THE PROPERTY VALUE PREMIUM OF A PLACE OF WORSHIP

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ABSTRACT

Using a unique data set of residential housing values we improve on previous hedonic pricing and event studies literature to estimate the amenity effects of a new religious structure on local property values. We improve on previous research by extending our analysis with a pre- and post-treatment model. Using a pre- and post-treatment model, we do not find that the religious structure that we examined influenced the value of surrounding properties in the period after it completion. Results suggest that previous research using only post-completion data may mischaracterize the amenity effects of religious structures.

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INTRODUCTION

As state and local budgets begin to feel the impacts of the recent sharp decline in property values the debate surrounding property taxes and tax-exempt properties is finding its way into the news and political debate. In municipalities, there are often a variety of properties and landscapes that are off of the tax rolls including amenities such as parks, lakes, or green spaces, but also including tax-exempt entities such as universities, religious structures, or other non-profit organizations. These amenities and entities may hold tax exempt status because each arguably contributes to an important public purpose. But, the fiscal impact of these tax-exempt amenities and entities also may be minimal because each also makes an indirect contribution to the local property tax base, by raising the value of surrounding taxable properties. The fiscal implications naturally vary depending on the magnitude of the indirect impact.

There is a large literature that has evolved to examine this empirical question. Much of this research has examined the fiscal implications of amenities such as parks, lakes, and green spaces. Previous research has shown that amenity effects are important in both the sale price and tax assessment values for residential properties and hedonic pricing models have been able to document these effects (Kaufman, 2006; Irwin, 2002; Espey, 2001; Lansford; 1995, Brown and Pollakowski, 1977; Correll, 1978, Darling, 1973; and Weigher, 1973). But, fewer studies have examined the impact of tax-exempt properties such as religious structures.

In this paper, we examine what effect, if any, that religious structures have on the value of neighborhood properties. We build on a small literature (Do, et al. 1994; Carroll et al., 1996) which has found ambiguous results; alternatively finding that religious structures are a “nuisance” that lower the value of surrounding properties or amenities that increase nearby property values; and even finding that the property value impact varied by denomination. We also make empirical contributions to the larger hedonic literature that examines the influence of neighborhood characteristics on property values. In particular, we identify a natural experiment where a religious structure was dropped into an older existing neighborhood for historical reasons, rather than included as a feature of a newly constructed neighborhood. In the latter case, land for religious structures could be carefully placed in either the higher or lower value areas of a new neighborhood. Further, in contrast to most studies in the hedonic literature, we also gather a long data series of sale values for single-family homes from the period before and after the religious structure was built. Most hedonic studies only include a cross-section or panel of assessed or sale values for the period after an amenity or neighborhood characteristic is in place. This data set allows us to estimate a pre- and post-treatment model to isolate the impact of the completed religious structure on neighborhood property values. We show that standard estimation techniques may mischaracterize the contribution of religious structures or other amenities to home values. We conclude that more robust estimation techniques are required for research using hedonic pricing and event studies models to obtain more precise results.

The paper is organized as follows. In the next section we provide a review of the literature on hedonic pricing models with an emphasis on the influence of neighborhood amenities on property values. We describe our data on sale values and housing characteristics in the third section. Empirical estimates are presented in the fourth section and the fifth section is a conclusion.

LITERATURE REVIEW

The literature on hedonic pricing models for residential housing is large and well established. For example, Ready (2005) uses a hedonic pricing model to control for housing characteristics while estimating the impact of a nearby landfill. In a like fashion the proximity and visibility of mobile home developments also tend to reduce residential housing values (Munneke, 1999). Other amenity characteristics have also been investigated with predictable results. Brown and Pollakowski (1977) show that natural shoreline significantly improves the value of residential properties while others have shown that reservoir shoreline has a similar effect (Lansford, 1995) and that recreational opportunities made possible by new reservoirs contribute up to 22% of housing values in nearby residential developments (Knetsch, 1964).

