INTERJURISDICTIONAL PRICE EFFECTS OF LAND USE CONTROLS

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I. INTRODUCTION

The last decade can be viewed as a time of reduced regulatory control of economic activities by the United States federal government. Examples can be found in the airline and trucking industries. In the local land use regulations area, however, there has been a substantial increase in the level of control and in the number of regulatory mechanisms adopted by local governments. The conventional types of land use regulations are zoning, subdivision controls, and building codes. Local governments throughout the United States have used these types of regulations since the early 1920s. During the 1970s and 1980s, local jurisdictions have invented newer forms of regulation, such as growth management plans and impact fees, in order to cope with rapidly changing demographic and fiscal conditions.

Local land use regulations have been justified on the ground that local governments are authorized to exercise police power to protect the public health, safety, and welfare of their residents from negative externalities arising from noncompatible land uses. A number of scholars have suggested, however, that government regulations can be viewed as the result of competition among interest groups for favorable government action as well as a mechanism for correcting the allocative

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inefficiencies of market failure.[1]

Winners in local land use regulation are existing resident homeowners, while losers are such groups as prospective residents,[2] current renters, and land developers in the local community.[3] In suburban communities which have adopted restrictive land use controls, existing resident homeowners are invariably the politically dominant group.[4] The existing residents can benefit from excluding prospective low-income residents because their contribution to local taxes is likely to be less than their share of local services consumed.[5]

Existing residential property owners may also benefit from restrictive local land use controls through a direct price effect.[6] Restrictions may reduce the potential supply of housing, thus raising the price of housing in the community and the cost to prospective residents.

The theoretical literature on land use controls demonstrates that such controls have no impact on the price of a standard unit of housing in an open city. Under this model, new housing supplied in undeveloped rural areas is a perfect substitute for housing in regulated close-in suburbs. Thus, individual localities are perfect competitors in the supply of housing services, and local land use policies impact the price of housing only through amenity effects. On the other hand, in a closed-city model, coalitions of homeowners within and across communities

1. The seminal paper for this argument is Stigler, *The Theory of Economic Regulation*, 2 BELL J. ECON. 3 (1971). A more formalized model is presented in Peltzman, *Towards a More General Theory of Regulation*, 19 J. LAW & ECON. 211 (1976).

2. The losing prospective residents are those who wish to reside in a particular community, but who are unable to actually choose that community as their residence due to affordability constraints.

3. Land developers (and/or the suppliers) of residential and other types of properties may or may not be affected by local land use regulations because they can transfer some or most of the costs imposed by the regulations to final consumers, depending upon market conditions (specifically, the price elasticity of demand).

4. *See* Rolleston, *Determinants of Restrictive Suburban Zoning: An Empirical Analysis*, 21 J. LAW & ECON. 211 (1976).

5. *See* Bradford & Kelejian, *An Econometric Model of the Flight to the Suburbs*, 81 J. POL. ECON. 566 (1973). This article shows that fiscal advantages are significant in explaining interjurisdictional mobility. Only if lump sum taxes (equal to the capitalized value of the differential costs imposed by low-income users) can be exacted is there no incentive to zone out low-income households. *See also* Tiebout, *A Pure Theory of Local Expeditures*, 64 J. POL. ECON. 416 (1956).

6. If households wish to move to another house in their current community, a rise in their original property's value is counter-balanced by an increase in the cost of rent of their new home. Only if they move to an alternate community does the gain in house value increase their net worth.

can raise housing prices through artificially restricting supply levels. The values of land sites zoned for a given housing density are increased by restrictive zoning.[7]

Empirical economic literature has focused on the externality effects of land use controls. However, if the open-city model does not hold, regulations may have monopoly price effects as well. This Article examines whether the increasing price of developable land sites contributes to regionally based housing affordability problems.

II. Measuring Price Effects of Land Use Controls

The price effects of local land use regulations are usually measured in hedonic housing price models. The following is a typical testing model:

Method One: $V_{ij} = f(Z_j, X_{ij}, R_i, T_i)$

where:

V_{ij} is the value of the jth residential property located in community i;

Z_j is a vector of structural characteristics of the property in community i;

X_i is a vector of locational characteristics of community i;

T_i is a vector of time dummies or factors which vary with time;

R_i is a vector of regulatory variables which measure the restrictiveness of land use controls for property j in community i.

