Journal of Environmental Economics and Management 88 (2018) 311–326

Contents lists available at ScienceDirect

Journal of Environmental Economics and Management

journal homepage: www.elsevier.com/locate/jeem

Land preservation policy effect or neighborhood dynamics: A repeat sales hedonic matching approach

Linda Fernandez [a,*], Bowman Cutter [b], Ritu Sharma [c], Tom Scott [d]

[a] Department of Economics, Virginia Commonwealth University, VA, USA
[b] Department of Economics, Pomona College, USA
[c] Water Environmental Research Federation, USA
[d] Department of Environmental Policy, Science and Management, University of California, Berkeley, USA

ARTICLE INFO

Article history:
Received 23 May 2014
Received in revised form 26 December 2017
Accepted 2 January 2018
Available online 4 January 2018

Keywords:
Coarsened exact matching
Repeated sales
Open space
Neighborhood effects
Residential property

ABSTRACT

We offer an improvement on the traditional hedonic property value estimation by using a repeat sales matching estimator applied to a policy context where the distance to nearest permanently protected preserves changes over time. We use several strategies to control for unobserved heterogeneity with data from multiple transactions on the same residential parcels from Western Riverside County in Southern California. We have developed data on the conversion to permanent preserves over a 16-year period. We present an empirical strategy to differentiate geographically broad treatment effects from neighborhood unobservables using Coarsened Exact Matching.

Introduction

McConnell and Walls (2005) document hundreds of studies examining the value of land open spaces with one or more uses (golf courses, parks, habitat) as environmental amenities. The number of papers on the topic is partly driven by the policy debate over ecosystem preservation and the large number of land preserve referenda in recent years (The Trust for Public Lands, 2017). The large majority of these studies have used a static, cross-sectional hedonic analysis of residential properties to estimate the value of land environmental amenities such as habitat preserves among other uses. McConnell and Walls (2005) conclude that this approach lacks the dynamic perspective that would be required to address the change in land preserve values over time as well as space. Kuminoff (2009) and Parmeter and Pope (2013) identify the limitations of the static hedonic model and the repeated sales model as they both fall short of an actual measure of marginal willingness to pay for a change in amenity over time and space. The value of proximity to land preserves from cross-section or repeated cross section data where preserve areas are fixed and constant over the time period of the sample could result in biased estimates of value because preserve proximity could be correlated with unobservables such as landscape characteristics (soil quality) or house quality (wood or stucco construction material) that influence house values. Our study improves hedonic estimates by using a repeat-sales matching estimator applied to a policy situation where the distance to nearest permanently protected preserves changes over time. Land as open space in our empirical study might have been in its original state (preserve) for an

* Corresponding author.
E-mail address: lmfernandez@vcu.edu (L. Fernandez).

https://doi.org/10.1016/j.jeem.2018.01.001

unknown length of time without a policy designating permanence for endangered species habitat protection. The policy we analyze guarantees that the preserve is permanently protected to help endangered species habitat.

While proximity to preserves generally increases residential property value, land preserves are not generic and it should matter if the land is preserved in perpetuity for habitat versus land that could potentially be developed in the future. We study a case where, in an area experiencing rapid urban growth, existing open space was designated as a preserve in perpetuity for endangered species habitat. This is an atypical situation as few policies actually create permanent preserves. It is more common that policies change the probabilities of development of already open land or the distance to the nearest permanently preserved land. We aim to find out whether the housing market reacted to this change in information about permanent preserves. Smith et al. (2002) analyze protected land that is fixed in use (golf course, public parks) and adjustable in use (agricultural use now or vacant land). In that static study, it is found that the location of protected land is determined by market forces and will be sensitive to buyer expectations and endogeneity of land uses. Alternatively, some have found that the amount of preserves will not change when house prices change (Irwin and Bockstael (2001) and Walsh (2007)). Irwin and Bockstael (2001) and Walsh (2007) both cite ways in which government intervention into land management is regulated without a market. In their examples relating to forest land and wetlands, the supply side rather than the demand side is addressed.

