ENVIRONMENTAL LAND USE RESTRICTION AND PROPERTY VALUES

Jeffrey A. Michael[*] *& Raymond B. Palmquist*[**]

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INTRODUCTION

The effects of land use restrictions on property values is an important, cross-cutting issue in the fields of land use and natural resource management. Yet this issue has been under-examined, at least in a form that would be helpful to judges, legal advocates, regulators, conservationists, planners, and others who deal, in a variety of different

* Eberhardt School of Business, University of the Pacific. The authors are grateful to John D. Echeverria for useful comments and support during the research that generated this paper. The Packard Foundation provided financial support for the project.

** Department of Economics, North Carolina State University.

legal and policy contexts, with restrictions affecting land value. This article seeks to fill that gap.

In the United States, we employ a myriad of techniques to protect and manage private real property to achieve environmental goals. The focus of this paper is legal restrictions on the use of private property. Such restrictions can be imposed through legislative mandates, such as growth management laws, minimum lot size or density restrictions, agricultural, and open space zoning, and so forth.[1] They may also be imposed voluntarily through the donation or purchase of easements or other interests in land. Some legal restrictions are designed to endure in perpetuity (e.g., most conservation easements), while others are designed to remain in effect for a finite period (e.g., development moratoria).

It is widely assumed that legal restrictions can adversely affect the value of real property.[2] This premise underlies claims for compensation for regulatory takings under the federal and state constitutions, and legislative proposals to provide payments to land owners subject to legal constraints.[3] It also supports the tax deductibility of donations of interests in land under the tax code. However, contrary to this general assumption, restrictions may also positively affect land values, and the positive effects of restrictions may offset, at least in part, their negative effects. For example, a regulation can positively affect property values by limiting the supply of developable land and/or by enhancing environmental amenities that increase demand for property. The positive effects of legal restrictions can be felt by the properties subject to the restrictions (direct effects) as well as by properties not subject to the restrictions (indirect effects). A full and accurate accounting of the effects of legal restrictions on property values requires consideration of both the negative and positive effects.

The purpose of this article is to synthesize the current theoretical understanding of how legal restrictions affect land values as well as the results of the valuable (albeit limited) empirical research on this topic.

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1. *See, e.g.*, WILLIAM A. FISCHEL, DO GROWTH CONTROLS MATTER? A REVIEW OF EMPIRICAL EVIDENCE ON THE EFFECTIVENESS AND EFFICIENCY OF LOCAL GOVERNMENT LAND USE REGULATION 2 (Lincoln Institute of Land Policy 1990) (listing growth control devices used by local governments under their police powers); Alan W. Evans, *The Land Market and Government Intervention, in* HANDBOOK OF REGIONAL AND URBAN ECONOMICS 1637 (E.S. Mills & P. Cheshire eds., Elsevier Science 1999) (describing government intervention in land markets via controls on use of land); John M. Quigley & Larry A. Rosenthal, *The Effects of Land Use Regulation on the Price of Housing: What Do We Know? What Can We Learn?*, 8 CITYSCAPE: J. OF POL'Y DEV. AND RES. 69 (2005) (reviewing literature describing effects of various land use regulatory practices on property values).

2. William K. Jaeger, *The Effects of Land-Use Regulations on Property Values*, 36 ENVTL. L. 105, 105–07 (2006).

3. *Id.*

Section I provides a theoretical framework for understanding how legal restrictions affect property values, including descriptions of the supply and demand factors that determine land prices, the models economists use to understand the effects of legal restrictions in urban land markets, and the so-called "hedonic methodology" economists sometimes use to identify specific determinants of land value. Section I concludes with a description of a comprehensive analytic framework for understanding how land use restrictions affect land prices and urban form under different assumptions. Section II describes the results of various empirical studies that have been conducted to test theoretical predictions with actual market data under different policy scenarios. Section III seeks to reconcile the empirical findings with the theoretical predictions by drawing some general conclusions about how legal restrictions apparently affect land values, identify potentially fruitful areas for future research, and describe some of the broader legal and policy implications of our analysis. Section IV provides a short conclusion to the article.

I. THE THEORY OF HOW LEGAL RESTRICTIONS AFFECT LAND VALUES

This section lays out the theory of how legal restrictions on land use affect the value of private property and describes some models that help illustrate the effects of different policies on property values and urban form.

A. Land Use Supply and Demand

Regulations and other land use policies can affect supply in urban land markets by withdrawing land from residential or other uses. In simple terms, more restrictions are likely to mean less developable land. However, the effects of restrictions on the market for land may not be completely straightforward. For example, regulations may lead builders to change the ratios of land to structure that are used in constructing housing. In other words, if less land is available, builders may tend to build on smaller lots.

On the demand side, land use restrictions can provide a range of amenities that increase demand. These may include visual amenities, recreational opportunities, preservation of agricultural life styles, or just the satisfaction from knowing that land is being preserved in an undeveloped state. These amenities will positively affect the demand for land if valued by prospective purchasers of property in the community. Other policies affecting the degree of crowding in the community or the costs of transportation may also affect demand.

The logical next question is: how do supply and demand interact to determine land prices and shape urban areas?

B. Urban Land Models

Economists have developed simple models designed to represent the economic forces at work in urban land markets. These models are highly simplified versions of what are actually very complex systems. The primary value of these models is to illustrate how individuals may behave and how properties may be affected in urban markets, and to identify potentially interesting questions to be explored through empirical research.[4]

Models for urban land markets are more complex than models for other kinds of goods and services because location and spatial effects are crucial in models for urban land markets. In addition, market prices for land are the product of a number of complex factors: the different alternative uses for the land, the mobility of residents, the complexity of the primary commodity associated with land (housing), and possible effects that are external to the markets. Fortunately, fairly simple spatial equilibrium models have proven quite robust over the years.

The simplest model involves a monocentric urban area in which residents commute to work in the center of the area and live at various distances from the center. In reality, cities have many locations for work and shopping, and residents differ in income and other characteristics, but this type of model yields useful insights even if these complexities are ignored.

This model assumes that the typical individual derives satisfaction from all the many goods she consumes, including housing. All of the choices a person makes among all non-housing goods can be treated, for convenience, as a single good. Thus, the individual can be said to derive satisfaction (utility) from this composite good and from housing. Housing is a spatial good because location affects the level of services and the cost of the services. When an individual chooses a particular house, the person chooses not only the physical structure but also a physical location, the attractiveness of which is affected by, among other things, the quality of the surrounding environment. In addition, if one lives further out from the center, transportation costs are greater. They are less the closer one lives to the center.

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4. For a more technical survey of these models, see generally Jan K. Brueckner, *The Structure Of Urban Equilibria: A Unified Treatment Of The Muth-Mills Model*, *in* 2 HANDBOOK OF REGIONAL AND URBAN ECONOMICS 821 (E. S. Mills ed., Elsevier Science 1987).

