



# Wide open spaces: Estimating the willingness to pay for adjacent preserved open space<sup>☆</sup>



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## ARTICLE INFO

### JEL Codes:

Q15  
Q240  
Q260  
R520  
R580

### Keywords:

Open space  
Hedonic models  
Land preservation  
Home values  
Geographic information systems (GIS)

## ABSTRACT

Each year, millions of dollars are spent transitioning open space to protected status, yet we do not know the value that existing homeowners place on adjacency to these protected land parcels. Between 2000 and 2013, the Pennsylvania Game Commission acquired over 85,000 acres across the state of Pennsylvania, thereby providing a promise of future openness for adjacent homeowners. This paper exploits the timing and spatial variation of these acquisitions to identify the housing premium associated with open space preservation. Results suggest that preservation increases the average adjacent home value by between \$22,326 and \$31,178. I analyze various sources of this premium and conclude that it is driven by a preserved view and not new access to public land. Further, analysis comparing preservation of the land to continuing vacancy shows that preservation is tax-neutral for local governments.

## 1. Introduction

Estimating the willingness to pay for housing amenities has been central to urban and regional economics for decades. Rosen's (1974) seminal paper proposing methods to measure willingness to pay through hedonic modeling inspired an influential literature on the valuation of amenities. One key amenity in this literature is open space, and institutions used to protect open space have attracted increasing attention from scholars and policy makers. There has been an extensive amount of work that has been performed on open space, McConnell and Walls (2005) provide a comprehensive review of open space studies which includes the definition of the various open space institutions used in each study. Further, Bockstael and McConnell (2007) provide a review of economic approaches to valuing environmental amenities.

Between 1980 and 2007, wildlife and wilderness areas increased by 23 percent (USDA, 2011), suggesting that a significant amount of open space has transitioned into protected status. This paper focuses on the institutions behind open space protections and the increased impact on nearby housing values resulting from an introduction of a

guarantee for future openness using Pennsylvania Game Commission land acquisitions.

State, local, and federal government as well as conservation organizations and private land developers have an interest in protecting open space. Each of these examples provide a guarantee that the owners of the land or government will not develop this land. I note that these various institutions differ by permanence and strength. For instance, owners of parcels can petition municipalities to change the land's zoning status to residential, and thereby removing the guarantee with relative ease. Converting a state park, which is owned by the public, into a residential area would require a significant amount of effort within the existing legal and political framework. The distinctions between open space institutions have received less attention in previous studies. Existing literature tends to conflate various institutions, such as parks and conservancies, making it difficult to assess how the market values a guarantee with credible permanence.<sup>1</sup>

In this paper I utilize changes in boundaries of guaranteed open space generated by the Pennsylvania Game Commission, to measure the premium that is paid to have an adjacent parcel with preserved status.

<sup>☆</sup> This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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<sup>1</sup> For instance, Shultz and King (2001) identify housing premiums between both parks and wildlife habitats while Irwin (2002) analyzes premiums for private cropland, private pasture, private forest, private land (of any type) in easement status, and military land.

The existing homes benefit from the preservation of adjacent land, so I leverage this treatment in a straightforward manner. I compare housing sales before and after the acquisition between homes that are near and far away from the acquisition. This is a simple difference-in-differences approach to estimate the premium of the preservation on existing homes. Using game land acquisitions has several key advantages over previous work on permanent open space, which has generated mixed results.<sup>2</sup> First, hundreds of these parcel conversions occurred across the state between 2000 and 2013. Previous studies have utilized existing open space boundaries or a single conversion event (Bucholtz et al., 2003). This approach causes concern for unobserved variables being correlated with proximity to the open space. Secondly, these acquisitions were unexpected by the general public. The PGC publicly unveils their purchases after a contract is signed stating that the PGC has the right to purchase the parcel for an agreed upon price. Further, these acquisitions are unusually permanent because the PGC is legally barred from selling parcels to private homeowners. This legal permanence provides one of the strongest institutional guarantees of future openness available. The final benefit of using PGC acquisitions is that the purchases are targets of opportunity, thereby reducing endogeneity that may be associated with other open space institutions. For instance, the location of parks, which are paid for and voted on by the public, may be located in desirable areas. This correlation complicates the identification of a causal effect of open space (Irwin and Bockstael, 2001, 2004; McConnell and Walls, 2005).

