How Responsive Is the Demand for Residential Land to Changes in Its Price?

BY RICHARD VOITH

Public policies from zoning to income-tax deductions for mortgage interest affect the price of residential land. In this article, Richard Voith's estimates help measure the effect of public policies on land consumption in the United States.

The dominant trend in metropolitan development in the 20th century was the increasing use of land per capita. As households moved to the suburbs, both houses and residential lots increased dramatically in size. These changes were direct consequences of higher incomes and lower transportation costs: people could afford to spend more on housing, and traveling longer distances between home and work became more feasible.[1] As commuting distances lengthened, the supply of land deemed to be acceptable for residential development increased greatly, and this greater supply meant that residential land became more affordable.

Not surprisingly, since rising incomes and lower transportation costs are common throughout developed countries, the trend toward increasing land consumption per capita is an international phenomenon. This trend, however, has been more pronounced in the United States than in other developed countries. Many observers suggest that rising incomes and lower transportation costs had a strong impact on the rate of suburbanization and increasing residential land consumption in the United States because Americans have strong preferences for the open space associated with low-density metropolitan development.[2] Another factor contributing to the pattern of low-density development may be the low price of land in the United States.[3] Abundant vacant land means that the supply of land that can be used for residential development can be greatly increased through investment in transportation. Such investment helps keep the price of residential land low.[4] In turn, these low prices encourage households to buy larger lots. However, public policies — including taxation, transportation, and zoning regulations — have also affected after-tax residential land prices.[5] Policy choices, therefore, may have played an important role in the patterns of U.S. metropolitan development as well as in the rapid increase in per capita land use.

While the pace of decentralization has continued unabated in the United States, concerns about road

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[1]In the traditional monocentric model of urban economies where everyone works in the center of the region, increasing income does not necessarily result in larger residential lots because the increased desirability of a larger lot is also associated with a longer commute. As income rises, the cost of commuting in terms of time increases. The two forces associated with rising income — the desire to buy more land and the increased cost of commuting — tend to offset one another. With the rise of suburban employment, however, households have the opportunity to increase the size of their lot without necessarily increasing their commuting costs.

[2]See the article by Peter Mieszkowski and Edwin Mills and Witold Rybczynski's book.

[3]U.S. and Australian metropolitan areas tend to be much less dense than those in Canada, Europe, and Asia. While international comparisons of residential land prices are not readily available, prices per square foot of office space, which should reflect land value as well, clearly indicate that U.S. metropolitan prices are relatively low. Only two U.S. cities, San Francisco and New York, are in the top 20 highest international office rents. (CB Richard Ellis Global Research and Consulting)

[4]Transportation investments may increase the value of land in areas that benefit from the investment, but these investments serve to increase the overall supply of land suitable for houses and, therefore, help keep the average price of residential land low.

[5]It's likely that public policies in Europe and Asia have affected land prices as well. The prevalence of "greenbelts" and other land-use restrictions reduce the supply of land available for development, which tends to raise the price of land.

congestion, loss of farmland and green space, and the character of community in our decentralized metropolitan areas have increased. These concerns have led some people to ask whether current patterns of low-density growth need to be reexamined and to suggest a whole range of policies that would alter current growth patterns.[6] To predict whether public policies are likely to have an impact on the amount of residential land households use and to evaluate the costs and benefits of policies that may affect residential land use, we must have a thorough understanding of the nature of demand for residential land.

One key aspect of this demand is how responsive it is to changes in price.[7] In other words, if the price of land increases, will consumers adjust their demand for land downward? And, if so, by how much?[8] If households have strong preferences for residential land and therefore consumers change their land consumption very little in response to a large increase in price, policies that raise the price of land would have very little impact on patterns of land use.

Furthermore, attempts to change land-use patterns would be very costly from a social point of view: Any policy that managed to reduce land consumption would generate hardships for households. Households would find it difficult to derive as much benefit from spending their money on other goods, such as more exotic vacations or more expensive clothing, as they did from their large yard.