The specific techniques used in implementing this regulatory impact test may affect the results obtained. If the effects of regulations are measured by including land use classifications directly in the hedonic equation, along with attributes mandated by regulation or their complements, only the attributes may appear to be significant.[8]

An alternative method has two steps. First, construct a housing price index for a standard house within or across communities (using an hedonic or a repeat sales index or a combination of both).[9] Second, test for the impact of land use controls along with other community and time variant determinants of housing values. Under this approach:

Method Two: $V_t = f(Z_i, X_i, R_i, T_i)$

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7. This increase is an addition to amenity effects.

8. For a critical review of the literature, see Pogodzinski & Sass, *The Economic Theory of Zoning: A Critical View*, 66 Land Econ. 294 (1990).

9. *See* Case, Pollakowski, Quigley & Wachter *On Choosing Among House Price Index Methodologies* (prepared for the ASSA meetings Dec. 1990) for a description of each of these approaches.

where:
V_i is the value of the price index of units with unchanged or a set of standard characteristics Z_i, and R_i is a vector of measures of the restrictiveness of land use controls in community i.

The impact of both zoning and growth controls can be tested using this methodology.

In developing the variables to measure the restrictiveness of controls, two approaches may be adopted. The first approach is to use the proportion of land zoned for each use and density category in a community as a separate regulatory variable. The second approach is to develop a restrictiveness index for land-use controls as follows:

$$R_i = \sum_{J=1}^{M} W_j L_{ij}/L_i$$

where:
R_i is the restrictiveness index in community i;
W_j are exogenously given weights for the jth use or density category;
L_{ij} is the total land area zoned for the jth use or density category in community i.

In developing these weights, more restrictive use and density categories (such as residential-single-family and one acre minimum-lot-size requirements) are assigned higher weights than more permissive use and density categories (such as multi-family and one-quarter acre minimum-lot-size requirements).[10]

Under the second approach, an index represents the restrictiveness of a community with respect to multiple categories of use and density controls. The number of regulatory variables developed under the first approach equals the number of use and density zoning categories in the community. The index approach requires fewer degrees of freedom than the first approach, and thus can be used in a price index equation which generally will have many fewer observations than a price equation.

Land use regulations have increasingly taken the form of growth controls. Testing for the impact of growth controls on housing prices is usually done by comparing price appreciation in communities with and without growth controls. Empirical studies generally find that housing prices in communities with growth restrictions are higher than

10. For examples of this approach in developing testing variables, see Rolleston, *Determinants of Restrictive Suburban Zoning: An Empirical Analysis*, 21 J. URB. ECON. 1 (1987); Shlay & Rossi, *Keeping Up the Neighborhood: Estimating Net Effects of Zoning*, 46 AM. SOC. REV. 703 (1981).

those of communities with no growth controls.[11] However, the testing variables which are traditionally included in growth control studies, as well as those included in studies of land use controls more generally, cannot determine how these regulations may raise housing prices.

III. THE SIMPLE ANALYTICS OF LAND USE CONTROLS

Land use controls in a community positively impact local housing prices in two scenarios. In the first scenario, controls create a better environment, which is capitalized in higher housing prices. In the second, growth or land use restrictions set the housing supply below equilibrium level. Consequently, these restrictions create excess demand in the local housing market. In the latter case, land use controls will have interjurisdictional as well as intrajurisdictional effects on housing prices.

