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URBAN SPRAWL: DIAGNOSIS AND REMEDIES

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This article argues that urban spatial expansion results mainly from three powerful forces: a growing population, rising incomes, and falling commuting costs. Urban growth occurring purely in response to these fundamental forces cannot be faulted as socially undesirable, but three market failures may distort their operation, upsetting the allocation of land between agricultural and urban uses and justifying criticism of urban sprawl. These are the failure to account for the benefits of open space, excessive commuting because of a failure to account for the social costs of congestion, and failure to make new development pay for the infrastructure costs it generates. Precise remedies for these market failures are two types of development taxes and congestion tolls levied on commuters. Each of these remedies leads to a reduction in the spatial size of the city.

Strong sentiment against the phenomenon known as urban sprawl has developed over the last few years in the United States. Many local governments and several states have adopted policies designed to deal with sprawl. The issue has even been placed on the national agenda, with the Clinton administration proposing to use federal money for the preservation of open space. At the root of this effort is a perception that the process of urban growth in the United States has gone awry.

This perception involves a number of interlocking complaints. Cities, it is claimed, take up too much space, encroaching excessively on agricultural land. Aesthetic benefits from the presence of open space are lost, and an allegedly scarce resource, namely farmland, is depleted. Excessive urban expansion also means overly long commutes, which generate traffic congestion while contributing to air pollution. Unfettered suburban growth is also thought to reduce the incentive for redevelopment of land closer to city centers, contributing to the decay of downtown areas. Finally, by spreading people out, low-density suburban development may reduce social interaction, weakening the bonds that underpin a healthy society. Twelve articles in the fall 1998 issue of *Brookings Review* (vol. 16) provide an excellent overview of the sprawl debate.

Are these complaints justified? If so, which remedies can policy makers apply? To answer these questions, a definition of the issue at hand is essential. Urban

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sprawl means different things to different people, and this dispersion of views can impede useful discussion. Here, the term *urban sprawl* will refer to excessive spatial growth of cities. The key word in this definition is excessive. Although cities must grow spatially to accommodate an expanding population, the claim is that too much spatial growth occurs. If this allegation is correct, current public policies should be altered to restrict the spatial expansion of cities.

The stakes in this policy debate are substantial. Policy measures designed to attack urban sprawl will ultimately affect a key element of the American lifestyle, the consumption of large amounts of living space at affordable prices. A simple supply-and-demand argument establishes this conclusion. Restricting urban spatial growth means limiting the supply of land for residential development. With supply limited, urban land prices and ultimately the price of housing (measured on a per square foot basis) must rise. In response to such price escalation, consumers would reduce their consumption of housing space, making new homes smaller than they would have been otherwise. Therefore, an attack on urban sprawl would lead ultimately to denser cities containing smaller dwellings.

If the criticisms of urban sprawl are correct, then the loss from lower housing consumption would be offset by other gains such as improved access to open space and lower traffic congestion, and consumers on balance would be better off. But if the attack on sprawl is misguided, with few benefits arising from restricted city sizes, people would be packed into denser cities for no good reason, leading to a reduction in the American standard of living. The same conclusion would arise if some limitation of city sizes is desirable but policy makers are overzealous. If only mild measures are needed to restrict urban growth that is slightly excessive, but draconian measures are used instead, consumers are likely to end up worse off.

Because the stakes are high in the debate on sprawl, it is important to gain an understanding of the forces that might lead to excessive spatial growth of cities and to understand the nature of appropriate remedies. In working toward this understanding, the ensuing discussion does not address an issue frequently raised in criticisms of urban sprawl, namely, the proliferation of unattractive land uses such as strip malls and fast food outlets. Because this complaint concerns the character of development rather than its spatial extent, it lies outside the definition of urban sprawl used here. Although ugly development cannot be banned, a remedy for this problem lies in the use of zoning regulations and other tools of urban planning, which allow land use to be channeled toward more aesthetic outcomes. These tools can complement the policies discussed below, which are designed to limit the extent, rather than the character, of development.

WHY GROWTH IS MOSTLY BENIGN: THE FORCES UNDERLYING URBAN EXPANSION

Competition for land between real estate developers and nonurban users (mainly farmers and other agricultural users) helps to determine the spatial sizes of cities.