On the other hand, if consumers readily adjust the quantity of land they consume in response to changes in price, policies that modestly change the price of land could have a large impact on land-use patterns. If consumers significantly adjust their land consumption to changes in its price, it means that there are other goods almost equally as attractive. Therefore, when land prices rise, households simply choose to have a smaller yard and have more money available for other uses. In this case, public policies that affect the price of land may have a large impact on land-use patterns, and these changes may have a relatively small impact on households' satisfaction. Thus, a key piece of information needed for understanding the forces affecting metropolitan development is how responsive households are to changes in the price of land.

TWO VIEWS OF THE DEMAND FOR RESIDENTIAL LAND

In the 1960s, two researchers in urban economics, Richard Muth and William Alonso, offered different perspectives on the nature of the demand for residential land. Muth viewed residential land as an input to the production of a house. In his view, the demand for residential land was based on the price of land relative to the price of other materials and labor needed to create residential housing. If land were inexpensive, builders would use more land and less lumber, steel, construction labor, and so forth when constructing a house. That is, builders would tend to favor single-floor structures covering more land. If land were expensive, builders would construct taller houses so that more houses could be put on less land.

Muth's fundamental insight was to apply a well-developed

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[6]These policies range from impact fees on new development, to land conservatories, to urban growth boundaries — like the one in Portland, Oregon — which circumscribe the areas in which development is allowed to occur. In the Third District, New Jersey's land-use plan limits development in the Pine Barrens. The state of Pennsylvania has recently enacted new legislation designed to encourage more cooperative local planning, increase regional land-use planning, and conserve open space.

[7]Another key aspect of the demand for residential land is how responsive it is to changes in income. In other words, how much more land do households want when their income rises? Glaeser, Kahn, and Rappaport provide estimates that suggest that the demand for residential land is fairly unresponsive to changes in income. They estimate that a 1 percent rise in income results in an increase in expenditures on land of only 0.4 percent.

[8]Economists call this relationship "the elasticity of demand." This elasticity measures how a change in price affects the quantity of a good demanded. Specifically, it is the percentage change in the quantity of a good demanded resulting from a 1 percent change in its price. The price elasticity for a product is typically negative, that is, a rise in price results in a decline in quantity demanded.

microeconomic theory that allows researchers to compute the demand for any input used in the production of any good if they know how responsive demand for the final good is to changes in price, how easy it is to find a substitute for the input, and how large a share of the total of all materials the input is. Thus, for housing, if we knew how responsive housing consumption is to changes in housing prices, how easy it is to substitute capital for land (think of building up, rather than out), and how big a share of total input costs land is, on average, we could compute how responsive changes in demand for land would be to changes in its price.

Using this microeconomic theory and armed with estimates of the variables outlined above, Muth (1964,1971) concluded that the demand for residential land was not very sensitive to changes in its price. Muth estimated that a 1 percent increase in the price of residential land would reduce the amount of land used by 0.75 percent, or a price elasticity of -0.75. His approach allowed him to estimate the price elasticity of demand for residential land without addressing the issue of consumers' direct demand for land.

Unlike Muth, Alonso focused on the fact that households probably valued residential land for other reasons, not just simply as an input to the production of housing. In his view, consumers' demand for residential land was like that for any other durable good.

Households may want land not only because they need a place on which to build a house but also because they want to plant a garden, create a play area for children, or ensure privacy. The amount of land that consumers want, therefore, will depend not only on how much land costs relative to other materials needed to build a house but also on the consumer's income and tastes; the attributes of the land itself, such as its location in the metropolitan area; and the price of land relative to the price of other consumer goods. The elasticity of demand for land, in Alonso's view, may be very different from that derived when viewing land as an input to the production of housing. Demand for land that is going to be used for a garden may be more sensitive to changes in price, for example, than demand for land on which a house will be built.[9] Unfortunately, little work has been done that directly estimates consumers' demand for residential land.[10]

If consumers readily adjust the quantity of land they consume in response to changes in price, policies that modestly change the price of land could have a large impact on land-use patterns.