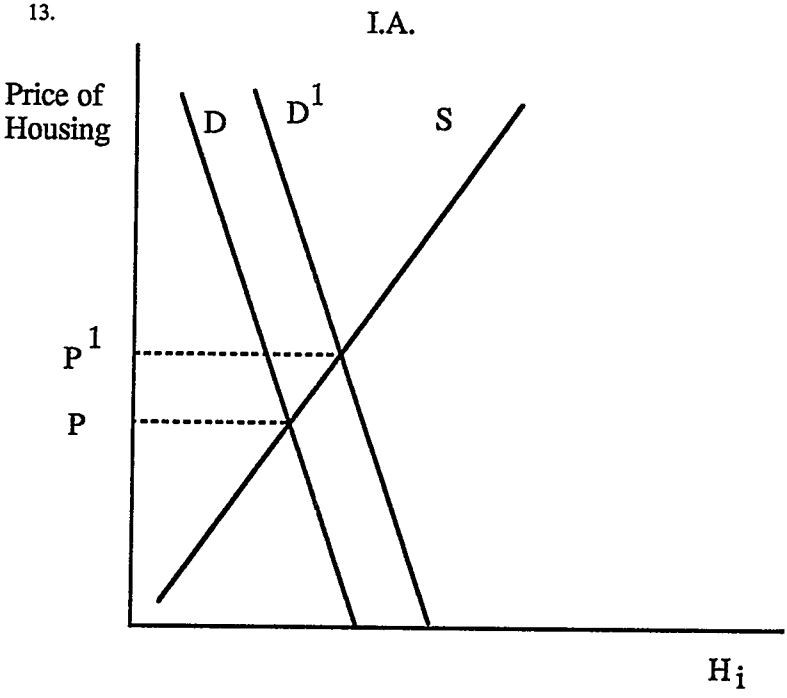
Figures 1.A., 1.B., and 1.C.[12] illustrate the scarcity, amenity, and interjurisdictional effects of land use regulations. In each graph, the units of housing supplied in the community in the current period are measured as H on the horizontal axis, with the price of housing P,

11. *See* Elliott, *The Impact of Growth Control Regulation on Housing Prices in California*, 9 AM. REAL EST. & URB. ECON. J. 115 (1981); Katz & Rosen, *The Interjurisdictional Effects of Growth Controls on Housing Prices*, 30 J. LAW & ECON. 149 (1987); Schwartz, Hansen & Green, *Research Design Issues and Pitfalls in Growth Control Studies*, 62 LAND ECON. 223 (1986); Schwartz, Hansen & Green, *The Effect of Growth Control on the Production of Moderate-Priced Housing*, 60 LAND ECON. 110 (1984); Schwartz, Hansen & Green, *Suburban Growth Controls and the Price of New Housing*, 8 J. ENVTL. ECON. & MGMT. 303 (1981); Schwartz & Zorn, *A Critique of Quasiexperimental and Statistical Controls for Measuring Program Effects: Application to Urban Growth Control*, 7 J. POL'Y ANALYSIS & MGMT. 491 (1988); Zorn, Hansen & Schwartz, *Mitigating the Price Effects of Growth Control: A Case Study of Davis, California*, 62 LAND ECON. 46 (1986).

12. *See infra* notes 13-15 for graphs.

measured on the vertical axis. In Figure I.A.[13] the intersection of supply curve, S, and demand curve, D, yield the equilibrium price, P, in community *i*. A higher level of restrictiveness increases amenities and the demand for housing in the community. This shifts demand upwards to D^1 and raises the equilibrium price of a house with a given set of structural characteristics to P^1.

13.