If land prices, or land rent and everything else other than transportation costs, were the same at all locations, each individual would prefer to live closer to the center. As a result, this model posits that competition for close-in locations will bid up land prices, and that prices will therefore increase with proximity to the center. In addition, construction at locations near the center will use relatively less land and relatively more capital. Thus, the model predicts that the density (individuals per acre) will be higher near the center and lower near the outer edge of the urban area. Finally, the model predicts that, starting at the center, land values will at first fall rapidly as one moves out from the center but then fall more slowly further out. This is referred to as the rent gradient.[5] At the outer edge of the urban area, the price of land for urban use is expected to be equal to the price of land in agricultural use.

The reality in many urban areas generally conforms to this model. Except in some blighted areas near older central cities, land prices tend to be higher in urban centers and decline with distance from the center. In addition, the skyline of a city tends to be taller in the urban center, confirming the existence of a land price gradient and supporting the theory that higher land prices mean that structural capital (tall buildings) will be substituted for land.

Economists commonly elaborate upon this basic urban model in one of two ways. The first modification is called a *small open* urban model and the second is called a *closed* urban model.[6] Each of these models is based on a different assumption about the relationship between a particular urban area and the surrounding region. While neither model captures the complexities of the real world, they are useful theoretical constructs.

In the *small open* model, an urban area is assumed to be one of many urban areas in a larger region, and it is further assumed that residents can move easily among different urban areas. Under these assumptions, the level of satisfaction (utility) will be the same for residents in all urban areas. This is because otherwise, given the assumption of ready mobility, residents could always make themselves better off by moving to another city. An urban area is deemed *small* relative to the region as a whole if policy changes in that area will not affect land values across the region. In other words, even though a new policy in the small open urban area may affect prices for individual properties, it will not affect the overall pattern of

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5. William C. Wheaton, *Monocentric Models of Urban Land Use: Contributions and Criticism*, *in* CURRENT ISSUES IN URBAN ECONOMICS 107, 112 (Peter Mieszkowski & Mahlon Straszheim eds., 1979).

6. *See generally* A. Mitchell Polinsky & Steven Shavell, *Amenities and Property Values in a Model of an Urban Area*, 5 J. PUB. ECON. 119 (1976).

prices across the region. If a policy increases the attractiveness of an area, the outer limit of the urban area should expand as new people move in. Evaluating the impacts of a new policy in a small open city is relatively straightforward because an increase or decrease in the price of lands affected by the policy will provide a measure of all the benefits or losses from adoption of the policy. This is because, under the open urban area model, the level of satisfaction of the residents remains unchanged. Therefore, any change in land prices captures all of the effects of the policy change.

In the *closed* urban model, it is assumed that the area is not embedded within a larger region and that there is not easy migration in and out of the area. Thus, at any particular point in time, the population of the area is assumed to be fixed. Under this model, in contrast to the small open model, the level of satisfaction (utility) may vary in response to public policies. Moreover, if a new policy affects a substantial number of properties in a closed urban area, land prices may change throughout the area. The new policy may also result in a change in the location of the urban area's outer limit.

The differences between these models can be illustrated by the expected responses to various external events. For example, agricultural land owners might see their incomes rise as a result of an increase in commodity prices. Under the small open model, such an increase in agricultural income is expected to lead to an increase in agricultural land prices (rents) and cause the urban boundary to shrink (or to expand slower than it otherwise would) because land at the urban boundary is now more valuable in agricultural use. Under this model, a change in agricultural land prices will have no effect on the prices of urban land and housing. This is because the returns from ownership of urban land will be determined by conditions across the region. By contrast, a change in income levels throughout the community will have different effects. If income increases in a city, the limit of the urban area will expand, land and housing prices will increase, and housing density will increase. If transportation costs increase, the effects would be just the opposite of those felt from an increase in income.

The predicted effects under the closed urban model are more complex. If agricultural land prices increase, the urban boundary will shrink as it does under the open urban model. However, land and housing prices will now increase, as will density, because residents will be unable to move between cities as in the open model. If income increases, the urban area will again become enlarged and the price gradient will become flatter. This is because the increase in income will lead to an increase in the demand for housing

and land, which is cheaper farther from the center. Again, if transportation costs increase, the effect will be just the opposite.

In the real world, of course, public policies do not produce results that exactly match the predictions generated by either of these two stylized models, but they can provide guidance on potential effects of a policy. Whether one model or the other will be more useful in any particular case depends on the circumstances. For example, in the short run, the cost of moving between cities in response to a new policy is quite high. As a result, a closed city model may be more appropriate for modeling short-run effects. However, in the long run, movement between cities will occur for a variety of different reasons and the policy may affect many individual decisions about whether and where to move. Thus, an open city model may be more appropriate to predict long-term effects.

Furthermore, if a new policy affects only a small fraction of the properties in a particular urban area, it may be reasonable to assume that land prices elsewhere in the area will not change significantly. Because people can move within the urban area to adjust to the policy change, the open city model may be appropriate, even if the overall urban area is closed. This is analogous to the concept of a localized externality in hedonic studies.[7] On the other hand, if the policy affects a significant fraction of the properties within an urban area, then modeling the urban area as closed is probably more appropriate. For example, suppose a municipal government purchases fifty acres of undeveloped land for a park. Setting aside this open space may well influence the value of neighboring land. However, the affected lands will be a small part of the urban area, and establishing the park will probably not influence land prices in the area overall. It would probably be appropriate to evaluate such a government action using the small open model. On the other hand, if a growth boundary were established around an entire urban area, this policy might affect property prices throughout the urban area. The appropriate model in this case may be the closed model.

While these relatively simple models explain a great deal about the structure of urban areas, they are static in the sense that they provide a snapshot of an urban area at a particular point in time. However, many land use policies are specifically designed to respond to dynamic changes, such as the ongoing growth of an urban area. Some land use policy research has adapted the static models described above, while others have used dynamic

7. Raymond B. Palmquist, *Valuing Localized Externalities*, 31 J. URB. ECON. 59 (1992).

models.[8] Dynamic versions of these urban models incorporate changes in population and income over time and track the evolution of the urban area.

C. Hedonic Studies

The urban models discussed above produce housing by combining structural capital and land. These models do not consider variety in housing. To determine the effects of environmental amenities on property values economists generally turn to hedonic studies.[9] In simple terms, hedonic analysis seeks to estimate the value of a particular feature or characteristic of a differentiated market good, such as land or housing. For example, the price of a house varies with square feet of living space, age of structure, number of baths, lot size, location, and so on. Hedonic analysis seeks to isolate the contribution of the particular characteristic being studied to the good's value. In the case of housing this might be some feature of the structure (such as the presence of a fireplace) or some characteristic of the community (such as proximity to preserved agricultural lands). The basic features of urban economic models can provide insights in designing hedonic studies.

Both urban land models and hedonic models address land prices and other characteristics of the land, but they do so in very different ways. In urban models, spatial location is all important, whereas spatial location is only one of many factors studied in hedonic models. For example, the distance to a park or the distance to downtown may be included in a hedonic model, but these are only a few of the many determinants of property value. In addition, urban models generally treat housing services as a homogeneous product with a constant price at any given location. Hedonic models, however, generally recognize the diversity of housing by including many different characteristics of housing units.