CHALLENGES IN ESTIMATING THE DEMAND FOR RESIDENTIAL LAND

Estimating the demand for residential land is a very difficult econometric problem for two reasons. First, we don't usually have direct prices for residential land because most residential land that is sold is bundled with a house: we only see the price of the house and the land together. Thus, researchers must use statistical techniques to break down the sale price into prices for the unit's individual components: bathrooms, bedrooms, and other housing traits, including land. This technique, which is called hedonic analysis, is a key tool economic researchers use when analyzing housing markets.

The second problem arises from the fact that the price of residential land is not independent of the kind of house on the lot. Economic theorists have shown that the price of a component of a bundled good, like land in housing, will depend on the quantity of the other components in the bundled good. Because the price of residential land depends on the bundle of housing traits, it differs across houses.[11] Since each housing bundle is associated with a quantity of land and an implicit price of land, consumers have a range of choices for both price and quantity of land when buying a house. This choice results in what economists call a selection problem: People who have strong preferences for land tend to buy houses with more land and, on the margin, are willing to pay a higher price for land bundled with the house. On the other hand, people without a strong desire for land will buy houses on small lots with relatively inexpensive land.

To make this issue more concrete, consider two houses in the same neighborhood: one with a quarter acre of land and one with two acres. Suppose further there are two similar consumers, but one has a strong preference for large lots. In this situation

[9]While we do not attempt to make separate elasticity estimates for land used for housing and for land used for other purposes, our estimated prices do allow for the fact that the market price per acre of land may depend on the parcel size. That is, larger parcels for a single house might have lower prices per acre.

[10]Paul Cheshire and Stephen Sheppard, who studied a variety of British cities, report price elasticities of demand for land ranging from -0.6 to -1.6.

[11]Land prices will also differ depending on the land's location within the metropolitan area and on attributes of the land such as whether it has a good view or is near the seashore. In my statistical work, one of the factors determining a parcel's land price is its distance from the center of the metropolitan area.

the consumer with the strong preference for more land would be willing to pay more for the house with the large lot than will the other consumer. Thus, he would both choose to consume more land and be willing to pay a higher price for the house to bid it away from the other consumer.[12]

What we observe in market transactions is how different households choose among housing and land bundles. We cannot tell directly how much of the observed differences in lot size across households is a result of an individual household's adjusting how much land it uses in response to price differences and how much is a consequence of observing a different household with different tastes. Ignoring the selection issue results in biased estimates of quantity's responsiveness to price. To correctly estimate demand, we would like to observe how the same household reacts to a change in price.

Researchers Timothy Bartik and Dennis Epple independently suggested an approach to dealing with the selection problem inherent in estimating demand for residential land. Their method — which applies to estimating demand for components of any bundled good, not just land — requires data that satisfy a number of criteria that are difficult to satisfy; therefore, their method has seldom been used. We implemented their procedure to evaluate how consumers adjust their residential land consumption in response to changes in land prices. (The box on page 39 describes the Bartik-Epple procedure and my application of it to the estimation of the demand for residential land.)

NEW ESTIMATES OF THE ELASTICITY OF DEMAND FOR RESIDENTIAL LAND

In a recent working paper, Joseph Gyourko and I applied the Bartik-Epple procedures to develop new estimates of the price elasticity of demand for residential land. We used a massive data set on housing sales in Montgomery County, Pennsylvania, over 26 years. Our data on almost 100,000 sales of single-family detached houses from 1972 through 1997 included not only the sale price, date, and detailed information on the characteristics of each house sold but also the amount of land in the parcel.[13] In addition to information on the house and its lot, all parcels were geocoded so that we had detailed information about the parcel's location within the county, its proximity to employment centers and transportation, and the characteristics of the neighborhood.

Our model indicates that the quantity of residential land that households choose is highly sensitive to the price of land.