For a city to grow spatially, developers must be able to bid away additional land from agricultural users. A successful bid by developers means the land is worth more in urban use than in agriculture, reflecting a greater economic contribution in its developed state. In this sense, land conversion is guided by the economist's "invisible hand," which directs resources to their highest and best use.

The key implication of this principle is that urban growth is not an indiscriminate process, devouring agricultural land without regard to its worth. Although many critics of urban sprawl seem to hold this unfavorable view of the growth process, the view is not consistent with the operation of a free market economy, where resources find their most productive uses. Buttressing this claim, evidence has shown that in regions where agricultural land is productive and its value high, cities are more spatially compact than in regions where agricultural land is unproductive and therefore cheap (Brueckner and Fansler 1983). Productive agricultural land is thus more resistant to urban expansion than unproductive land, reflecting the operation of the invisible hand.

Concerns about loss of "scarce" farmland are also misplaced. Because the value of farm output is fully reflected in the amount that agricultural users are willing to pay for the land, a successful bid by developers means that society values the houses and other structures built on the land more than the farm output that is forgone. If farmland became truly scarce and in need of preservation, its selling price would be high, making the land resistant to urban encroachment. With only a tiny fraction of the U.S. land area occupied by cities, farmland scarcity is not a problem currently, nor is it likely to become a problem in the future.

Although the allocation of land is governed by competition between urban and agricultural uses, the outcome has increasingly tipped in favor of urban use, leading to substantial spatial growth of cities and prompting criticism of urban sprawl. Economists believe that three underlying forces—population growth, rising household incomes, and transportation improvements—are responsible for this spatial growth (see Mieszkowski and Mills 1993). As the nation's population expands, cities must grow spatially to accommodate more people. In addition, rising incomes affect urban growth because residents of the city demand more living space as they become richer over time. By itself, the greater demand for space causes the city to expand spatially as dwelling sizes increase. This effect is reinforced by the residents' desire to carry out their greater housing consumption in a location where housing is cheap, namely the suburbs. So the spatial expansion due to rising incomes is strengthened by a price incentive favoring suburbanization.

A similar phenomenon occurs in response to investment in freeways and other transportation infrastructure. Because such investment makes travel faster and more convenient, thus reducing the cost of commuting, consumers can enjoy cheap housing in the suburbs while paying smaller commuting-cost penalties. As a result, suburban locations look increasingly attractive as commuting costs fall, which spurs suburbanization and leads to spatial growth of the city.

Job suburbanization has also occurred as cities have grown spatially. This relocation of jobs to the suburbs has been due in part to changes in the transport orientation of businesses. Rather than shipping their output through centrally located rail depots and port facilities, firms increasingly rely on truck transport and, thus, prefer the easy highway access (as well as the low cost) of suburban locations. However, the evidence shows that jobs also follow people. In other words, job suburbanization is partly a response to the suburbanization of the population, which occurs for the reasons discussed above. Thus, unlike the fundamental forces driving urban expansion, job suburbanization is partly an effect rather than a cause of this growth. Thurston and Yezer (1994) provide a useful empirical analysis of the interaction between job and population decentralization.

The confluence of an expanding national population, rising incomes, and falling commuting costs makes the rapid expansion of cities in recent decades unsurprising. The real question is whether this expansion has been too rapid. In other words, does the invisible hand, which guides the conversion of land to urban use, push too hard in the direction of bigger cities?

Economists use the term *market failure* to describe a situation in which the invisible hand fails to allocate resources in a socially desirable manner, so as to maximize aggregate economic well-being. Market failure arises when economic agents face incentives that are distorted because of institutional failings or some other reason, leading to economic outcomes that are bad from society's point of view. The classic example of a market failure is air and water pollution, where a factory has little incentive to take account of the environmental damage it causes and, thus, ends up polluting too much. Is a similar market failure involved in the spatial expansion of cities? If so, the criticism of urban sprawl is justified, and measures are needed to restrict urban expansion. Economists have, in fact, identified several market failures that may affect the urban growth process.

SOURCES OF MARKET FAILURE IN URBAN GROWTH AND POTENTIAL REMEDIES

Three market failures may lead to excessive spatial growth of cities. The first arises from a failure to take into account the social value of open space when land is converted to urban use. The second arises from a failure on the part of individual commuters to recognize the social costs of congestion created by their use of the road network, which leads to excessive commuting and cities that are too large. The third market failure arises from the failure of real estate developers to take into account all of the public infrastructure costs generated by their projects. Thus, development appears artificially cheap from the developer's point of view, encouraging excessive urban growth. These market failures, and the steps that can be taken to correct them, are discussed sequentially.