As we discuss below, most of the empirical studies conducted to date addressing the negative as well as positive effects of regulatory action on property values have utilized the hedonic method.

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8. *See, e.g.*, William C. Wheaton, *Urban Residential Growth Under Perfect Foresight*, 12 J. URB. ECON. 1, 1 (1982); Masahisa Fujita, *Spatial Patterns of Residential Development*, 12 J. URB. ECON. 22–52 (1982); Dennis R. Cappoza & Robert W. Helsley, *The Fundamentals of Land Prices and Urban Growth*, 26 J. URB. ECON. 295–306 (1989).

9. *See generally* Sherwin Rosen, *Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition*, 82 J. POL. ECON. 34 (1974).

D. Theoretical Literature on Environmental Land Use Policies

There is a small body of theoretical literature that seeks to predict the effects of specific environmental policies—such as establishment of urban growth boundaries and open space programs—on land values and urban form. Generally speaking, the literature tends to support the expectation that land use policies are likely to have complex and sometimes conflicting effects.

An urban growth boundary can have two effects on land values within a city. First, it may restrict the supply of land within the city, and second, it may increase demand for land in that city. Much of the early literature focused only on the supply restriction. The supply restriction will raise land values for developed parcels but reduce land values for parcels outside the boundary where development is no longer allowed. On the developed parcels, there is no net societal gain from the supply restriction because the landlords' gain is offset by the loss to residents from paying higher rents. There is a net loss on undeveloped, restricted parcels since the landlords have lower land values and there are no residents to offset this loss.

However, the urban growth boundary may also affect demand, and this can increase property values and welfare. The increase in demand may result because the growth restriction mitigates negative externalities and congestion resulting from growth, or because it enhances amenities, such as open space. These demand effects would create a gain in the value of the unrestricted land, and they may also offset the loss on the restricted properties. To our knowledge, this point has not typically been raised. We return to this point in the next section.

One of the most accessible theoretical analyses of urban growth boundaries is by Engle, Navarro, and Carson.[10] They analyze the effects of growth controls on a small open city. Migration into and out of this city comes from elsewhere in the system of cities, and the changes in the small open city do not significantly affect prices in the rest of the system. However, changes in the rest of the system do influence the small open city. They assume an external shock in the other cities causes a drop in utility and results in migration to the small open city. By framing the problem in this way, they are able to analyze the inherently dynamic issue of growth in a static model. This growth (migration) causes land rents to be bid up in the small open city, and the urban boundary expands if there are no growth controls.

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10. *See generally* Robert Engle, Peter Navarro & Richard Carson, *On the Theory of Growth Controls*, 32 J. URB. ECON. 269 (1992).

If growth controls are imposed, the authors considered two possible scenarios. Under the first scenario, growth is assumed to have no adverse effects (congestion, pollution, etc.) on the community. While the urban growth boundary prevents the city from expanding, rents inside the boundary rise to the same level that they would without the growth boundary. This is because migration between cities means that utility levels are the same throughout the system. However, rents on land between the initial urban boundary and the boundary that would have existed if the city had been allowed to expand are lost. There is a net reduction in utility in the community when the growth control is imposed.

Under the second scenario, it is assumed that population growth in the small open city would produce various environmental harms, such as congestion. In the absence of an urban growth boundary, the city expands but the rent gradient becomes flatter as the population expands. This is because the congestion lowers utility, and this must be offset by a reduction in land rents. However, with the growth boundary, the increase in congestion is eliminated and total rents increase. Within the urban growth boundary, land rent will be higher than if the growth boundary had not been imposed. Thus, according to the theoretical model, a growth boundary can increase societal welfare even when land rents are lost on the land outside the urban growth boundary.

Bento, Franco, and Kaffine examine the effects of urban growth boundaries designed to control sprawl.[11] In their model, households directly receive satisfaction from what they refer to as open space, as well as housing and the composite good.[12] However, they restrict open space to be space at the urban boundary, deriving the marginal effect of different amounts of this type of open space on rents. They show, theoretically, that an urban growth boundary can increase land rents and have positive net welfare effects. Using numerical simulations to illustrate the effects of their model, they find that restricting development on 12% of the land would provide the greatest net benefit. Obviously, the optimal level of restriction estimated by the model depends on the assumed values of its parameters, but the simulation demonstrates the possibility of welfare enhancing regulations in the presence of externalities.

While the preceding articles use a static approach, Brueckner employs a dynamic approach to analyze the effects of growth control measures.[13] He

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11. Antonio Bento, Sofia F Franco & Daniel Kaffine, *The Efficiency and Distributional Impacts of Alternative Anti-Sprawl Policies*, 59 J. URB. ECON. 121–41 (2006).

12. *Id.* at 133.

13. Jan K. Brueckner, *Growth Controls and Land Values in an Open City*, 66 LAND ECON. 237, 237 (1990).

assumes an open urban area and a population externality to represent the adverse effects of population growth on current residents.[14] He concludes that a growth control policy increases the value of developed land because reducing the population externality increases future rents. With undeveloped land, he finds two countervailing effects. The growth control slows development, delaying the higher land rents that development would provide. On the other hand, he also finds that growth control exerts a positive influence on property values once the growth control is eased and development is allowed.

Yang and Fujita develop a model where an open space policy provides utility directly but also removes land from residential use.[15] They assume that open space is a pure public good for those who live at the same distance from the central business district as the open space, and that it is not valued by those at other distances.[16] They then solve for the optimal open space and also for the market outcome. They conclude that the optimal distribution of open space is in pie-shaped wedges emanating from the central business district and alternating with pie-shaped wedges of residential land. They also conclude that the market solution fails to achieve this because the open space is a public good and thus underprovided.

Minimum lot size requirements are widely used by communities to preserve community open space, but we are not aware of any economic studies that consider the possibility that larger lot sizes may confer benefits on surrounding residents. Most of the theoretical work on minimum lot size requirements examines their effect on municipal finances.[17] This appears to be one of the gaps in the economic literature relating to the effects of environmental restrictions on property values, a topic to which we return in the final section of this paper.

E. Towards a Comprehensive Predictive Model

With this understanding of the theory describing how government polices affect land values and urban form, it is possible to construct a

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14. *Id.* at 237–38, 246–47.

15. C. H. Yang & M. Fujita, *Urban Spatial Structure with Open Space*, 15 ENV'T & PLAN. A 67 (1983).

16. *Id.*

17. S. Bucovetsky, *On the Effects of Minimum-Lot-Size Zoning*, 15 ECON. LETTERS 189–93 (1984); Vernon J. Henderson, *The Impact of Zoning Policies Which Regulate Housing Quality*, 18 J. URB. ECON. 302, 309–10 (1985); Geoffrey K. Turnbull, *A Comparative Dynamic Analysis of Zoning in a Growing City*, 29 J. URB. ECON. 235–48 (1991).

comprehensive analytic framework to predict how land policies may affect real estate prices.