Using these data, we constructed statistical models of housing prices, and these models predicted the value of the property based on characteristics of the property and its neighborhood. The models also yielded estimates of the contribution of each housing trait — bathrooms, central air conditioning, square footage of the lot, and so forth — to the value of the property. From these estimates, we can derive the implied price of residential land for each parcel sold in each year of the sample. (See *House Prices and Residential Land Prices in Montgomery County, 1972-1997.*) This is the first stage of the Bartik-Epple procedure.

The second stage uses the estimated land prices for each parcel and the observed quantities of land associated with each parcel to determine the relationship between prices of land and quantity of land consumed. The second-stage statistical model, the details of which are discussed in *The Bartik-Epple Approach to Estimating the Demand for Bundled Goods,* on page 39, provides an estimate of the relationship between the price and quantity of land that is free of potential biases associated with selection problems discussed earlier.

Our model indicates that the quantity of residential land that households choose is highly sensitive to the price of land. The elasticity of demand is around -1.6, which indicates that a 10 percent increase in price would reduce land consumption 16 percent. Estimates of the elasticity of demand that do not control for the selection problems identified by Bartik and Epple show significantly greater responsiveness of residential land consumption to land prices. Even though our estimates are about 50 percent lower than estimates that do not take selection issues into account, they are still substantially higher than those suggested by Muth, who found that a 10 percent increase in

[12]The discussion of selection ignores the issue of location. Basic urban theory suggests that houses located near the center will have high land prices because commuting costs are low, and because of these high prices, residential lots will tend to be small. Although the selection mechanism described above still occurs, prices of small, centrally located residential lots are likely to be high because of premiums for central locations, but not as high as they might have been if people with strong preferences for land had chosen to live there.

[13]Housing traits include the unit's age, square footage, square footage of the lot, and the presence of central air conditioning, fireplace, pool, and garage. Neighborhood characteristics include the population density of the unit's census tract, percent of the tract with single-family housing units, travel time from the census tract to the Philadelphia central business district, and the presence of commuter rail service in the neighborhood.

House Prices and Residential Land Prices in Montgomery County, PA 1972-1997

The pattern of real prices for houses in Montgomery County from 1972 to1997 differs markedly from the pattern of residential land prices in our statistical models (Figures 1 and 2). Real housing prices slowly trended downward from 1972 to 1982, rose sharply from 1982 to1989, then trended downward again in the 1990s. Overall, mean real house prices stood at $118,500 at the start of the sample and rose to $155,100 in 1997, an increase of about 31 percent, or 1.2 percent per year.

Our statistical models break down housing prices into prices for the houses' component traits for each year of the sample, an approach that allows us to compute estimates of the price of land for every house sold during the sample period. By averaging the estimated lot prices for all houses sold in each year, we can show the pattern of land prices for houses sold over the sample period (Figure 2). In sharp contrast to the average price of housing, the average price of land fluctuates considerably from year to year but shows no significant trend over time. Average price per square foot of land stood at $1.03 at the beginning of the sample period and $1.09 at the end of the period in 1997. Although the difference in prices from the beginning to the end of the sample was less than 6 percent, there were large fluctuations. Low point for the price of land was $0.72 in 1979, less than half its peak level of $1.51 in 1988.

The year-to-year variance in the estimated average value of residential land over the sample period is not surprising, since it reflects changes in overall supply and demand in the regional economy.[a] The wide variance in land prices is not unexpected because the value of land reflects the value of the location.[b] Casual observation of the land-price time series shows that land prices fall substantially at the beginning of recessions and their associated depressed housing markets and rise markedly just after the economic upturn begins. Land prices peaked in Montgomery County in the late 1980s. Since then, prices have trended downward roughly 30 percent in real terms, although the last year of data show a marked upturn in price that the popular press suggests has continued into the new millennium.

Based on the average lot size and the price per square foot shown in Figure 2, the cost of land hovered around 15 percent of mean house value in most years between 1972 and 1997. For example, in 1972, the mean lot size was 19,856 square feet, the price per square foot was $1.03, and the average value of a house $120,300. Therefore, land constituted 17 percent of mean house value that year. This percentage reached its low in 1992, when the price of $0.89 per square foot implied that land was only 10 percent of mean house value.