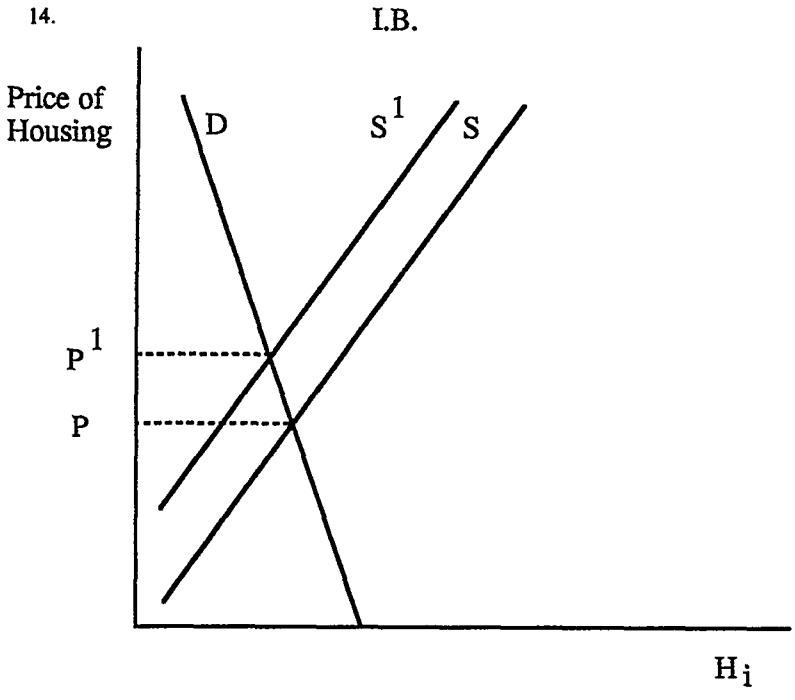


Intrajurisdictional Amenity Effect

In Figure I.B.[14] the initial equilibrium price and quantity of housing is the same as in Figure I.A. A higher level of restrictiveness shifts the supply curve to S^1, resulting in a higher equilibrium price, P^1. The increased restrictiveness may result from the tightening of a variety of controls. For example, a community may implement a growth management plan which grants fewer building permits or a new master plan which decreases the percentage of land zoned for one acre lot size residential use and increases the proportion zoned for agricultural use. Fewer households are housed in community *i* as a result of lower supply and the higher prices of residential building sites.

This creates spillover effects to neighboring communities which are more affordable. The interjurisdictional effects are shown in Figure

14.



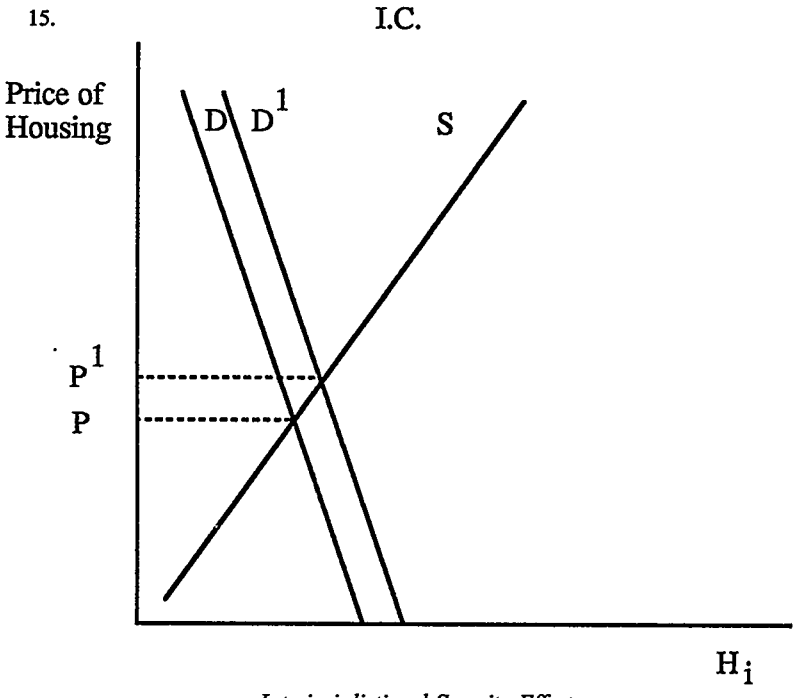
Intrajurisdictional Scarcity Effect

I.C.[15] as an increase in demand from D to D^1 and price from P to P^1 in community *j*, which is adjacent to community *i* and has less restrictive land use controls.

IV. Measuring Interjurisdictional Price Effects of Land Use Controls

A testing model can separately identify the existence of interjuridicational and intrajurisdictional price effects of land use controls. In their study, Dr. Pollakowski and Dr. Wachter constructed a simple testing variable to identify interjurisdictional price effects.[16] If these price effects exist, they signal the presence of scarcity zoning effects in addition

15.



Interjurisdictional Scarcity Effect

16. Pollakowski & Wachter, *The Effects of Land Use Constraints on Housing Prices*, 66 Land Econ. 315 (1990). The initial results of this research were presented at a conference at the Lincoln Institute of Land Policy, co-chaired by William Fischel and Michelle White, in the fall of 1989. The research is part of a larger project on regional housing prices which includes the study of Fairfax County presented below supported by the Homer Hoyt Institute.

to externality effects.[17] The results of this study on housing price appreciation in Montgomery County, Maryland, and a more recent study by Dr. Cho[18] from Fairfax County, Virginia, provide evidence of both effects. These studies use data from 1982 through 1989 for suburban counties contiguous to Washington, D.C. As exemplified in the whole of the northeastern United States, the Washington, D.C. metropolitan area experienced considerable growth in the 1980s. This growth occurred both in numbers of housing starts and in housing price appreciation. The results, however, may not hold for time periods and markets with less growth.