Failure to Account for the Social Value of Open Space

Ready access to open space is important for society's well-being. Open space provides city dwellers with an easy escape from the frenetic urban scene and a chance to enjoy nature. Such open-space benefits, however, are not taken into account when land is converted to urban use. As noted above, conversion depends solely on the land's productivity in urban use (which depends on the value of the houses built) relative to the land's productivity in agriculture (as reflected in the value of farm output). The problem is that since intangible open-space benefits do not constitute part of the income earned by the land when it is in agricultural use, the disappearance of these benefits does not show up as a dollar loss when the land is sold to a real estate developer. The invisible hand thus ignores open-space benefits, causing too much land to be converted to urban use and leading to excessive spatial growth of cities.

A simple form of government intervention can remedy this problem: charging a development tax on each acre of land converted from agricultural to urban use (this tax is added to any fees already levied). The magnitude of the tax is set equal to the value of the open-space benefits that are lost when the land is converted. By raising the cost of conversion, the tax retards the development process and slows the rate of urban expansion.

The subjective nature of open-space benefits makes crafting a public policy to preserve them very difficult and potentially counterproductive. The problem is that implementing such a policy requires assigning a dollar value to the open-space benefits provided by an acre of land. Although economists have tried to estimate such values, the results are not sufficiently credible to be a reliable basis for policy (for an overview of the methods used by economists to measure the value of environmental amenities, see Blomquist and Whitehead 1995). This estimation problem puts the policy maker in the position of having to guess the correct magnitude for a development tax. The proper tax could be quite small (even zero) if most consumers are not very concerned about the availability of open space around their cities. However, a well-meaning policy maker, perhaps swayed by the arguments of a vocal interest group, might charge a high development tax because of a gross overestimate of open-space benefits, with harmful results. Such a tax would needlessly restrict expansion of the city, raising housing prices and shrinking housing consumption.

Failure to Account for the Social Costs of Freeway Congestion

The second market failure affecting the spatial sizes of cities arises through the activity of commuting. Commuters incur substantial costs, which include the out-of-pocket expenses of vehicle operation as well as the "time cost" of commuting.

The latter cost measures the dollar value to the commuter of the time consumed while in transit, which is mostly wasted. Together, these out-of-pocket and time costs represent the "private cost" of commuting, the cost that the commuter himself bears.

When the commuter drives on congested roadways to get to work, another cost is generated above and beyond the private cost. This cost is due to the extra congestion caused by the commuter's presence on the road. Such congestion arises because slight increases in traffic on a crowded roadway can lead to a substantial drop in traffic speed. The lower speed prolongs everyone's trip, raising the time cost of travel for all commuters. Thus, on congested roads, the true social cost of commuting for an individual includes the costs imposed on other commuters through that extra congestion. Although this extra congestion is slight, its impact is significant because many other commuters are affected.

Because these congestion costs are borne by others, the commuter himself has no incentive to take them into account. This missing incentive constitutes a market failure, and it means that commuting on congested roadways looks artificially cheap to individual commuters. Therefore, congested roads are overused from society's point of view.

To correct this problem, reducing road usage to socially optimal levels, several steps are appropriate. Some traffic should be diverted to off-peak hours, when roads are less congested, and some car commuters should switch to public transit. In addition, because of the overlooked social costs of commuting, the average commute distance is too long from society's point of view and should be shortened. But an excessively long average commute means that cities are too spread out. Therefore, by causing people to commute too far, the market failure associated with freeway congestion can lead indirectly to urban sprawl. Wheaton (1998) provides a clear theoretical demonstration of this point.

Because the source of the problem is the individual's false perception of the costs of commuting, the remedy is to raise commuting costs by imposing a "congestion toll." Such a toll charges each commuter for the congestion damage imposed on others. When a toll is levied, the out-of-pocket cost of rush-hour commuting rises, and individuals have an incentive to shorten their commutes. Because this means living closer to one's job location, the ultimate effect is a spatial shrinkage of the city. The city becomes denser, just as if a development tax had been imposed. With people driving shorter distances to work, total traffic volume (as measured by vehicle miles) falls, as does the amount of auto-related air pollution, addressing key complaints of the critics of urban sprawl. All these effects would emerge, of course, only over a very long time period as land use adjusts to the higher cost of commuting.