FIGURE 1
House Sale Prices in Montgomery County, PA

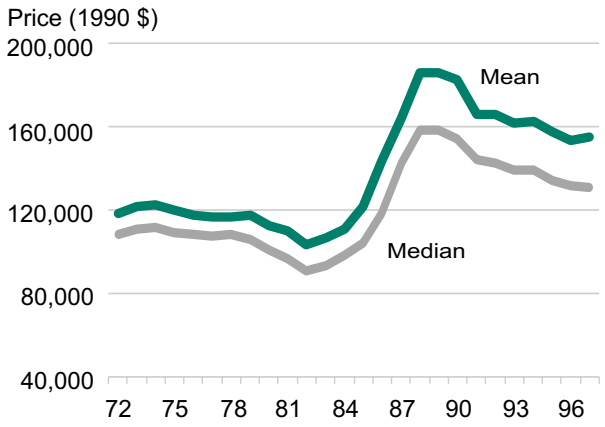
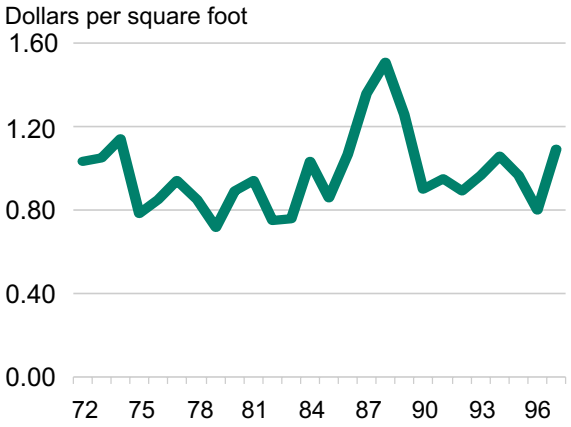


FIGURE 2
Implied Lot Prices per Square Foot



[a]In addition, the average value of residential land is affected by the location of residential sales in a given year. If, for example, sales were concentrated in areas with low land prices, this would be reflected in a lower countywide average price for that year.

[b]This stands in contrast to the value of housing structures, which is tied to construction costs in the long run. Because the value of land is not tied to construction costs, the price of land fluctuates more to equilibrate supply and demand.

land prices would reduce land consumption less than 10 percent. Our findings provide evidence that Alonso was correct in arguing that the demand for land is based on more than its use as an input to the construction of houses.[14]

IMPLICATIONS FOR POLICY AND METROPOLITAN GROWTH PATTERNS

In recent years, rapid rates of low-density suburban growth have convinced most observers, as well as developers and consumers, that single-family detached houses on large lots primarily reflect an American preference for open space and personal privacy. But these same patterns of low-density development have also been associated with a rapid increase in automobile travel and congestion, as well as concerns about the loss of open space, quality of development, loss of community, and decline in older cities and towns.

This juxtaposition of preference and concerns has resulted in a quandary: If Americans strongly prefer very low-density development, addressing the concerns raised is likely to be very costly. Efforts to force people into denser communities through public policies that raise land prices or through land-use regulation would exact a high price in terms of households' welfare and, therefore, would likely be politically unpopular.

On the other hand, higher levels of transportation investment to address the increased demand for automobile travel associated with less dense living patterns could relieve congestion but, in addition to the expense, would likely put older communities at an even greater disadvantage, perhaps even accelerating their decline.[15]

Our estimates suggest that American consumers are very flexible with respect to residential land consumption.

The finding that the quantity of residential land that households choose to own is very responsive to the price of land suggests that the quandary described above may not, in fact, be such a thorny issue: Americans' choice of low-density residential development is as much a reflection of the relatively low price of land as it is of a uniquely strong preference for large residential lots. Our estimates suggest that American consumers are very flexible with respect to residential land consumption: When land prices rise, American consumers readily shift their consumption to other goods with relatively lower prices.