In addition, the results may be influenced by the location of the two communities. Other studies suggest that scarcity zoning effects would be largest where one jurisdiction controls the area's housing market. More generally, any price effects should be positively related to the fraction of metropolitan land individual jurisdictions controlled. Washington, D.C. is unusual among large American metropolitan areas in that it has relatively few governments. Consequently, the atypical level of centralization may make the results less than universal.[19]

A. *Montgomery County, Maryland*

Using a double sales index, Dr. Pollakowski and Dr. Wachter[20] constructed longitudinal housing price indexes for seventeen planning areas and groupings of planning areas that constitute Montgomery County, Maryland. They explained these price indexes in terms of a set of determinants which include land use restrictions.[21] As shown in

17. If supply restrictions raise prices in neighboring communities, prices are also increased due, at least in part, to this effect in the community implementing these controls.

18. For the development of a model to test for interjurisdictional affordability effects, data sources, equation specifications and additional empirical estimations, see M. Cho, *The Exclusionary and Spillover Effect of Land Use Regulations: A Model and Empirical Evidence* (1990) (Dissertation in Public Policy and Management, The Wharton School, University of Pennsylvania). This research was supported by the Homer Hoyt Institute and the National Association of Home Builders.

19. *See* Fischel, *Is Local Government Structure in Large Urbanized Areas Monopolistic or Competitive?*, 34 NAT'L TAX J. 95 (1981); Fischel, *Zoning and the Exercise of Monopoly Power: A Reevaluation*, 8 J. URB. ECON. 283 (1980).

20. *See* Pollakowski & Wachter, *supra* note 16.

21. Statistical results are summarized in Tables I and II, *infra* notes 22 & 23.

Table I,[22] a number of national and regional variables have explanatory power in the determination of housing price appreciation in the county. Moreover, this study confirms the explanatory power of national mortgage interest rates and regional construction costs on housing demand and, therefore, on housing prices. The study focuses, however, on local determinants of housing prices.

A number of demand and supply factors are important at the local level. On the demand side, the study indicates that per capita income

22. Montgomery County

TABLE I
Ordinary Least Squares Estimation

Dependent Variable: Real Housing Price Index

Independent Variable	Estimated Coefficient	Standard Error	t-Statistic
Constant	95.462	2.876+002	0.33
Real Per Capita Income	3.765	0.671	5.60
Distance to Federal Triangle	−17.008	3.773	−4.52
Gravity Employment Index	1.085−003	1.311−003	0.82
Real Mortgage Rate	−3.745	2.065	−1.81
Real Construction Cost Index	4.634+002	3.006+002	1.54
Percent Land Vacant	−0.925	0.814	−1.13
Development Ceiling	−3.419	2.277−003	−1.50
Zoning Restrictiveness Index for Vacant and Developed Land	5.737	1.031	5.56
Relative Restrictiveness of Adjacent Planning Areas	85.502	23.889	3.57

Number of Observations	391
R^2	0.93
Corrected R^2	0.93
Sum of Squared Residuals	2.19+002
Standard Error of the Regression	0.75
Mean of Dependent Variable	2.43

is an important determinant of housing prices.[23] Per capita income is traditionally used as a proxy for a variety of neighborhood amenities because it is generally accepted that prices will be bid up in the neighborhoods and communities with the highest levels of amenities overall.

Two measures of accessibility to employment and other destinations of interest are included. Distance to the largest concentration of employment in the Central City (the Federal Triangle) has a significant negative effect on housing prices, with a response elasticity of −0.240. Another index, a gravity index of accessibility to employment within the county, has a positive but insignificant effect. The gravity index is correlated with the distance variable where part of the employment effect is captured by distance.

On the supply side, the percentage of vacant land, along with land use constraints and other growth controls, vary across planning areas. The study finds higher housing prices where there is a limited availability of potential residential land sites as measured by percent of land vacant — though the coefficient is not significant.

