The effect of conservation policy and varied open space on residential property values: A dynamic hedonic analysis

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ARTICLE INFO

ABSTRACT

We investigate open space value in an ideal setting for a natural experiment between Riverside County, with an open space conservation policy, and neighboring San Bernardino County without the policy. With spatial econometrics, time series and spatial data, this study accounts for both spatial and temporal variation of open space values. The novelty of our paper is that we combine an investigation of the effect of open space proximity on residential property value with an analysis of the effect of endangered species habitat preservation policy distinguishing between types of open space (wild habitat for endangered species versus developed parks) in a two county study. We find that proximity to open space has a positive and statistically significant influence on increased value of residential real estate, with some distinction among type of open space between the counties. Conservation policy for open space with wild habitats contributes to increased value of this amenity in Riverside County.

1. Introduction

Open space may be protected or unprotected, public or private land (USDA, 2006). Public and private open space is highly valued (Irwin, 2002; Thorsnes, 2002). Open space includes parks, stream and river corridors, forests, and other natural lands within urban and suburban areas. The rate of open space conversion to urban development doubled in the late 1990s from rates of earlier decades for some areas (USDA, 2006). From such conversion, we are losing 6,000 acres of open space each day across the United States, at a rate of 4 acres per minute (USDA, 2006). This means losing public goods and services such as food, fiber, recreation, natural hazard mitigation, and habitat for endangered species (USDA, 2006).

In order to address the loss of open space, it is important to understand the value of open space. This study aims to estimate the value of open space in the context of a formal conservation policy to preserve open space for habitat. This study's estimated values help to evaluate the conservation policies that have been implemented in Riverside County, California for addressing endangered species habitat loss and open space protection. In this study, open space consists of the lot size aside from the structure size on a residential land parcel, and alternatively parks, forests and wild land for endangered species habitat. The objective of our analysis is to investigate how residential real estate value is affected by proximity to a habitat and open space policy. A comparison of pre and post policy residential real estate price variation in neighboring counties of our study with and without open space conservation policy leads to a rigorous analysis of the impacts of the conservation policies on residential property values, controlling for similar characteristics in the two counties. Our results are particularly policy relevant because they apply to open space preservation on the wild land-urban frontier. This frontier is often where ecological value of open space is high because there is room to maintain contiguous habitat. Contiguous refers to uninterrupted habitat that is not broken up by development amidst habitat acreage. Our research suggests that there are statistically significant benefits to residential real estate values in addition to these ecological benefits.

There is a history of effort for conservation and preservation of open space areas by Riverside County that follows a trend elsewhere of establishing habitat conservation plans for open space. The Riverside County Integrated Plan (RCIP) is a comprehensive, three-part, integrated program initiated by the Riverside County Board of Supervisors in 1999 to determine future conservation, transportation, and housing and economic needs in Riverside County (Riverside County, 1999). Protection of the natural environment by conserving endangered species habitat on open space through a Multi-Species Habitat Conservation Plan (MSHCP) is central to the RCIP. The MSHCP

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will provide habitat open space and protect watersheds and the environmental needs of the County. "Its (RCIP) objective is to retain and enhance the integrity of existing residential, employment, agricultural, and open space areas by protecting them from encroachment of land uses that would result in impacts from noise, noxious fumes, glare, shadowing, and traffic." (Riverside County, 2003).

According to the Riverside County General Plan (2003), "The population of Riverside County and its cities is expected to double between the years 2000 and 2020, growing by approximately 1.4 million people. Efficient land use may have growth strategically located into existing developed areas, thus minimizing development pressures on rural, agricultural, and open space areas." The MSHCP addresses permanent opportunities for habitat through land use policy. The RCIP does strive for the balance of its three parts: open space conservation, transportation and housing with some limits to insure open space is not less of a priority that the other two parts (Riverside County, 1999). The RCIP designates permanent public land habitat through county acquisition leading to no threat of land conversion in the future.

Our primary objective of this study is to analyze the RCIP policy and its impact on property values. This study's analysis assigns Riverside County as the treatment group where the RCIP has been implemented, and San Bernardino County as the control group where the RCIP policy has not been implemented. This study also compares residential property values for Riverside County before and after the county's involvement in the RCIP program. We use a hedonic model with spatial econometric techniques for the valuation of open space. These econometric models will be discussed further in the methodology section.

1.1. Literature review

The novelty of our paper is that we combine an investigation of the effect of open space proximity on residential property value with an investigation of the effect of open space preservation policy with a distinction between types of open space (wild habitat for endangered species versus developed parks). We investigate the effect of a county level endangered species habitat preservation policy with a basic premise supported by the literature of open space that is nearer to residential property is worth more than further away. We are able to show the marginal negative effect of greater distance from residential property to wild open space is absolutely larger in both a county with a preservation policy and one without.