First, this framework draws a distinction about the expected consequences of a land use or environmental policy depending upon whether or not it generates an *amenity effect*. This generic term is intended to refer broadly to the effects of policies that provide environmental benefits or preclude environmental deterioration. If there is no amenity effect, then the model posits that land use policies can positively affect land values only through supply restrictions, where the supply of land for certain types of uses is limited.

Second, the model draws a distinction between the *direct* and *indirect* effects of public policies on land prices. For example, a policy has a direct effect on land that is outside an urban growth boundary and cannot be developed, but that otherwise would have been developed. Similarly, minimum lot size zoning has a direct effect on lands subject to the zoning restrictions. On the other hand, public policies also have indirect effects on lands that are affected by the policies but are not directly subject to them. For example, land prices inside an urban growth boundary may be indirectly affected by an urban growth boundary and unzoned lands may be indirectly affected by zoning of other lands.

Under the open city model, if there are no amenity effects, the prices of lands directly affected by a land use restriction will fall. This is to be expected because the land can no longer be developed or can no longer be developed as intensively. The prices of lands that are not directly affected will not change if there are no amenity effects. As a result of the open city assumption, price levels of these lands are determined by the broader economy and are not influenced by the policy.

In contrast, if there are amenity effects, the predictions are quite different. The effect on the land that is directly affected depends on the policy. If land is completely withdrawn from urban use, the price of this land will decrease. However, if some development is still possible, there will be two effects moving in opposite directions. The supply restriction still reduces land prices, but the amenity effect will cause prices to move in the opposite direction. The net effect is indeterminate as a matter of theory and has to be determined empirically. If an empirical study found no effect or a positive effect from a policy on the value of directly affected lands, this evidence would suggest an amenity benefit from the policy.

When one considers the properties indirectly affected, the ambiguity disappears. If there is an amenity effect, it will lead to an increase in the prices of parcels that indirectly benefit from the policy. Thus, there are two potential tests for an amenity effect. First, if the policy has a non-negative effect on properties directly affected, this is evidence of an amenity effect.

Alternatively, if the policy has positive effect on properties that are indirectly affected, this also shows an amenity effect.

Under the closed city model, the predictions are a little different, and one of the tests described above no longer works. If there are no amenity effects, the prices of properties directly affected will still decline. But the prices of properties that are not directly affected will now rise, rather than remain unchanged as in the open city case. This is due to the fact that supply restrictions, when they are binding, should increase land values. This makes an empirical test of the amenity effect on properties indirectly affected more difficult because the supply restriction moves land prices in the same direction as the amenity effect.

If there is an amenity effect under the closed city model, properties that are directly affected will exhibit two countervailing effects: a positive amenity effect and a negative supply restriction effect. If the amenity effect is strong enough on these properties, land prices may be unchanged or increase as before. The amenity effect on properties that are indirectly affected will still be positive, but so is the supply restriction effect. Unless one can separately measure these effects, one cannot conclude unambiguously that there is or is not an amenity effect. On the other hand, in an empirical study, if the amenity effect is localized and the supply restriction affects a larger area, it may be possible to disaggregate the amenity effect from the supply effect.

Model	Properties Directly Affected by the Regulation	Properties Indirectly Affected by the Regulation
Open city, no amenity effect	Decrease	No Change
Open city, amenity effect	Uncertain	Increase
Closed city, no amenity effect	Decrease	Increase
Closed city, amenity effect	Uncertain	Increase

Table 1.

The table above summarizes the model's predictions of how legal restrictions affect land prices. In every case, the impact on indirectly affected properties is more positive than on directly affected properties. Indirectly affected properties increase in price in all scenarios, except under the open city model, under the assumption that there are no amenity effects

when the effect is neutral. So long as regulations are assumed to have some positive amenity effect (a reasonable assumption in many cases), the model indicates that the net effect of the restriction on directly affected properties is uncertain. In other words, the actual effects of environmentally protective polices on directly affected lands can only be definitively settled through empirical research.

These results highlight the importance of the caution offered by Jaeger about not confusing positive impacts on indirectly affected properties with negative effects on regulated properties.[18] If land prices are higher on unrestricted (indirectly affected) properties than restricted (directly affected) properties, the difference is likely to be due to, at least in part, the positive effect of the restriction on indirectly affected properties. Thus, the difference cannot properly be attributed to a negative impact of legal restrictions on land values. Only if a policy fits the open city model and there is no amenity effect can the price difference be taken to measure the negative effect of legal restrictions on restricted landowners.

II. EMPIRICAL STUDIES OF THE EFFECTS OF LEGAL RESTRICTIONS ON LAND VALUES

Empirical analysis of real property markets is critical to validating the foregoing theoretical predictions, determining the net impact on real property prices in situations where there are offsetting negative and positive impacts, and determining the magnitude of any gains or losses associated with restrictions. We first discuss some of the methodological challenges these types of studies present, and then turn to a summary of the findings of the most pertinent studies.

A. Methodological Challenges

It is important to distinguish between traditional appraisal techniques for measuring the effects of legal restrictions on land values and the approach to this issue generally taken by economists. The most common appraisal technique is to examine a small group of comparable sales, whereas economists generally use large samples of data and statistical models. The comparable sales approach to appraisals identifies a small number (typically three) of recently sold properties that are most like the property being appraised. Then, the appraiser makes adjustments in value

18. *See* Jaeger, *supra* note 2, at 105–07 (making the distinction between "the effect of a land-use regulation on property values and the value of an individual exemption to a land-use regulation").

for the differences in the attributes between the comparable properties and the property being appraised. If the difference is in a common attribute, such as number of square feet of heated area, appraisers have reliable evidence on the necessary adjustments.

However, for legal restrictions and environmental amenities, the comparable sales approach has many problems. Unlike physical property characteristics such as a bathroom or fireplace, many environmental and land use restrictions affect supply and demand in the entire market. As discussed in the previous section, environmental regulations can have significant positive indirect effects on the value of parcels that are not directly subject to the regulation. Thus, the difference in observed values between comparable restricted and unrestricted parcels reflects both direct and indirect effects, and appraisals based on comparable sales will overestimate the effect of environmental restrictions on property values.

When comparable sales of restricted parcels are not available, appraisals will sometimes use an income approach to estimate a property's restricted value. For example, development could be restricted on a parcel, but agriculture or other income producing uses are still allowed. The restricted value of the property would be set at the present value of estimated future cash earnings of the parcel. The income approach will also lead appraisals to overestimate the effect of environmental restrictions because it ignores the contribution of environmental amenities to the restricted properties value and includes indirect positive effects on unrestricted properties like the comparable sales approach.

Economists prefer to use hedonic studies of actual transactions and consider as many characteristics of the properties as possible. They seek to use estimators that control for the various factors that remain unobservable. Ideally, they would be able to use data from before and after the restriction was imposed. Such techniques will potentially allow the price effects of a restriction to be separated into the effects due to supply restriction, amenity creation, and external effects from other properties.