Neighborhood amenities such as parks, (Espey, 2001; Weigher, 1973), water parks (Darling, 1973), greenbelts (Correll, 1978) and open spaces (Irwin, 2002) are also found to positively and significantly impact the value or surrounding residential housing. Undeveloped lands such as brownfields and greenspaces can likewise contribute to property values (Kaufman, 2006). These results are unsurprising; especially those for residential developments where the amenity features are implemented by developers seeking to maximize revenues. More difficult to assess are projects that are not the result of market mechanisms but are instead the results of public development or developments that do not face market pressures. The controversies surrounding professional sports franchises and sporting arenas are well developed (Dehring et al, 2007; Rappaport, 2001; Siegfried, 2000).

Increasingly, the impact of religious structures that are exempt from taxes are under greater scrutiny and the current literature on this subject has found mixed results. In a study on places of worship's externalities on single-family home prices in Chula Vista, California, Do, Wilbur, & Short (1994) found that proximity to a place of worship was negatively associated with market value. The relationship was conditional on the property being within 850 feet of the church. Do, et al. (1994) utilize a hedonic regression to capture the implicit prices of attributes, which are acquired through a first step regression analysis (Rosen, 1974). However, Do, et al. (1994) only examine home sales for a period well after the construction of the churches (and homes) in their sample. In such a post-treatment analysis, it is difficult to separate the amenity value of the church from other neighborhood amenities or disamenities that may exist with or without the church's construction. [1]

Carroll, Clauretie, & Jensen (1996) extend the analysis by making use of data from a longer time period from 1991 through 1995. Further, unlike Do et al. (1994), Carroll et al. (1996) conduct multiple regressions representing the entire sample, as well as homes sold before the construction of neighborhood churches, and homes sold after the construction of neighborhood churches. Carroll, et al. (1996) found that proximity to a completed religious structure increased property values. The authors also found that the property value impact varied by denomination, with homes near Latter-Day Saint (Mormon) churches selling for more than homes near Catholic, Baptist, or other churches.

However, most of the Henderson, Nevada sample used by Carroll, et al. (1996) contained homes built after the nearby church was completed. For the handful of churches that were built during the sample period, Carroll et al. (1996) did not compare property values both before and after the church was completed. Thus, the authors did not use the longer time series in their data set to conduct a true comparison of the value of proximity of the church both before and after it was constructed. Further, in the newly built neighborhoods that Carroll et al. (1996) studied it is likely that home owners would have known that a church was planned for a particular site even before it was built, making it unclear what the "before" and "after" periods really were . We prefer the natural experiment that we identified in an older, established neighborhood of Omaha, Nebraska. This case is described below.

DATA

[1] For example, it may be that the land set aside for the churches (and nearby homes) was low-valued land and that high valued land was reserved for high-return residential development. If this were the case, the negative amenity attributed to the churches would, in fact, be more appropriately attributed to the natural geography on which they were built.

In 1999 the construction of a Latter-Day Saint (LDS) temple within the neighborhood was announced with construction ending in 2001. The site is within the geographic boundaries of Winter Quarters; a temporary pioneer settlement on the western shore of the Missouri River that was first occupied by migrants in 1846 and abandoned in 1848.

The temple's construction provides a unique natural experiment to assess its impact on the surrounding neighborhoods since the structure's location was chosen for historical reasons and not for other reasons documented in the literature. As such it represents a true exogenous shock to surrounding property values and avoids the potential that sites for religious structures were endogenously selected for either higher or lower value sections of newer neighborhoods of the kind studied by Do et al. (1994) and Carroll, et al. (1996). Further, the age and stability of the Omaha neighborhood should serve to reinforce our findings as all other neighborhood characteristics should have been fully priced into homes' values by 1999. Finally, open only to church members, the facility does not generate significant traffic and does not provide social services. As such it should not generate any of the possible negative effects identified by Do et al. (1994).

Carroll, et al. (1996) found that the denomination effect for LDS structures is both positive and significant. Thus our estimation of the amenity effect should not be biased or rendered insignificant by a negative denomination effect.