Unlike the development tax, the proper magnitude of congestion tolls can be computed reliably, drawing on the wealth of accumulated knowledge about commuting behavior (for a discussion of toll computation and the practicality of tolls, see Small 1992). Yet, although economists and transportation engineers uniformly

endorse congestion tolls, they are seldom levied in practice. One problem is political: even though the revenue earned from tolls would allow other taxes to be reduced, commuters view tolls as a net tax increase, which creates opposition.

Another problem is the daunting logistics of collecting tolls in a manner that does not impede traffic flow. In principle, technological advances can remove this obstacle by allowing toll charges to be tallied by electronic meters installed in the automobiles. Low-tech solutions such as downtown parking taxes and costly bumper stickers that permit rush-hour usage of central roadways are also feasible. The latter approach was implemented in Singapore, whereas cities in Norway have experimented with more high-tech methods of collecting tolls (for details of these schemes, see Small and Gomez-Ibanez 1999).

Congestion tolls may also reduce road usage in the other ways mentioned above, which do not affect urban sprawl. Some commuters may give up their cars, switching to public transit to get to work. Also, businesses might alter work schedules to allow their employees to commute at off-peak hours when no toll is charged.

Failure to Fully Account for the Infrastructure Costs of New Development

The infrastructure costs generated by new development are another source of market failure that affects urban growth. When a new housing development is built, roads and sewers must be constructed, and facilities such as schools, parks, and recreation areas are needed. Homeowners, through the property tax system, pay for this infrastructure.

The market failure arises because, under current financing arrangements, the infrastructure-related tax burden on new homeowners is typically less than the actual infrastructure costs they generate. The reason is that the cost of new sewers and schools is shared among all of the city's residents rather than charged directly to those who require the new infrastructure. In effect, infrastructure is priced approximately at average cost rather than marginal cost. Because the property tax burden on new homeowners is lower than if they fully paid for their infrastructure costs, these homeowners are able to pay a higher purchase price for their houses than if the correct tax were levied. With their houses selling for more, developers are then able to offer more for agricultural land than would be possible if the correct tax burden were levied on new homeowners. Higher bids for agricultural land in turn mean more conversion of land to urban use, leading to too much development and excessive spatial sizes for cities. Thus, by undercharging new homeowners for the infrastructure costs they generate, the current system of public finance leads to urban sprawl.

The way to correct this problem is to alter the system of infrastructure financing so that new development pays for its infrastructure costs. In fact, many communities have undertaken such an alteration by adopting a system of "impact fees." Under this system, infrastructure costs are paid up front in a lump sum fashion

rather than being spread over many years of property tax payments. The impact fees are calculated exactly to offset the infrastructure costs from the new development, so that no additional financing is required. The fees are paid directly by housing developers instead of by homeowners. The dollar amounts can be substantial, reflecting the high per house cost of sewers, school facilities, and other infrastructure. Altshuler and Gomez-Ibanez (1993) provide an excellent overview of the use of impact fees in the United States.

Because impact fees correctly charge for infrastructure costs, the burden they impose is higher than under traditional property tax financing. As a result, impact fees depress the amount that housing developers are able to pay for agricultural land relative to the traditional case. This in turn slows the development process, limiting the pace of urban spatial growth. Theoretical analysis by Brueckner (1997) demonstrates the need for impact fees and characterizes their effects.

Impact fees are widely used in many parts of the United States. Many Chicago-area communities charge school impact fees, for example, which defray the cost of new school construction. These fees often amount to several thousand dollars per house. Historically, impact fees have been challenged in the courts by real estate developers, who have contested the rights of communities to levy the fees or the methods used to calculate them. In some cases, the fee computations have in fact been flawed, so that the magnitudes do not properly reflect infrastructure costs. Correct impact fees can be computed, however, and their use can lead to better development decisions.

USE OF GROWTH BOUNDARIES TO CONTAIN URBAN SPRAWL

The three remedies (development taxes, congestion tolls, and impact fees) prescribed for the market failures leading to urban sprawl each involve use of the price mechanism. Policy makers, however, often favor a much blunter instrument, usually called an urban growth boundary (UGB). A UGB is a zoning tool that slows urban growth by banning development in designated areas on the urban fringe. In effect, imposition of such a boundary involves drawing a polygon around a city and prohibiting development outside it. Ding, Knaap, and Hopkins (1999) provide an analysis of the operation of UGBs.