Because households are sensitive to the relative price of land, public policies that affect the price of residential land are likely to have a considerable impact on the density of metropolitan areas. For example, some estimates imply that the federal tax treatment of owner-occupied housing lowers the after-tax cost of housing by 12 percent.[16] On the basis of these estimates, the tax treatment of owner-occupied housing lowers residential density by 16.1 percent.[17]

Our estimates of how responsive households' land consumption is to changes in price should help policymakers assess the likely impact of "smart growth" policies. Smart growth policies have focused on ameliorating some of the perceived negative consequences — increased reliance on cars, greater travel distances, road congestion, loss of open space, and loss of a sense of place — associated with rapidly increasing land use per capita.[18] To the extent that

[14]Some caution is appropriate in generalizing the implications of elasticity estimates, since they are based on only one county. Although the estimates are based on a great deal of data for the county, other regions of the country conceivably could have different land-price elasticities.

[15]Another approach to the traffic congestion problem is more appropriate pricing of automobile travel. Many economists have suggested that tolls, time-of-day pricing and other user fees that reflect the true social costs of car travel would result in less congestion and more efficient development patterns. These approaches have not been widely accepted in the U.S.

[16]A good example of a policy that affects the price of residential land is the federal tax treatment of housing. James Poterba has estimated that federal tax policy lowers the after-tax cost of owner-occupied housing and, by extension, residential land, by 15 percent, assuming the market price of housing is unaffected by tax policy. The value of the tax break, however, is offset partially because the lower after-tax land prices increase demand, which, in turn, drives market prices up. Assuming that 20 percent of the tax benefit is capitalized into land prices (Sinai 1997), the housing tax break effectively lowers housing and residential land prices 12 percent.

[17]The tax policy increases land consumption by 19.2 percent (12 percent times 1.6). Remember, our estimation of the elasticity of demand for residential land is -1.6 percent. This increase in land consumption lowers density by 16.1 percent. Note that density equals population divided by land (P/L). Since current tax policy increases the demand for land 19.2 percent, density under that policy is P/L(1.192). This represents a 16.1 percent decline in density from what it would be without the tax policy.

[18]Growth in land use per capita can arise from increasing lot sizes within communities or shifts in population from communities with small average lot sizes to communities with larger lot sizes. In the Philadelphia metropolitan area, most of the increase in land consumption per capita in the 1990s has not come from increasing average lot sizes in suburban communities but rather from declining population in the city of Philadelphia — which, on average has very small lot sizes — and increasing population in suburban counties, which have larger average lot sizes.

The Bartik-Epple Approach to Estimating The Demand for Bundled Goods

In 1987, Timothy Bartik and Dennis Epple independently suggested similar approaches to the problem of estimating the demand functions for goods that are sold bundled together with other goods, like land and housing. They suggested that one could overcome the econometric problem associated with the fact that consumers choose over a range of both price and quantity of residential land if observations on multiple markets were available that met two essential conditions: (1) the distribution of household preferences were unchanged across different market observations; and (2) there must be forces — changes in incomes and prices — that shift household budget constraints across markets. The first condition ensures that, across markets, we would observe differences in quantity of land consumed that reflect, on average, responses to changes in prices and incomes, rather than differing tastes among households. The second condition enables the researcher to statistically isolate the changes in land consumption in response to a change in price.

Using data on nearly 100,000 housing transactions spanning 26 years in Montgomery County, Pennsylvania, we estimate the demand function for residential land following the Bartik-Epple technique. We treat each year of data as a separate market. Essentially, we assume that the preferences of the population do not systematically change over time. With regard to the observable attributes of the Montgomery County population, there has been very little change (aside from size of population) in the underlying composition of households over the period. During this period, there were many factors affecting the supply and demand for housing that shift household budget constraints, including (1) employment shifts in Philadelphia and the suburbs, which served to shift the demand for housing in different ways throughout the county[a]; (2) changes in mortgage rates that affect the cost of financing home purchases and are related to the finance costs builders face during the construction of new houses; and (3) the supply of available land changed over time at different rates throughout the county, which affected the market prices of houses and, hence, consumers' budget constraints.