To take full advantage of our natural experiment, we gathered a unique data set consisting of eighteen years of sales values and property characteristics for an established residential neighborhood in northern Omaha, Nebraska. One of Omaha's older neighborhoods, the mean date of construction for houses in our sample is 1940 as seen in Table 1. The mean square footage of the residential units was only 1,200, and the units averaged only 1.23 bathrooms. Over the 1990 to 2007 period that we studied, the average real value of the residential units sold was just $36,300 in 1985 dollars.

[Table 1 here]

For our analysis we focus on homes within a three mile radius of the religious structure. All properties within the designated area are identified by parcel identification number using GIS mapping tools provided by the Douglas County Assessor's office. After identifying parcels to be gathered, each parcel identification number was then individually searched to collect structural information.

Bounded by an interstate freeway to the north, the Missouri River to the East and major thoroughfares to the South and West, the designated area of study contains there were 2,969 single family home sales in the designated study area during the 1990 to 2007 period. Non-residential properties were excluded from the sample. The information gathered from the Douglas County Assessor's office consisted of sale prices and typical structural variables, such as parcel size (in square feet), year built, condition of property, quality of structure, number of bedrooms, and whether the property had a garage or not.[2] Neighborhood characteristics such as mean income and the percentage of owner-occupied properties were assigned based on Census block group. The properties in our sample were located in 11 different Census block groups. Each property's distance from the structure was calculated using online mapping tools. We also measured distance by direction. Specifically, distance was measured separately for properties located to the South, East, and West of the temple. Distance to the South was measured for properties located in the same Census block group as the temple and in all Census block groups located directly to the South. Distance to the East was measured for all Census block groups located to the East, and a similar approach was used to measure distances to the West. As we note in our results section, we find mixed evidence that the influence of proximity to the temple on property values varies by direction. We did not gather data and analyze properties located in Census block groups to the North of the

[2] Given that we gathered two decades worth of sale price data, we were concerned that over such a long period of time personnel and methods may have changed in the office of the assessor. However, our discussions with the Douglas County Assessor's Office mitigated our concerns. The assessor's office indicated that the methodology and criteria used to determine the condition, quality and assessed value of the homes in our sample was stable.

temple site as these properties were outside of our study area. The interstate freeway that forms the northern boundary for our study area lies between the temple site and all Census block groups to the North.

ESTIMATION AND RESULTS

We identify the impact of the temple's construction on neighboring residential property values by estimating two separate models. In both models, continuous variables are expressed as natural logs. The first model is a traditional hedonic pricing model using data for property sales following the completion of construction (i.e. a post-treatment model):

$$Price_{i,t} = \alpha_0 + \alpha_1 ParcelSize_{i,t} + \alpha_2 BuildingSize_{i,t} + \alpha_3 YearBuilt_{i,t} + \alpha_4 Condition_{i,t} + \alpha_5 Quality_{i,t} + \alpha_6 Bedrooms_{i,t} + \alpha_7 Baths_{i,t} + \alpha_8 Garage_{i,t} + \alpha_9 Time_{i,t} + \alpha_{10} Time^2_{i,t} + \alpha_{11} Distance_{i,t} + \varepsilon_{i,t} \quad (1)$$

We expand on previous research by also estimating a pre- and post-treatment model for both the full sample of observations preceding and following construction of the temple where:

$$Price_{i,t} = \alpha_0 + \alpha_1 ParcelSize_{i,t} + \alpha_2 BuildingSize_{i,t} + \alpha_3 YearBuilt_{i,t} + \alpha_4 Condition_{i,t} + \alpha_5 Quality_{i,t} + \alpha_6 Bedrooms_{i,t} + \alpha_7 Baths_{i,t} + \alpha_8 Garage_{i,t} + \alpha_9 Time_{i,t} + \alpha_{10} Time^2_{i,t} + \alpha_{11} Distance_{i,t} + \alpha_{12} Complete_{i,t} + \alpha_{13} DistanceComplete_{i,t} + \varepsilon_{i,t} \quad (2)$$