Hedonic studies use regressions, where land values or property values explain the characteristics of the properties, including the regulations which restrict the use of the property. However, there are often other unobserved factors influencing land values, and this can create a statistical problem known as endogeneity. If an explanatory variable such as the presence of a land use regulation is correlated with important, unobserved variables, the endogeneity problem can create unreliable results. For example, a regression may show that development restrictions have positive impacts on property prices, but if wealthier communities are more likely to adopt restrictions, the regression could be measuring, at least in part, the impact of unobserved community characteristics such as affluence rather than the

effect of the restriction itself. To use another example, a regression showing that conservation easements have no adverse impact on property values may be misleading if properties placed under conservation easement tend to be higher priced for unobserved reasons. Much of the earlier empirical research did not adequately address the problem of endogeneity.[19]

Empirical studies can attempt to account for endogeneity in several ways. One technique uses a two-step method where the first step estimates the probability that the regulation is imposed based on the attributes of the land and community, and the second step regresses property values against characteristics and incorporates results from the first step to control for the endogeneity.[20] Another technique replaces the regulation variables with instrumental variables that are correlated with the regulation variable but not with the unobserved components of the error term of the regression.[21] Unfortunately, such instruments are often difficult to identify, limiting the effectiveness of this technique. Finally, matching models can be used to attempt to match properties that are subject to a restriction with properties that are as similar as possible, but which are not subject to the restriction.[22]

Yet another challenge for hedonic studies is the paucity of relevant data. Data on vacant land prices are limited because unimproved properties represent a small fraction of the properties in most markets and they sell relatively infrequently. While there is a much larger volume of data on housing prices, and land values can sometimes be derived from housing data, this type of computation can be fraught with difficulties. Ideally, our review of the relevant literature would be limited to studies of vacant, unimproved land that account for potentially endogenous regulations. Unfortunately, there are few studies that meet these criteria, as discussed below.

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19. *See* John M. Quigley & Larry A. Rosenthal, *The Effects of Land Use Regulation on the Price of Housing: What Do We Know? What Can We Learn?*, 8 CITYSCAPE: J. OF POL'Y DEV. & RES. 69 (2005) (noting that "most studies ignore the 'endogeneity' of regulation and price"); Keith R. Ihlanfeldt, *The Effect of Land Use Regulation on Housing and Land Prices*, 61 J. URB. ECON. 420, 421 (2007) (critiquing land use regulation literature).

20. Raymond B. Palmquist, *Property Value Models*, *in* HANDBOOK OF ENVIRONMENTAL ECONOMICS, VOLUME 2, at 763, 763 (K.G. Mäler & J.R. Vincent eds., 2005).

21. *Id.* at 801.

22. James J. Heckman, Hidehiko Ichimura & Petra E. Todd, *Matching As an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Program*, 64 REV. ECON. STUD. 605 (1997); Sandra E. Black, *Do Better Schools Matter? Parental Valuation of Elementary Education*, 114 Q.J. OF ECON. 577 (1999).

B. Urban Growth Boundaries

In the absence of amenity effects, theory suggests that the expected direct effects of an urban growth boundary will be a decrease in land prices in the restricted zone outside the boundary and an increase or no change in the prices of unrestricted lands inside the boundary. However, theory also suggests that the negative effects could be offset by positive amenity effects if the boundary reduces negative externalities associated with pollution and congestion that would have been generated by additional development in the absence of the boundary. The relatively few empirical studies on growth boundaries, mostly focused on Oregon, provide mixed support for these theoretical predictions.

Knapp studied the consequences of Portland, Oregon's urban growth boundary (UGB) on the value of vacant land using data from about four years after the UGB was originally drawn in the mid-1970s.[23] Only land within the UGB could be converted to urban use before some future date.[24] An intermediate growth boundary (IGB) was also established that was inside the UGB. There were restrictions on development outside the IGB and inside the UGB, but these restrictions were subject to local control and were expected to apply over a shorter time period. Knapp also distinguished between urban and nonurban use by the density of development allowed (4.4 units per acre). In Washington County, Knapp found evidence that non-urban zoned lands had significantly lower values than urban zoned lands, regardless of location. In addition, nonurban lands outside each of the boundaries had lower prices than inside the boundaries, but the effect of the IGB was only slightly less than the effect of the UGB. In Clackamas County, the results were less clear cut. The urban-nonurban difference was not significant, and only nonurban lands outside the UGB had significantly lower values. He attributed this to differences between the counties as to how strictly the IGB was enforced. Unfortunately, he lacked data on land sales prior to adoption of the growth boundary. This makes it difficult to draw conclusions about whether these differences were the result of a rise in land values inside the boundaries or a decline in values outside the boundaries, or both.

In a later study, focused primarily on housing costs, Phillips and Goodstein described local government reports of a sharp differential in

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23. Gerritt J. Knapp, *The Price Effects of Urban Growth Boundaries in Metropolitan Portland, Oregon*, 61 LAND ECON. 26, 26–27, 30–33 (1985).

24. *Id.*

average per acre land values at the urban growth boundary.[25] However, their regression model is based on a cross-section of the median price of housing in thirty-seven cities. Thus, it is not well designed to address the question of the relative effect of the UGB in Portland and certainly could not show whether any price differences reflected increased prices inside the boundary or decreased prices outside the boundary, or both.

More recently, Jaeger and Plantinga looked at the impact of growth boundaries on vacant land price trends in three Oregon counties and compared them with trends in two Washington counties that did not have such controls.[26] Their sample included smaller urban areas with growth boundaries such as Eugene and Medford-Ashland and did not include counties in the Portland area.[27] Instead of using a hedonic model, they compiled a lengthy time series of assessed and appraised values for vacant land parcels before and after the implementation of growth boundaries. Examining average land values over several decades, they found no change in the rate of land value appreciation inside and outside urban growth boundaries. They also found no change in appreciation rates when comparing prices of restricted lands in Oregon to a set of similar counties in Washington without growth boundaries. They concluded that these results could be explained by the fact that boundaries are set so that they do not impose a binding constraint on the total amount of growth and development in an area and an adequate supply of developable land exists within the growth boundaries. These results could also be explained on the basis that the negative direct effects of regulation were largely, if not entirely, offset by positive indirect effects.

C. Minimum Lot Zoning

Beaton looked at zoning impacts on vacant land in the Pinelands region of New Jersey.[28] For the most restrictive zones, he found that vacant land prices increased greatly compared to control areas between 1972, when the restrictions were originally proposed, and 1981, when they finally took effect.[29] Following the implementation of restrictive zoning, vacant land

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25. Justin Phillips & Eban Goodstein, *Growth Management and Housing Prices: The Case of Portland, Oregon*, 18 CONTEMP. ECON. POL'Y 334 (2000).

26. *See generally* William K. Jaeger & Andrew J. Plantinga, Oregon State University Extension Service, Special Report 1077, *How Have Land-Use Regulations Affected Property Values in Oregon?* (2007).

27. *Id.* at 6.

28. Patrick W. Beaton, *The Impact of Regional Land-Use Controls on Property Values: The Case of the New Jersey Pinelands*, 67 LAND ECON. 172, 172 (1991).