The critical focus of the study is on the housing price effects of local land use controls. Restrictions raise the price of existing housing, while lowering the price of undeveloped land. As noted previously, the increased price of existing housing may occur for either or both of two reasons. First, the restriction of housing supply exerts an upward pressure on price. Second, these low-density measures may make the affected locations more desirable, thus leading to an increase in demand and consequent increase in price. Restrictive zoning lowers prices of undeveloped land because some desired uses of the land have been precluded.

The Montgomery County study estimates both the direct and spillover effects of zoning controls and other growth restrictions on hous-

23. Montgomery County

TABLE II

Variable	Price Elasticity
Real Per Capita Income	.492
Distance to Federal Triangle	−.240
Gravity Employment Index	.008
Real Mortgage Rate	−.028
Real Construction Cost Index	.346
Percent Land Vacant	−.024
Development Ceiling	−.013
Zoning Restrictiveness Index	.275
Relative Restrictiveness of Adjacent Planning Areas	.093

ing prices. The direct effects of regulatory control are calculated first through measures of allowed residential development ceilings established by the Montgomery County Planning Board for each area. A second index of regulatory controls measures the restrictiveness of zoning. Residentially developed and vacant land is ordered by lot size and intended use, and the index is constructed as a weighted sum of the percentage of land zoned at varying degrees of restrictiveness. Spillover effects are identified by constructing measures of the relative restrictiveness of adjacent planning area regulations for each of the above variables.

The study finds that the effects of local development ceilings are, in the aggregate, quite small. This result is perhaps not surprising, given that this constraint is clearly not binding in many cases. Zoning restrictiveness is found to have a significant positive effect on housing prices, obtaining a housing price elasticity of 0.275. A spillover effect of restrictiveness of neighboring areas is also separately identified with a housing price response elasticity of 0.093.

These findings show that specific local growth controls may have both interjurisdictional and intrajurisdictional effects. Thus, restrictive zoning in one jurisdiction (or neighborhood) can contribute to housing price appreciation in adjacent areas. While the magnitude of this effect is smaller than the intrajurisdictional effect, it is nonetheless significant.

B. *Fairfax County, Virginia*

The Montgomery County study methodology has been extended to Fairfax County, Virginia.[24] The data derive from Fairfax County Real Estate Assessment Data tapes which the Tax Assessment Office collects and the Office of Research and Statistics of the Fairfax County Government organizes. The data consist of transaction prices and structural characteristics for all properties within the county. Using hedonics, housing price indexes are estimated for ten magistral districts within the county and explanatory equations are estimated. The regression specification is similar to that for Montgomery County, as are

24. *See* M. Cho, *supra* note 18 (development of a model to test for interjurisdictional affordability effects, data sources, equation specifications and additional empirical estimations).

the results shown in Table III.[25] The dependent variable is the log of the hedonic real price index.

The distance variable has a negative coefficient, as expected, and is significant. The result shows that housing prices decreased by 2.45% for each mile farther from the city center of Washington, D.C. The coefficient of household income is positive, as expected, and is significant. The coefficient of the income variable shows that a $1000 increase in household income raises housing prices by 2.29%. The coefficient of vacant land is negative, as expected, but it is not significant.

There are some differences in the specification for Fairfax relative to the Montgomery County equation: a change in housing prices is included to identify disequilibrium effects but it is not significant. The regulatory variables are measured as described above except that indexes are created for vacant land only and population density is included. The negative sign of the latter is interpreted as measuring disamenities associated with crowding. There are additional regulatory variables included. Apart from the index of the proportion of residential relative to commercial land use designated in each magistral dis-

25. TABLE III
Ordinary Least Squares Estimation

Dependent Variable: Real Housing Price Index (Log)