The variable *Price* is the real sale price of the home, *ParcelSize* is the size of the parcel in square feet, *YearBuilt* is the year in which the home was completed, *Condition* is variable assessing the condition of the home at time of sale, *Quality* represents the quality of construction, *Bedrooms* is the number of bedrooms in the home, *Baths* is the number of bathrooms, *Garage* is a zero/one variable indicating whether the home has a garage, *Time* and *Time Squared* are linear and geometric time variables, *Distance* is the distance in miles of the home from the temple, *Complete* is a zero/one variable which takes a value on 1 beginning in 2001 and *DistanceComplete* is the interaction variable for the pre- and post-treatment model.

Table 2 shows the regression results from our hedonic model of property values under alternative specifications and samples.[3] Box-cox test results support the use of a double-log model rather than a levels model. We first examine a post-treatment model that includes data only from the period after the completion of the temple. We then utilize a pre- and post-treatment model that includes data from years both before and after the temple was completed.[4] In a third model, we utilize a pre- and post-treatment model where the influence of proximity to the temple varies by direction. We also include a fourth model estimated using only homes that were located within 1 mile of the temple site, as a robustness check.[5]

[Table 2 here]

Regression results broadly support the expected effect of housing characteristics on property values. Coefficient estimates, however, were sometimes insignificant in our fourth model, which contained just 828 observed sales since it was limited to homes located within 1 miles of the temple site. Values rise with the size and condition of homes, and with the presence of features such as garages and bathrooms. The value of homes rose with building square footage, with each 1% increase in square footage yielding a 0.40 to 0.42% increase in property values depending on specification. Property values also increase

[3] We tested for spatial correlation in our data using the approach recommended by Kim et al. (2003). We found no evidence of spatial correlation using either the spatial lag or the spatial error model.

[4] We checked for the presence of "Tiebout sorting" in our model, which would be characterized by an increase in property sales near the temple after its completion, as homeowners attracted to the facility move closer to it. However, we did not find evidence of such Tiebout sorting. We found that the increase in property sales in the period after the temple's completion was similar for properties located near the temple and properties located further away from the temple.

[5] We considered examining the influence of direction for samples of properties located even closer to the temple site. However, sample sizes were quite small. For example, there were just 270 properties located within ½ mile of the temple. Therefore we choose to use a 1 mile boundary.

with the parcel size in the pre- and post-treatment model, though the magnitude of the effect per square foot was much smaller.

Condition and quality measures and year built also had a statistically significant and positive influence on property values. Housing characteristics such as the number of bathrooms or the presence of a garage both raised property values. Homes with a garage were worth 12% to 15% more, depending on the specification. The addition of another bathroom added to the value of homes in the neighborhood we studied in 3 of our 4 specifications, even after controlling for square footage of the homes. Another bathroom added 9% to 10% to the sale price. This is a very strong effect and may reflect the presence of relatively few bathrooms in these older homes, particularly those that were not remodeled. An increase in the number of bedrooms was not found to raise property values, after accounting for the square footage of the homes. The value of homes rose with time as would be expected, though at a decreasing rate.

The effect of neighborhood characteristics varied between models using the full sample, and the fourth model that only used home sales of properties located within 1 mile of the temple site. In models evaluating the full sample of properties, mean income in the Census block group had a positive impact on property values but the owner-occupancy rate had no impact. In the model evaluating properties located within 1 mile of the temple site, higher mean income and owner-occupancy in the Census block group had a negative impact on property values. This difference in the impact of neighborhood characteristics on property values likely occurred because neighborhoods located closer to the temple site are relatively homogenous in terms of income and owner-occupancy.