Once our data meet the fundamental requirements of the Bartik-Epple procedure, a two-step procedure is then used to estimate the demand for residential land. First, using hedonic regression techniques, we estimate the relationship between house value and housing traits for each house in each year. Then, using this estimated relationship for each market (year), we compute the implicit price of residential land separately for each house. Second, we estimate a function that describes the relationship between the implicit price of land and the quantity of land consumed.[b] The estimation is done in such a way that the changes in quantity reflect those changes associated with shifts in the budget constraint and not changes that reflect differences in tastes across households. This is accomplished using an instrumental variables approach that purges the changes in quantity of land consumed that are due to differences in individual tastes. We use the variables described above as instruments for the quantity of land consumed.[c] These variables shift the consumer's budget constraint and, hence, shift the quantity of land consumed without shifts in preferences. The instrument equation yields the predicted quantities of land that differ across households only as a result of differences in households' budget constraints (not preferences). We then estimate the relationship between changes in land prices and changes in the quantity of land consumed.[d] These estimates allow the computation of unbiased estimates of the price elasticity of demand for residential land.

[a]Thus, shifts in housing demand associated with changes in city and suburban employment vary across space as well as time. See my 1999 article.

[b]The function estimated is an "inverse demand" function because price is on the left-hand side of the equation and quantity consumed is on the right-hand side.

[c]Specifically, the instruments include supply shifters: number of new homes built in the tract each year, fraction of homes in a tract each year that are new, census tract size in square miles, vacant land in the tract available for residential development; demand shifters: suburban employment growth lagged one year, suburban employment growth lagged two years, Philadelphia employment growth lagged one year, Philadelphia employment growth lagged two years, suburban and city employment growth rate lagged one year interacted with municipality dummy variables; and variables that affect supply and demand: fraction of households that moved between 1975 and 1980, fraction of heads of household between the ages of 35 and 54, annual mortgage rate, annual mortgage interest rate interacted with municipality dummy variables, total number of sales in the tract each year, and dummy variables for year of sale.

[d]For the inverse demand function to be identified, the instruments that shift supply (and hence are not included in the demand equation) must be significant. Our supply shifters in the instrument equation are all highly significant.

smart growth policies limit the amount of land available for residential use, they will drive up land prices, imposing additional costs on households.

Both the cost and the effectiveness of the policies in achieving their goals will depend, in part, on how responsive to price households' demand for land is. If, for example, consumers were very unresponsive to the price of land, local policies restricting the availability of residential land would have two effects. Because large price changes would be required to make households reduce their land consumption, land prices would likely rise a great deal in response to constraints on supply. High prices for land would result in some decline in land consumption per household, but only at a relatively large cost in terms of households' living standards. Also, higher prices for land would lead some households to seek new communities with lower land prices.

The bottom line is that if consumers are unresponsive to land prices, policies restricting the quantity of residential land will impose high costs on consumers and will likely induce households to circumvent the intent of the restrictions by moving to communities without restrictions. Ironically, if there are communities without land-use restrictions adjacent to communities that enforce such restrictions, the net result may be additional geographic decentralization with little overall impact on density.

Our estimates, however, suggest that consumers' consumption of land is quite responsive to changes in price. This finding raises the likelihood that smart growth policies will have larger effects on patterns of metropolitan land use, at lower costs to households than previously thought. When demand for residential land is elastic — that is, small increases result in relatively large adjustments in the amount of land consumed — consumers will substitute consumption of other goods for consumption of land relatively easily. Thus, policies that reduce the supply of land will result in increased prices for land, but these increases will be relatively modest. This suggests that the hardship associated with smart growth policies will be smaller than if demand were inelastic and, furthermore, that pubic policies designed to increase land prices and reduce households' land consumption will likely be more effective in increasing residential density.

Our findings imply that the low-density patterns of residential development so dominant in the United States may reflect not a unique American taste for large lots and open space but rather the low price of residential land. Moreover, public policies that affect the price of residential land could significantly alter these patterns of development. BR

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