −0.071 and a *p*-value of .052. In general, the SAR specification appears to refine the hedonic model based upon the spatial correlation that is present in the data.

Conclusion

Conservation districts strive to maintain neighborhood standards as determined by the district residents. Residents set restrictions specific to their community with the intent of preserving and enhancing their neighborhood. As far as could be determined, no study exists to establish whether a conservation district has any affect on residential transaction prices within and around the district. The extant literature that most closely resembles this study pertains to historical district regulations and historically designated areas. In general, previous studies find that property in historic districts command price premiums over similar properties in non-historic districts. Also, a few papers examine a spillover effect from historically designated areas.

The results of this study demonstrate a positive and statistically significant relationship between residential sale prices and properties located within conservation districts. There is also evidence of a spillover premium for property adjacent to the conservation districts. On average, the results suggest that conservation districts increase the value of residential properties in and around the districts. These findings, including the magnitude of the found premiums, are consistent with the majority of the historical district papers.

The public policy implications of these findings are twofold. First, city planners and land use officials have a potential mechanism to maintain residential property values in neighborhoods that enjoy an architectural style or craftsmanship of a particular epoch. Second, city taxing authorities should recognize the potential relationship between conservation district regulations and the tax base since the conservation regulations increase residential property values.

But a word of caution is appropriate here. As compared to traditional zoning, the conservation regulations are relatively new and more narrowly implement land control techniques. Subsequently, there has not been an opportunity to study the effects of these regulations over long time periods and complete neighborhood lifecycles. In the short-term, conservation regulations may promote conformity and neighborhood character resulting in price premiums. However, the long-term effects of these regulations are not known. In the long-run, aggressive conservation regulations may restrict changes in highest and best use and stifle the natural progression of the neighborhood lifecycle.

The premiums found in this study are an average for all conservation districts in the sample. Further research is recommended to more fully understand the relationship between conservation regulations and residential property values.

Endnotes

1. With one exception, all conservation districts were established before January 2004. The exception is the Belmont Addition district, which was formally established in March 2004. Only two transactions took place between January 2004 and March 2004 within the Belmont conservation district. We include these two sales in this study's dataset. We execute the model with and without the two Belmont pre-designation sales, and observe no material differences between models.
2. Calculated as $\exp(\hat{c} - 1/2\ \hat{V}(\hat{c})) - 1$, where $\hat{c}$ is the estimate of the coefficient and $\hat{V}(\hat{c})$ is the variance of the coefficient estimate (Kennedy, 1981, p. 801).

[3] To further alleviate potential multicollinearity we execute a reduced model, not shown, that removes all explanatory variables that are statistically insignificant at the 5% level. A benefit of this reduced test is confirmation that the parameter estimates do not change when the model is altered. As expected, removing statistically insignificant variables from the model does not materially change the OLS parameter estimates. Since the model uses less variables, we find a small reduction in the VIF for each of the variables.

References

Asabere, P.K. and F.E. Huffman. Historic Designation and Residential Market Values. *The Appraisal Journal*, 1994a, 62:3, 396–401.

——. The Value Discounts Associated with Historic Façade Easements. *The Appraisal Journal*, 1994b, 62:2, 270–77.

Asabere, P.K., F.E. Huffman, and S. Mehdian. The Adverse Impacts of Local Historic Designation: The Case of Small Apartment Buildings in Philadelphia. *Journal of Real Estate Finance and Economics*, 1994, 8, 225–35.

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, 129–37.

Clark, D.E. and W.E. Herrin. Historic Preservation and Home Sale Prices: Evidence from the Sacramento Housing Market. *Review of Regional Studies*, 1997, 27, 29–48.

Coulson, N.E. Really Useful Tests of the Monocentric Model. *Land Economics*, 1991, 67: 3, 299–307.

Coulson, N.E. and R.M. Leichenko. The Internal and External Impact of Historical Designation on Property Values. *Journal of Real Estate Finance and Economics*, 2001, 23: 1, 113–24.

Darling, A.H. Measuring Benefits Generated by Urban Water Parks. *Land Economics*, 1973, 49, 22–34.

Ford, D.A. The Effect of Historic District Designation on Single-Family Home Prices. *Journal of the American Real Estate and Urban Economics Association*, 1998, 17:3, 353–62.

Griffith, D.A. and L.J. Layne. *A Casebook for Spatial Statistical Data Analysis*. New York: Oxford University Press, 1999.

Gillen, K., T. Thibodeau, and S. Wachter. Anisotropic Autocorrelation in House Prices. *Journal of Real Estate Finance and Economics*, 2001, 23:1, 5–30.

Hughes, W.T. and C.F. Sirmans. Traffic Externalities and Single Family House Prices. *Journal of Regional Science*, 1992, 32:4, 799–815.

Judge, G.G., R.C. Hill, W.E. Griffiths, H. Lutkepohl, and T.C. Lee, *Introduction to the Theory and Practice of Econometrics*. New York: John Wiley and Sons, Inc., 1988.

Kennedy, P.E. Estimation with Correctly Interpreted Dummy Variables in Semilogarithmic Equations. *American Economic Review*. 1981, 71:4, 801.

Leichenko, R.M., E.N. Coulson, and D. Listokin. Historic Preservation and Residential Property Values: An Analysis of Texas Cities. *Urban Studies*, 2001, 38:11, 1973–987.

Listokin, D., B. Listokin, and M. Lahr. The Contributions of Historic Preservation to Housing and Economic Development. *Housing Policy Debate*, 1999, 9:3, 431–78.

McMillen, D.P. The Return of Centralization to Chicago: Using Repeat Sales to Identify Changes in House Price Distance Gradients. *Regional Science and Urban Economics*, 2003, 33:3, 287–304.

——. Reaction of House Prices to a New Rapid Transit Line: Chicago's Midway Line, 1983–1999. *Real Estate Economics*, 2004, 32:3, 463–86.

Nelson, G., J.A. Hansz, and M.L. Cypher. The Influence of Artificial Water Canals on Residential Sale Prices. *The Appraisal Journal*, 2005, 73:2, 167–74.

Pace, R.K. Spatial Statistics Toolbox 2.0. http://www.spatial-statistics.com/software_index.htm, 2003.

Seiler, M.J., M.T. Bond, and V.L. Seiler. The Impact of World Class Great Lakes Water Views on Residential Property Values. *The Appraisal Journal*, 2001, 69:3, 287–95.

Schaeffer, P.V. and C.A. Millerick. The Impact of Historic District Designation on Property Values: An Empirical Study. *Economic Development Quarterly*, 1991, 5, 301–12.

Sirmans, G.S., D.A. Macpherson, and E.N. Zietz. The Composition of Hedonic Pricing Models. *Journal of Real Estate Literature*, 2005, 13:1, 3–43.

Voith, R. Transportation, Sorting and House Values. *Journal of the American Real Estate and Urban Economics Association*. 1991, 19:2, 117–37.

Wojno, C.T. Historic Preservation and Economic Development. *Journal of Planning Literature*, 1991, 5, 296–306.

Julian Diaz III, Georgia State University, Atlanta, GA 30302-4020 or jdiaz@gsu.edu.

J. Andrew Hansz, University of Texas-Arlington, Arlington, TX 76019 or hansz@uta.edu.

Matthew L. Cypher, Southern Methodist University & INVESCO Real Estate, Dallas, TX 75240 or Matthew_Cypher@invesco.com.

Darren K. Hayunga, University of Texas-Arlington, Arlington, TX 76019 or hayunga@uta.edu.