Overall, the post-treatment model and the pre- and post-treatment model yielded similar results for the impact of housing characteristics on house sale prices. Taken together, the two types of models also yielded interesting results on the influence of the temple on property values. Specifically, in the post-treatment model using only post-completion data, property sales price falls 1.03% per 10% increase in distance from the temple. However, in models using pre and post-treatment data, the coefficient on the distance and completion interaction terms are generally statistically insignificant.[6] The coefficient on the Complete variable is positive and significant[7]. Further, we note that the coefficients on the distance variables remain negative and statistically significant, indicating that property values fall with distance from the temple site with the structure either present or absent, presumably for some other unmeasured characteristics of the neighborhoods surrounding the temple. Overall, results suggest that use of a post-treatment model and only post-completion data would mischaractertize the impact of the temple on property values.

Results also show that the influence of proximity to the temple may vary by direction. The coefficient on the interaction term for distance to the South and completion is negative and statistically significant in the full sample model. This suggests that the completion of the temple may have raised the property value of homes located in neighborhoods to the South of the structure[8]. However, that result did not hold when the sample was restricted only to properties located within 1 mile of the temple site. In that case, the coefficients on interaction terms for distance and completion are always statistically insignificant. These results suggest that it can be useful to evaluate the influence of proximity by direction but that we do not find consistent evidence that completion of the temple increased property values overall or in any particular direction from the structure. Further, results are generally consistent

[6] We also estimated a repeat sales model examining the appreciation in sale prices for 1,241 cases of repeat sales in our data. Consistent with the results of our pre- and post-treatment model, results of the repeat sales model again provided no evidence that the completion of the temple structure impacted property values.

[7] The addition of the Complete variable reduces the size of the coefficients on the Time and Time Squared variables. This demonstrates that the time trend pattern was even more complex than our simple trend variables captured.

[8] The natural geography of the neighborhoods surrounding the temple site naturally flows to the south. Neighborhoods to the east are separated by a major road and neighborhoods to the west have fewer connecting roads. As a result, the temple may best serve as an amenity for housing to the south.

whether we utilize the full sample of properties or restrict the sample to properties located within 1 mile of the temple.

CONCLUSION

Public amenities and other tax exempt entities can make a significant indirect contribution to the local tax base by increasing the value of taxable properties within a municipality. But, the size of this indirect impact is uncertain, and may well vary greatly by type of amenity. As a result, a large literature evolved to measure the indirect impact of amenities such as parks, lakes, and green spaces on the value of surrounding properties. Further, as this literature has evolved and branched out, researchers have begun to consider the property value impact of tax-exempt entities, including religious properties (Do, et al., 1994; Carroll, et al., 1996). Researchers have found that religious institutions have an influence property values. Specifically, researchers such as Do (1994) and Carroll et al. (1996) have examined property values in areas surrounding existing neighborhood churches in newer neighborhoods and found an impact on surrounding property values.

The current paper expands on this literature by examining how proximity to a religious institution impacts property values using a pre- and post-treatment model, and by allowing the influence of proximity to vary by direction. Our analysis of the amenity value of a religious institution focused on a single case, that of a Latter-Day Saint (Mormon) temple built in an older neighborhood of Omaha, Nebraska in 2001 on the site of a historic pioneer settlement. But, this unique case had several advantages for testing the amenity value of religious structures. First, the temple's construction provides a unique natural experiment to assess its impact on the surrounding neighborhoods since the structure's location in an older existing neighborhood was chosen for historical reasons and was not master planned as part of the development of a new neighborhood. Second, we developed a panel data set of sale prices that included multiple years of data from both before and after the construction of the temple. This allowed us to construct a pre- and post-treatment model to isolate whether differences in property values near the temple arose after the temple was constructed, or existed prior to construction due to other attributes of the area.

Our findings suggest that it is useful to measure the value of neighborhood amenities in a pre- and post-treatmentmodel, when feasible. When we examine sale prices only for the period after the temple was constructed, we find that proximity to the temple raises property values. But, we no longer find that proximity to the temple raises property values when we examine sale prices in the period both before and after the temple was constructed using a pre- and post-treatment model. In our case, homes located nearer the site of the new temple were always more valuable, presumably due to other, unmeasured neighborhood characteristics. Therefore, in this example, the tax-exempt religious structure would not pay for itself by increasing the value of other neighborhood residential properties due to an amenity effect.