29. *Id.* at 190–91.

prices in the preservation area decreased to a level similar to that in the control areas. In contrast, the areas in the Pinelands zoned for development greatly increased in value after restrictions were imposed in 1981. Beaton's results suggest that the price differential between more restricted and less restricted parcels is more the result of regulations increasing values in the development zone than decreasing values within the restricted zone. His results also illustrate how pressure to develop before restrictions are imposed can temporarily boost land values in areas targeted for future regulation.

Several other studies have examined the impact of agricultural preservation zoning on farmland values. Vaillencourt and Monty looked at the effect of agricultural preservation zoning instituted in Quebec, Canada in the late 1970s using a regression model.[30] They did not allow the effect of the zoning to vary based on location and parcel characteristics, and as a result their model simply gives an average impact of zoning across all properties. Using data on over 1200 vacant land sales, they found that agriculturally zoned land sold for 15–30% less than unzoned land.

Henneberry and Barrows were interested in the potential positive effects of exclusive agricultural zoning in Wisconsin for properties that had little development potential.[31] First, using data on both parcels that were developed and parcels that were not developed, they used discriminant analysis to develop a prediction equation for development potential.[32] They then used this to predict the development potential for vacant parcels. Next, they selected parcels with little development potential for their regressions. They ran separate regressions for parcels that had exclusive agricultural zoning (EAZ) and for those that did not. They used the regression results to predict the value of various parcels with and without EAZ. EAZ was shown to provide an increase in sales price for larger parcels further from towns. For some smaller parcels close to towns the effect was negative, a result they attributed to possible misclassification in the discriminant analysis.

Beaton and Pollack studied the effects of Maryland's adoption, in the 1980s, of critical area building restrictions in coastal areas bordering Chesapeake Bay.[33] They did not find a significant decrease in the prices of

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30. *See generally* Francois Vaillancourt & Luc Monty, *The Effect of Agricultural Zoning on Land Prices, Quebec, 1975–1981*, 49 LAND ECON. 36 (1985).

31. David M. Henneberry & Richard L. Barrows, *Capitalization of Exclusive Agricultural Zoning into Farmland Prices*, 66 LAND ECON. 249, 249 (1990).

32. *Id.* at 252.

33. Patrick W. Beaton & Marcus Pollock, *Economic Impact of Growth Management Policies Surrounding Chesapeake Bay*, 68 LAND ECON. 434, 434 (1992).

vacant land within the coastal zone, but did find increases in the prices of both vacant and residential developed lands in some areas in close proximity to employment centers, supporting the inference that positive amenity and supply constraint effects may have exceeded the negative direct effects of restrictions.[34]

In another study, Parsons examined the impact of the Maryland coastal restrictions on housing prices and found that the restrictions increased waterfront values by 50% and the value of homes located in the restricted critical area by about 20%.[35] Parsons showed large amenity effects and supply restriction effects on housing, but it is difficult to infer from his data whether these impacts would offset the negative effects of restrictions on undeveloped land.

Spalatro and Provencher looked at the impact of minimum frontage restrictions on the value of undeveloped waterfront land in Wisconsin.[36] During the study period, the state had a minimum 100-foot frontage rule for developing lakefront lots, but seven towns adopted local regulations with 200-foot frontage requirements, covering about one-third of the approximately 900 undeveloped property sales in the sample. The increase in the frontage requirement would eliminate the possibility of subdividing lots with 200 to 400 feet of frontage. The authors call this the *development effect*, and its effect on lot price should be negative in that range of frontage. However, this development effect may be offset by enhanced lake amenities (e.g., water quality, views, boat traffic, etc.) when other lots on the lake face the same restrictions. The results produced some evidence of a negative development effect, but the positive amenity effect of the restrictions clearly dominated it. Lakefront land values increased by about 20%.

However, it should be noted that these estimates do not take into account the possibility that increased restrictions could be endogenous. Coastal and lakefront building restrictions of the kind examined in the studies described above may be more likely to be adopted in areas with more valuable land because of unobserved characteristics. Amenity effects may be overestimated because of this endogeneity. Restricting waterfront building on a lake provides the largest amenity benefits to exactly the landowners who are regulated. By contrast, other kinds of restrictions, such

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34. *Id.* at 451–52.

35. George R. Parsons, *The Effect of Coastal Land Use Restrictions on Housing Prices: A Repeat Sale Analysis*, 22 J. ENVTL. ECON. & MGMT. 25, 35 (1992).

36. *See generally* Fiorenza Spalatro & Bill Provencher, *An Analysis of Minimum Frontage Zoning to Preserve Lakefront Amenities*, 77 LAND ECON. 469 (2001).

as general building restrictions designed to slow growth or protect open space (e.g., an urban growth boundary), may have less direct benefits.

A few studies have attempted to use the effect of zoning on housing costs to examine the effect of the restrictions on land values. For example, in a recent paper, Hardie, Lichtenberg, and Nickerson examined the value of lands subdivided for development.[37] They used sales data for these properties to construct a dependent variable that subtracted the tax-assessed value of structures from the real sales price of the properties, summed this residual value across all sales within the subdivision, and divided by the total size of the subdivision to get an average price per acre for each subdivision. The resulting values had a very wide range, from $15,000 per acre to $3.25 million per acre, averaging $569,000 per acre with a standard deviation of $528,000 per acre. The authors found that increasing the amount of forested land within the subdivision, as required by the Forest Conservation Act, provided amenities that were valued more highly than the opportunity cost of the forested land. On the other hand, increasing the minimum lot size or reducing the maximum density had negative effects. The magnitude and variance of these calculated land values appear problematic and it is difficult to compare these results to the results of other studies. In addition, the results were influenced by reliance on tax assessors' evaluations of structure value, which may or may not have been accurate.

D. General Building Restrictions, Wetlands, and Watersheds

Rather than focusing on a single regulation, several studies constructed indexes of the stringency of municipal building restrictions to explain differences in real estate values between cities. For example, the researcher will count the number of different types of restrictions—such as impact fees, minimum lot zoning, or building permit caps—employed by a given city and use this as an index in a hedonic regression model. A majority of these studies are set in California and generally address the effects of restrictions on housing costs. However, a few of the studies look at vacant land sales. For example, a recent paper by Ihlanfeldt examined both improved and vacant property sales in a broad cross-section of Florida cities that employ varying numbers of building restriction measures.[38] His restriction index was simply the number of different restrictions the

37. *See generally* Ian Hardie, Erik Lichtenberg & Cynthia J. Nickerson, *Regulation, Open Space, and the Value of Land Undergoing Residential Subdivision*, 83 LAND ECON. 458 (2007).

38. *See generally* Keith R. Ihlanfeldt, *The Effect of Land Use Regulation on Housing and Land Prices*, 61 J. URB. ECON. 420 (2007).

community imposed, and he found that more stringent growth restrictions correlated with high income and education levels in the jurisdiction. Because of this, the regulation index may be correlated with unobserved characteristics of the properties and communities. To correct for this endogenous effect, he used an instrumental variable method. He concluded that restrictions decreased land values and increased house prices. Each additional restriction was found to decrease average land values in a jurisdiction by approximately 14%, yet it increased the value of an average house by 7.7%. While the study is carefully done, the restriction index is somewhat problematic because it gives equal weight to widely divergent restrictions. Also, vacant land prices are typically a nonlinear function of acreage, but that is not controlled for in this study and may affect the results. Finally, if vacant land prices depend on the restriction index, then an interaction term between lot size and the index may be required in the house price equation.