A typical criticism of static, cross-section land hedonic pricing literature is that there is significant unobserved heterogeneity that could bias results. Kuminoff, Parmeter and Pope (2010) attempt to measure this bias with a Monte Carlo study that identifies gains in accuracy in estimating the marginal willingness to pay by changing the price function from a traditional hedonic model to include spatial fixed effects, flexible Box Cox specification, quasi-experimental identification and temporal controls for housing market adjustment. They conduct a Monte Carlo replication based on one North Carolina county and focus on showing the consequences of omitting a subset of neighborhood characteristics from the regression. The authors note that their Monte Carlo simulation is in place of an entire empirical dataset from dynamic decisionmaking under uncertainty. Instead, they simulate exogenous changes in commute time, demographics and distance to a park and then calculate a market equilibrium. Klaiber and Smith (2013) suggest a method similar to Kuminoff et al. (2010) that includes a market simulation to avoid biases in hedonic estimates arising from omitted variables.

Our paper is the first to use repeat-sales data with preserve designation changing over time from temporary to permanent status. This status change changes the distance to permanent preserves between property sales over time. We use several different strategies to control for on-site property changes, unobserved heterogeneity, and neighborhood observables. Our strategies also address what Abbott and Klaiber (2011) note as attention towards the scale of possible correlated omitted variables. In this paper we developed data on the conversion of temporary to permanent preserves over a 16-year period in Riverside County, California. Driven by Endangered Species Act requirements, the county maintained an active program of preserve acquisition from 1988 through the end of our sample period in 2004. Because of the length of the time period, we observe many properties being sold more than once. This allows us to use a repeat-sales/hedonic approach of Case et al. (2006), which is essentially a property level fixed effect. This fixed effects approach controls for any time-constant property or neighborhood influences. This is our first strategy for controlling for the unobserved heterogeneity that Kuminoff et al. (2010) find biased results. However, this approach does not control for neighborhood or property characteristics that may change over time. For properties, we conducted an in-depth analysis of property building permits and show specifications that drop properties with any significant permitted changes.

We use several strategies to control for neighborhood observables that may change over time. One possibility is that these changes could be related to initial neighborhood characteristics, so we control for characteristics at the census tract level in 1990. We also control for changes in census tract characteristics between property sales. Next, we use a placebo treatment approach. Our data has many properties that sold more than two times. This means that we observe many properties where the distance to permanent preserves changes between one pair of sales, but not for another pair of sales. If changing neighborhood level unobservables drives our preserve distance change results, than one would expect these unobservables to have an effect between sale pairs that have no permanent preserve distance change as well as those that do. We use a false treatment dummy to examine this hypothesis.

We also use the coarsened exact matching (CEM) (Iacus and King, 2012) method to compare properties that are similar in initial attributes. The addition of the permanent preserves can be viewed as an experiment with a treatment group where proximity to permanent preserve changes and a control group where the distance does not change. The CEM approach ameliorates both the unobserved heterogeneity and functional form problems identified in Kuminoff et al. (2010). The matching reduces any problem with changes in the unobservables that are related to initial conditions. Also, because, post-matching, the control and treatment observations are similar; much less weight is put on the functional form as relatively similar observations require less extrapolation from the functional form. Iacus and King (2012) call this a doubly-robust approach to estimation.

The use of repeat-sales data is beneficial because it allows an observation-level fixed effect, but introduces the complication of changing neighborhood attributes. A difficulty with controlling for neighborhood change is that the change may be a consequence of the permanent preserve designation. Indeed, if permanent preserve designation changes houses values, it is likely to do so through a change in the demographics of those who buy properties. Then, that new demographic may have a different preference for house attributes. Controlling for neighborhood change may well be controlling for the permanent preserve effect we wish to find. However, it could also be that permanent preserve designation tends to occur in areas where neighborhood demographics and housing are also changing, so that controlling for neighborhood change is necessary to