More generally, we believe that the use of pre- and post-treatment models can be used to build a more thorough understanding of the role of public amenities on taxable property. Further, by expanding on the small literature on the impact of religious structures on neighborhood property values, we hope to contribute to a larger literature on how tax-exempt properties influence the tax base of municipalities.

TABLES

Table 1 – Data Description

	Mean	Min	Max	StDev
Baths	1.226	1	4	0.422
Bedrooms	2.665	1	6	0.677
Building Size	1187	428	5856	390
Condition	2.902	1	5	0.651
Distance	1.334	0.2	2.6	0.501
Garage	0.872	0	1	0.334
Mean Real Income	$27,812	$21,389	$44,643	$2,868
Parcel Size	8,352	500	426,016	13,525
Percent Owner Occ	79.0%	54.41%	95.06%	0.083
Quality	2.890	1	5	0.390
Real Sales Price	$36,328	$3,228	$442,920	$20,714
Year Built	1937	1857	2006	17.669

Table 2 – Regression Results

Dependent Variable: Log of Real Sale Price
(All Continuous Variables are in Logs)

	Post-Treatment Model	PrePost-Treatment Model	PrePost-Treatment Directional	PrePost-Treatment Directional <1Mile
Bedrooms	-0.017	0.05	0.05	0.081
	(0.047)	(0.031)	(0.032)	(0.057)
Building Size	0.420***	0.416***	0.415***	0.405***
	(0.055)	(0.034)	(0.034)	(0.064)
Condition	0.437***	0.333***	0.332***	0.199***
	(0.045)	(0.031)	(0.031)	(0.061)
Mean Real Income	0.269**	0.282***	0.195	-0.498**
	(0.125)	(0.083)	(0.121)	(0.205)
Parcel Size	0.034	0.074***	0.084***	0.043
	(0.033)	(0.023)	(0.022)	(0.046)
Percent Owner Occ.	-0.003	0.038	0.017	-0.250***
	(0.102)	(0.075)	(0.082)	(0.093)
Quality	0.146*	0.175***	0.172***	0.324***
	(0.078)	(0.053)	(0.053)	(0.091)
Baths	0.089**	0.101***	0.098***	0.028
	(0.042)	(0.025)	(0.025)	(0.054)
Garage	0.147***	0.123***	0.124***	0.132***
	(0.039)	(0.024)	(0.024)	(0.040)
Year Built	5.819***	6.793***	6.985***	5.420***
	(1.788)	(1.316)	(1.316)	(1.945)
Time	0.186*	0.027***	0.027***	0.014
	(0.102)	(0.005)	(0.005)	(0.010)
Time2	-0.006*	-0.001*	-0.001*	0
	(0.003)	(0.000)	(0.000)	(0.001)
Distance	-0.103***	-0.080***		
	(0.028)	(0.020)		
Complete		0.076***	0.056*	0.127**
		(0.028)	(0.030)	(0.056)
Distance*Complete		-0.014		
		(0.030)		
Distance*East			-0.069*	-0.18
			(0.041)	(0.270)
Distance*South			-0.058**	-0.138***
			(0.026)	(0.041)
Distance*West			-0.215**	-1.805***
			(0.107)	(0.538)
Distance*Complete*East			0.051	0.062
			(0.047)	(0.268)
Distance*Complete*South			-0.072*	0.027
			(0.043)	(0.065)
Distance*Complete*West			0.048	-1.927
			(0.156)	(3.188)
Constant	-41.633***	-48.394***	-49.051***	-29.828*
	(14.199)	(10.466)	(10.400)	(15.278)
R-squared	0.24	0.318	0.319	0.333
N	1397	2969	2969	828

p	9.78E-52	5.70E-191	1.10E-189	3.77E-56

*** = significant at 1%, **= significant at 5%, and *=significant at 10%.

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