A recent study by Chamblee, Dehring, and Depken examined the impact of watershed development restrictions on vacant land prices in western North Carolina.[39] To protect the quality of freshwater supplies, the state of North Carolina passed a Water Supply Watershed Protection Act requiring local governments to adopt a minimum two acre lot size in designated watersheds.[40] Unlike the waterfront development restrictions discussed in the previous section, the local amenity benefits of the restrictions are likely to be smaller because most of the regulation's environmental benefits accrued to downstream water users. Using a hedonic model, they found that the parcels most restricted by the regulation, those under four acres that could no longer be subdivided, incurred a 34% reduction in prices.[41] They found no evidence of amenity or scarcity effects boosting local property values as a result of the regulation.

There are a small number of recent studies examining the impact of wetlands designations on property values. Since wetland regulation of individual properties is outside the control of the local political process or landowners, the regulation can be considered exogenous. Importantly, the properties containing wetlands might be less valuable in the marketplace even in the absence of regulations. For example, wetland properties may require costly drainage to develop even if it were permitted, or may be less productive for agriculture.

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39. John F. Chamblee, Carolyn A. Dehring & Craig A. Depken, *Watershed Development Restrictions and Land Prices: Empirical Evidence from Buncombe County North Carolina* (Working Paper, 2007), *available at* http://ssrn.com/abstract=998901.

40. Water Supply Watershed Protection Act, N.C. GEN STAT. § 143-214.5 (2007).

41. Chamblee, Dehring & Depken, *supra* note 39, at 16.

Shultz and Taff looked at vacant farmland in North Dakota.[42] Their estimates show that the presence of wetlands reduced the value of agricultural land by about 40%.[43] There is no development pressure in this area of North Dakota, so the effect (if any) of restrictions on the value of productive agricultural use would be largely negative. There is little potential for offsetting positive impacts from amenities or limiting the supply of developable land. Guttery, Poe, and Sirmans found that wetlands regulations decreased the value of multi-family housing properties by about 8% outside Baton Rouge, Louisiana.[44] Kiel estimated that single family homes on wetland regulated parcels sold for about 4% less than comparable unregulated properties in Newton, Massachusetts.[45] The coefficient is marginally significant, but it is not possible to tell if the effect is because of the wetlands or the regulation.

A related study by Netusil considered environmental zoning, including wetlands, riparian corridors, and upland forest in Portland, Oregon.[46] There are two classifications for environmental zoning: environmental protection (p-zone) and environmental conservation (c-zone), with the former being more stringent.[47] Netusil included all types of zoning and a wide variety of amenities as well as the traditional hedonic variables. This allowed her to attempt to separate the regulations' effects from the amenity conditions. She also subdivided Portland into five geographic regions and considered the effects separately in each of the regions. The results for the coefficients of the environmental zoning variables were positive and significant, negative and significant, or not significant depending on the zoning and region of the city, so no general conclusions could be reached. If all environmental zoning categories were combined, there was some evidence of a negative effect from environmental zoning, with the effect being greater on large lots.

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42. Steven Schultz & Steven Taff, *Implicit Prices of Wetland Easements in Areas of Production Agriculture*, 80 LAND ECON. 501 (2004).

43. *Id.* at 508.

44. Randall S. Guttery, Stephen L. Poe & C. F. Sirmans, *An Empirical Investigation of Federal Wetlands Regulation and Flood Delineation: Implications for Residential Property Owners*, 26 J. REAL EST. RES., 299 (2004).

45. Katherine A. Kiel, *The Impact of Wetlands Rules on the Prices of Regulated and Proximate Houses: A Case Study* 1–2 (New England Public Policy Center at the Federal Reserve Bank of Boston, Working Paper 07-3, 2007), *available at* http://www.bosfrb.org/economic/neppc/wp/2007/neppcwp0703.pdf.

46. Noelwah R. Netusil, *The Effect of Environmental Zoning and Amenities on Property Values: Portland Oregon*, 81 LAND ECON. 227 (2005).

47. *Id.* at 227.

E. Conservation Easements

There are many studies that examine the positive effects of protected open space on values of nearby properties.[48] These studies demonstrate a clear positive amenity effect from permanent development restrictions on private lands through conservation easements and from publicly owned open space in parks or preserves. They raise the issue of how conservation easement restrictions may affect not only the value of nearby properties but also the value of properties encumbered by easements.

Compared to regulations, conservation easements should generally have a negative impact on property values. This is because conservation easements place restrictions on potential uses of a property and generally restrict only a single property or a few properties. As a result, one would not anticipate any offsetting positive impact from supply restrictions, and amenity effects would occur only if neighboring properties also participated, which is not guaranteed under most programs.

Because donated conservation easements are voluntary on the part of the landowner, it is especially critical to control for endogenous effects. It is not clear whether higher or lower value properties are more likely to engage in conservation easements. On the one hand, a landowner may have a greater incentive to put properties with low development value under easement. On the other hand, high-income landowners have a much greater incentive to donate easements because the tax benefits are much larger for individuals with large tax liabilities.

All of the recent studies of conservation easements have attempted to control for endogenous effects, although the approach differs between studies. Nickerson and Lynch, and Anderson and Weinhold use two-step Heckman models, Michael utilizes properties with easements placed after the time of sale, and the most recent studies by Lynch et al. use propensity score methods to match similar easement and non-easement properties.[49]

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48. *See, e.g.*, Gayatri Acharya & Lynne Lewis Bennett, *Valuing Open Space and Land-Use Patterns in Urban Watersheds*, 22 J. REAL EST. FIN. & ECON. 221–37 (2001) (describing the effect of land use variables such as open space on the value of residential property); *see also* Jacqueline Geoghegan, *The Value of Open Spaces in Residential Land Use*, 19 LAND USE POL'Y 91–98 (2002) (examining the relationship between different types of open spaces and housing prices); Elena G. Irwin, *The Effects of Open Space on Residential Property Values*, 78 LAND ECON. 465–80 (2002) (analyzing the influence of surrounding open space on residential sale prices).

49. Cynthia J. Nickerson & Lori Lynch, *The Effect of Farmland Preservation Programs on Farmland Prices*, 83 AM. J. OF AGRIC. ECON. 341, 343 (2001); Kathryn Anderson & Diana Weinhold, Dep't of Agric. & Applied Econ., Univ. of Wis.-Madison, Staff Paper No. 484, *Do Conservation Easements Reduce Land Prices? The Case of South Central Wisconsin* (2005); Jeffrey A. Michael, *Conservation Easement and Property Values: Selection Effects and Differential Impacts on Vacant and Residential Properties* (Working Paper, 2007); Lori Lynch, Wayne Gray & Jacqueline Geoghegan, *Are*

Nickerson and Lynch examined Maryland farms in three geographically dispersed counties.[50] Their data consisted of 24 preserved farms and 200 unpreserved farms that sold between 1994 and 1997. They used a combined model with both vacant parcels and parcels with a residence where the sale price had been adjusted by subtracting the tax-assessed value of the structures. The results showed conservation easements reduced farmland prices by 15%, but the effect was not statistically significant.