Independent Variable	Estimated Coefficient	Standard Error	t-Statistic
Constant	10.840	0.412	26.28
Real Per Capita Income	0.023	0.003	7.00
Distance to Federal Triangle	−0.035	0.010	−3.53
Change of Real Housing Price Index over two years (Log)	0.007	0.006	1.17
Population Density	−0.071	0.023	−3.11
Percent Land Vacant	−0.006	0.003	−1.69
Zoning Restrictiveness Index for Vacant Land	0.012	0.004	2.81
Relative Zoning Restrictiveness of Adjacent Planning Areas	0.003	0.001	2.68
Use Restrictiveness Index for Vacant Land	−0.085	0.021	−3.98
Relative Use Restrictiveness of Adjacent Planning Areas	0.025	0.005	4.94
Number of Observations	69		
R^2	0.84		
Corrected R^2	0.79		
Sum of Squared Residuals	0.49		
Standard Error of the Regression	0.009		
Mean of Dependent Variable	11.86		

trict's vacant land, however, none is significant. The latter has the expected negative sign indicating that the higher the percentage of land allocated to residential use, the lower are housing prices.[26]

In Fairfax, as in Montgomery, spillover variables are included to measure the relative restrictiveness of adjacent planning area regulations on housing prices. The coefficients of the spillover variables are significant with the expected positive sign.

V. Conclusion and Policy Implications

The implementation of restrictive land use controls raise several public policy concerns. One is the spatial distribution of the per capita tax costs and quality of local public goods across metropolitan areas, most importantly, education. In urban areas which do not adopt exclusionary controls, the diminished tax base may cause costs to rise relative to those in restrictive suburban communities. A second concern is access to affordable housing.[27] Issues of inefficiencies resulting from the deconcentration of urban areas also exist. Land use controls may accelerate this process by increasing the pressure on environmental resources in the rural fringe and producing diseconomies of scale in the provision of infrastructure, especially transportation. Although planners and policy makers regard all of these with concern, state courts have focused mostly on the former. Nonetheless, the issues are interrelated. If the open-city model holds in its extreme version, then new communities will develop to deliver housing and public goods to residents at no extra cost in response to existing communities adopting restrictive regulations. Land use controls limit free rider effects without raising housing costs to nonresidents. Individuals who choose communities which provide relatively large amounts of amenities pay for it with their property taxes as they are constrained to consume appropriately large amounts of housing. Nonetheless, they have a choice of less expensive communities with fewer amenities. Additionally,

26. Pollakowski & Wachter also use regulatory indexes for vacant land only, with similar results. The competitive demand for commercial land use is measured with the gravity employment index based upon data gathered in Montgomery County but not for Fairfax.

27. There has been little testing for the impact of affordability constraints on location or other housing decisions. *See* Linneman & Wachter, *The Impacts of Borrowing Constraints on Homeownership*, 17 J. Am. Real Est. & Urb. Econ. 389 (1989) for an empirical estimate of the impact of affordability constraints on the rent or own decisions.

there are no affordability effects because the choice of cheaper housing remains.

Alternatively, the exclusion of potential residents through the adoption of land use controls in some communities may raise the cost of housing in neighboring communities. Spillover effects occur if the housing supply is not infinitely elastic and if housing in newly developed communities does not perfectly substitute for that in existing communities. As a result, the open-city model does not hold. If so, land use controls will increase the price of housing in both the community adopting the controls and its neighbors.

Implementation of land use controls in this case limits the development of close-in suburbs below market equilibrium levels and accelerates the growth of rural areas on the urban fringe. If productivity depends upon the spatial distribution of the population due to agglomeration effects, economies of scale in infrastructure distribution, and environmental effects, then this development may be suboptimal for the region as a whole, even though it is optimal for individual communities.[28]

Effectively, the community that adopts restrictive controls will have an impact on the price of housing and the pace of development in adjacent communities. The existence of interjurisdictional price effects implies that controls have positive effects on housing prices separate from those attributable to improved amenities. Thus, controls may affect the affordability of housing due to scarcity zoning and amenity effects.

The empirical tests for interjurisdictional effects suggest that this may occur for the period and communities to which the tests have been applied. More research is needed on whether those results can be extended to longer time frames and other geographical areas. In addition, the implications of the research are limited. Land use controls have benefits. That they have costs to residents of adjacent communities does not imply that, on balance, their use negatively affects the public good.

28. For an analysis of the efficiency of local zoning and taxation, see Fischel, *Does Fiscal Zoning Make the Property Tax Efficient?* (prepared for the ASSA meetings Dec. 1990)