Amidst the large literature on economic value of open space, few papers (for example, Cho et al., 2009) account for simultaneous changes in time and space with respect to open space and residential real estate values and others have not included a policy effect with their hedonic pricing investigation of value of open space. Cho et al. (2009) find the marginal effects of different measures of land amenities (lower housing density, greenways, parks and water bodies) on property value were statistically positive and significant. There is a statistically significant increase in the time periods they include (1989–1991 and 1999–2001). In their study, while the marginal effects of lot size and proximity to golf course were also positive and significant, they decreased from the first to the second time period. Brander and Koetse (2011) estimate the value of urban open space using meta-analyses of contingent valuation and hedonic pricing methods of existing literature including Anderson and West (2006), Geoghegan et al. (1997), Irwin (2002), Acharya and Bennett (2001), Poudyal et al (2009) who include a percentage of urban open space within a given buffer distance and Wu et al. (2004) who include explicit distance to open space. Brander and Koetse (2011) focus mainly on forests and urban parks for their open space variables. Increase in distance from open space has a negative and statistically significant impact on house prices.

The time series data used in our paper help capture changes in value of open space over time for a longer continuous time horizon than Cho et al. (2009) for open space that supports endangered species habitat unlike the open space in Cho et al. (2009) and in Brander and Koetse

(2011). For a time horizon of three years in one city, Corona, CA, Yoo et al (2017) estimate value from developed urban park open space amidst commercial and industrial areas and residential real estate. Prior studies reviewed by McConnell and Walls (2005) did not have a spatial weight matrix to take into account spatial correlation in the dependent variable (i.e. house price in this case) and error terms. Past studies in the large literature review by McConnell and Walls (2005) include cross sectional hedonic pricing and contingent choice methods instead of the dynamic and spatial approach we use.

Open space is clearly not a homogeneous good (Kroeger, 2008). We are able to distinguish between different types of open space where the distance change occurs to test the policy influence on the heterogeneous open space. With data of different residential real estate from 1996 to 2004, we conduct a spatial econometric analysis in this paper. The spatial weights in this analysis offer a useful framework for studying cross-sectional dependence with geographic distance changes (Anselin, 1988).

The data used in our study include real estate sales information for residential properties in Riverside and San Bernardino Counties over a significant time horizon. These are two neighboring counties with similar characteristics except for the RCIP policy in Riverside County and not in San Bernardino County. The data in our analysis provides information useful for conducting a study over time and space, both of which together are not accounted for to a considerable extent in the past hedonic studies. For example, the data used in Brasington and Hite (2008) is only for one year in Ohio. Although their data covers the spatial dimension, it does not provide any information on the temporal dimension. Furthermore, in the study by Nordman and Wagner (2009), although they use a time series data for 1999–2005, they limit their study only to the town of Brookhaven in Suffolk County, New York. Therefore, the authors focus only on the temporal dimension but not on the spatial aspect of the hedonic study.

Our study includes different zones across neighboring Riverside and San Bernardino counties sharing comparable demographic characteristics except for the RCIP policy, hence accounting for segmented markets even within counties. In this manner, we overcome the limitation that McConnell and Walls (2005) note about county level analyses in their hedonic pricing literature review. Estimates of open space values at a county level may lead to biased estimates as open space values differ by location and distance of open space from residential real estate (McConnell and Walls, 2005). Acharya and Bennett (2001) indicate the importance of the spatial scale to determine the value of open space variables. Our early view of small scale zones separately (Mukherjee and Fernandez, 2011) did not lead to a proper comparison across the entire two county dataset. The incomplete view lacks an evaluation with interaction terms to help gauge the change over time and space of residential real estate values between similar counties in all but habitat conservation policy occurring only in one.

We analyze the influence of open space variables on residential property values before and after the RCIP policy is implemented in Riverside County versus San Bernardino County, without any conservation policy. In addition to the quasi-experimental setting, our analysis divides the two county study region into several zones. These zones are paired across counties based on similar population size and date of establishment of municipalities and census information. This pairing helps control for factors from the last sentence in residential real estate aside from open space policy in one county. As observed by Kuminoff et al., (2013), households "sort" across neighborhoods according to their wealth and their preferences for public goods, social characteristics, and commuting opportunities. The aggregation of these individual choices in markets and other institutions influences the supply of amenities and local public goods. Our policy analysis is an improvement over previous studies to address what Kuminoff et al. (2013) suggest in terms of providing a pseudo experiment of a control and treatment context with the conservation policy. Our analysis is at a finer scale compared to previous studies that have looked at open space