Anderson and Weinhold also examined the issue using a sample of 19 easement-restricted and 112 unrestricted land sales in south-central Wisconsin.[51] When using a model that combined vacant parcels with those containing a residence, their results were similar to Nickerson and Lynch: conservation easements had no statistically significant impact on land prices. However, when they restricted the sample to vacant parcels, conservation easements had a statistically significant negative impact on land prices.

Michael looked at conservation easement sales in Baltimore County, Maryland, an area which has a large, long-running conservation easement program.[52] Separate hedonic models were estimated for vacant parcels and properties with a residence. He found easements to have significant negative effects on the value of vacant land, but no effect on improved parcels. He argued that this is to be expected since private amenity effects to landowners are greater when there is an opportunity to live on the parcel.

Recent papers by Lynch, Gray, and Geoghegan reexamined the issue with larger data sets encompassing most of the state of Maryland and employed both hedonic methods and propensity score models to compare average values of matched properties.[53] In the first paper, they pooled vacant and improved properties and found that easements reduced land values by a statistically significant 11–17% when there was no control for selection effects. However, they were unable to show any statistically significant difference in average prices for easement restricted properties with the propensity score methods when they controlled for the proximity of other easement properties. In the updated paper, Lynch, Gray and

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Farmland Preservation Program Easement Restrictions Capitalized into Farmland Prices? What Can a Propensity Score Matching Analysis Tell Us?, 29 REV. AGRIC. ECON. 502 (2007) [hereinafter Lynch et al. 2007a]; Lori Lynch, Wayne Gray & Jacqueline Geoghegan, *An Evaluation of Working Land and Open Space Preservation Programs in Maryland: Are They Paying Too Much?* 1 (Dep't of Agric. & Resource Econ., Univ. of Md., Working Paper No. 07–11, 2007) [hereinafter Lynch et al. 2007b].

50. Nickerson & Lynch, *supra* note 49.

51. Anderson & Weinhold, *supra* note 49.

52. Michael, *supra* note 49.

53. Lynch et al. 2007a, *supra* note 49; Lynch et al. 2007b, *supra* note 49.

Geoghegan modified the propensity score model and also examined unimproved properties separately. Their estimates showed statistically significant evidence that vacant farmland sells for 11–20% less with a conservation easement. Although easements are shown to decrease property values, they note that the impact in this and other studies is smaller than they expected and that the observed reductions in value are substantially less than the size of the payments landowners have been receiving for easements under an agricultural land preservation program.

III. ANALYSIS, FUTURE RESEARCH NEEDS, AND PRACTICAL IMPLICATIONS

In general, the empirical studies discussed above track theoretical predictions, although it is clear that the effects of legal restrictions on property values vary depending upon the circumstances. The data is sufficient to support the general conclusion that amenity effects do in fact exist, even for owners who are directly affected by regulatory restrictions. At the same time, the magnitude of these positive effects is difficult to measure and they may or may not match the negative effects of development restrictions. Theory suggests that comprehensive development restrictions designed to protect significant local amenities could produce positive amenity effects, and several empirical studies are consistent with this prediction.[54] Accurately determining the net effect on property values in any individual case requires careful empirical research.

Our review of these studies suggests that easement restrictions precluding development of vacant lands reduce property values. But the impact of these restrictions appears to be surprisingly small, typically less than 20%. These figures are much smaller than the percentage property value reductions typically calculated using traditional appraisal methods, suggesting that offsetting amenity and scarcity effects significantly mitigate losses.

Our review of the literature revealed a surprisingly small number of empirical studies that have directly examined the effects of restrictions on land values (as opposed to housing prices). The lack of studies on the effect of large lot zoning on private property values is particularly striking. The lack of empirical research is a critical void in the economics literature, especially given the enormous practical significance of valuation questions in many legal and policy settings. There is a clear need for more research

54. *See, e.g.*, Fiorenza Spalatro & Bill Provencher, *An Analysis of Minimum Frontage Zoning to Preserve Lakefront Amenities*, 77 LAND ECON. 469–81 (2001).

focused on the question of how legal restrictions on land use affect property values. One of the challenges in undertaking this research is the need for careful use of statistical tools to control for endogeneity, and to ensure that empirical studies measure the effects of the restrictions being studied and not the effects of the other attributes of the properties and locations.

While there is a clear need for more empirical research, this review of the relevant theory and the limited empirical literature points to some insights that may be helpful in legal or policy contexts. Future empirical research in this area could be designed to shed additional light on these topics.

The degree of economic harm allegedly caused by a regulatory restriction is a central issue in cases in which a landowner seeks compensation for a taking of private property under the Takings Clause of the Fifth Amendment to the United States Constitution. A variety of considerations unrelated to economics do, and arguably should, inform the resolution of takings cases, including the language and original understanding of the Takings Clause, Supreme Court precedent, and value judgments about the social harmfulness of regulated activities. But the economic impact of regulations is related to the role of the Takings Clause in "bar[ring] Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole."[55] The conclusion that regulations typically have a mix of positive and negative impacts on property values highlights the practical difficulties courts face, in the context of individual lawsuits, in determining how an owner has been affected by a single regulation, much less by the totality of regulations that may restrict use of (and simultaneously protect) private property. At a minimum, it is clear that a simple before-and-after calculation of property values using standard appraisal techniques will often generate figures that overstate, perhaps significantly, the actual adverse effect (if any) of a legal restriction on the value of restricted property.

This review also has potentially important implications for conservation easement programs. Conservation easement restrictions are often more site-specific and less comprehensive in nature than regulatory programs. As a result, at least in some cases, it can be anticipated that easement restrictions will not generate the same level of indirect benefits as regulations. Nonetheless, as with regulatory takings claims, appraisals that utilize the with and without restriction methodology run the risk of overstating the adverse effects of legal restrictions on the value of properties with conservation easements. Furthermore, as discussed above,

55. Armstrong v. United States, 364 U.S. 40, 49 (1960).

recent empirical studies on the effects of conservation easements on property values reveal surprisingly modest adverse effects from easement restrictions, especially if the restricted parcels include a residence. These conclusions suggest that the public may be systematically overpaying for some conservation easements, meaning the public may be conferring unwarranted windfalls to some property owners and not achieving the full potential conservation benefit from its investments.

CONCLUSION

Both theory and available research results indicate that legal restrictions on the use of property have a mix of negative and positive effects on land values, and that accurately determining the net effect of any particular restriction requires careful empirical research. The empirical research that has been conducted to date is quite limited, however, and there is a need for further efforts in this important, yet neglected, area. Rigorous economic analysis has an important role to play in numerous settings where measuring the impact of legal restrictions on land values has practical significance, including litigating regulatory takings cases and administering conservation easement programs.