Using geographical information software (GIS), I identify homes sales which are adjacent to a game land acquisition as well as home sales which are near the acquisition but not directly adjacent for application in a difference-in-differences empirical framework. Comparing the increase in average home prices between these two groups before and after the acquisition occurred provides a housing premium estimate for living adjacent to protected open space. I find robust evidence of a housing premium for guaranteeing adjacent land remaining undeveloped on home values. In particular, the conversion of open space to game lands increases adjacent home values between 20.4 and 26.2%. For the mean home value of \$119,000, this translates into an increase of \$24,326 to \$31,178 per home. This finding is robust to various definitions of adjacency. Then I examine possible channels driving this premium. Using two different approaches to disentangle the effect of a preserved view and the effect from newly accessible game lands, I find that the housing premium is being driven by the preserved view. Further I analyze the premium for heterogeneous lot sizes in an effort to determine if the preservation serves as a complement or substitute to a homeowner's personal lot size. I find suggestive evidence that the premium for the open space preservation is being driven by larger lot sizes, implying that the preserved open space is a complement to a homeowner's lot size. Finally, I find no evidence of a premium on commercial land sales, further underscoring the value of guaranteed views for homeowners.

These findings have significant economic implications. The results of my study suggest that game land acquisitions between 2000 and 2013 have generated between \$35,552,916 and \$45,428,726 of home value gains from the conversion to preserved status. Furthermore, my analysis suggests these gains have arisen from the guarantee of open space and not from changes in allowable land use. These results suggest that there

<sup>2</sup> Johnston and Duke (2007) use a stated preference survey to analyze willingness to pay for land conversion via various channels. They find that respondents significantly prefer state contracts over trust purchases and contracts, state purchases, and conservation zoning. Irwin (2002) shows that converting pastureland to conservation or public land provides positive benefits to neighboring house values while converting to a forested landscape has a negative premium. Shultz and King (2001) suggests living closer to areas such as wildlife habitats and large natural resources are positive amenities while undeveloped, neighborhood, and district parks are associated with a negative effect on nearby homes, likely from excessive use and foot traffic.

are large potential gains from simply clarifying land use definitions and developing institutions which can provide a credible guarantee against future development near residential areas. Lastly, the magnitude of the gains in home values provides support for keeping PGC land negotiations private in order to prevent speculation.

The paper proceeds as follows: Section 2 will present background on the Pennsylvania Game Commission & the context of the natural experiment and Section 3 will detail data and the definition of adjacency. Section 4 will discuss the econometric specification and Section 5 will provide a brief discussion of results. Section 6 will provide welfare and policy implications and Section 7 concludes.

## 2. Pennsylvania Game Commission & context of the natural experiment

In this section, I provide a brief history of the Pennsylvania Game Commission and describe the data on acquisitions I use. In the late 1800's, Pennsylvania's wildlife populations were ravaged by unregulated hunting, residential development, and pollution. Because of these concerns, the state authorized the game commission to purchase land to be used for wildlife refuges and hunting preserves in 1919. Since this time, the PGC has been actively acquiring tracts of land across all of Pennsylvania.<sup>3</sup> Game lands are public lands which are best known for providing hunting opportunities; however, the game lands also have walking trails and wildlife viewing areas that provide a usage for a broader audience than just hunters. The protected land that the PGC supplies is a public goods amenity. Radeloff et al. (2010) shows that some of the highest rates of housing growth in the United States is located near protected lands. Other research has looked at the development of agricultural lands and the spatial distance to protected versus unprotected open space (Irwin and Bockstael, 2004; Towe et al., 2008). These reasons suggest that game lands provide a positive amenity for those homeowners.

However, hunting for wild game is not without risks for hunters, people using the game lands for reasons other than hunting, and homeowners near the game lands.<sup>4</sup> This negative effect from the risks associated with having hunting activities close to a property would only lessen the likelihood of finding a housing premium associated with these acquisitions. Therefore, any effect found may be considered a premium which is the net effect of both the positive and negative amenity effect associated with the game lands.

Game lands are very common across Pennsylvania. There are existing game lands in 65 out of 67 counties, with Delaware and Philadelphia counties being the exception. Between 2000 and 2013, the PGC has acquired 386 different parcels totaling 85,182 acres. PGC land acquisitions are funded through mineral and oil revenue, hunting license revenue, and firearms sales. The lands the commissioners consider for purchase are scientifically examined for the benefit they can provide for wildlife management. This institution's lack of political influence sets it apart from other open space institutions such as parks and zoning ordinances. Zoning land for a specific use follows a political process and therefore not exogenously determined (Lui and Lynch, 2011; Adelaja and Gottlieb, 2009; Pogodzinski and Sass, 1994). The PGC acquisitions placed a credible promise of open views in the future.<sup>5</sup>

<sup>3</sup> Currently, the PGC has acquired 1.4 million acres of land across Pennsylvania. This amount of land is larger than the state of Delaware, which is 1.25 million acres in size.

<sup>4</sup> The hunter education program in Pennsylvania was implemented in 1959 and hunting related shooting incidents have declined by nearly 80 percent since then. In 2012 there were no firearm hunting fatalities and only 33 hunting accidents. (source: pgc.state.pa.us; Release #034-14).

<sup>5</sup> While there are instances of the PGC exchanging parcels, legally they can only trade land if the game commission has a substantial gain from the trade. This is usually reserved for when they are trading smaller isolated tracts for larger ones, or right-of-way roads for the public.

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