A UGB is easy to implement but has great potential for misuse. The problem is similar to the one that arises in taxing development to preserve open space, namely, the need for guesswork. In particular, without a careful inquiry into the sources of market failure, policy makers cannot gauge the exact extent of urban overexpansion. As a result, a UGB may be much too stringent, needlessly restricting the size of the city and leading to an inappropriate escalation in housing costs and unwarranted increases in density.

The way to avoid such errors is to attack urban sprawl at its source by imposing the specific remedies outlined above. Proper congestion tolls and impact fees can

be computed with a high degree of reliability, ensuring that the resulting adjustments in urban spatial size are correct from society's point of view. A development tax designed to preserve open space works well also, provided that a proper measure of open-space benefits can be computed.

Portland, Oregon, has the best-known example of a UGB (for a discussion of land use planning in Oregon, see Knaap and Nelson 1992). Some commentators claim that Portland's UGB is responsible for excessive house price escalation in that city, whereas others argue that the boundary is so loose that its price effects are negligible. This controversy illustrates an important point, namely, that there is no way to tell whether a UGB is set properly without focusing on the underlying market failures that lead to urban sprawl. Regardless of which view of the Portland case is correct, UGBs retain the potential for excessively restricting city sizes and should be used with great care.

"VOTING WITH ONE'S FEET" AND URBAN SPRAWL

In addition to population growth, rising incomes, and falling commuting costs, another fiscal force has contributed to the suburbanization process in U.S. cities. This is the desire of high-income consumers to form separate jurisdictions for the provision of public goods such as education, public safety, and parks. When households of different incomes are intermixed, high-income households pay more than an equal share of the cost of public goods, a consequence of their larger property tax bills. In addition, high-income households may end up with lower public spending than they would prefer, a consequence of the lesser ability to pay of low-income voters. However, when high-income households "vote with their feet," forming their own jurisdictions for provision of public goods, both of these drawbacks are avoided. Separate jurisdictions eliminate the need to subsidize low-income households, so that taxes can be lowered at the same time that public good provision is increased. The location for such new jurisdictions is on the suburban fringe. Thus, spatial expansion of cities is partly driven by the fiscal incentive of high-income households to separate themselves from the less well off. Tiebout (1956) provided the seminal analysis of the fiscal incentives leading to such homogeneous communities, and Wildasin (1986) provides an overview of more recent studies.

This force cannot be categorized as a market failure like those discussed above. It is an outgrowth of the U.S. system of public finance, which gives local governments great autonomy in choosing spending levels. This autonomy spurs the process of voting with one's feet, which allows high-income households to insulate themselves fiscally from their low-income counterparts. To undo the urban spatial expansion created by this impulse for fiscal segregation, a change in the underlying structure of fiscal incentives is required. For example, the current system of autonomous jurisdictions could be modified by adding a higher level metropolitan-area government with the power to tax suburban residents and to spend the proceeds in

the central city. Alternatively, a more restricted type of tax base sharing among municipalities could be implemented. Because either change would limit the ability of high-income households to escape redistributive taxation that benefits low-income consumers, the incentive to form separate communities on the suburban fringe would be weakened, curbing the spatial expansion of cities.

Any proposal for a metropolitan-area government, however, is likely to encounter fierce political opposition from well-off households, making such a change impractical. An account of such opposition is provided by the Orfield (1998) article in the Brookings symposium, which documents the political struggle over metropolitan government in Minneapolis. In addition, such proposals have the drawback of interfering with freedom of choice in the public sector, which comes from a household's ability to select a place of residence from among a host of fully autonomous jurisdictions offering different amounts of public spending.

By-Products of an Attack on Urban Sprawl

Suburbanization contributes to the decay of central cities by reducing the incentive to redevelop land near the center. The reason is that the suburbanization forces generated by rising incomes and falling commuting costs end up reducing the demand for aging central-city housing, depressing its price and diminishing the incentive for upgrading and redevelopment. Although central decay is therefore a likely outcome even if the spatial growth of cities is not excessive, the problem is exacerbated when cities overexpand. By inappropriately increasing the supply of developed land, overexpansion puts downward pressure on housing prices throughout the city. With central-city prices lower than they would be if city size were not excessive, the incentive for upgrading and redevelopment of aging dwellings is further reduced.

If, however, sprawl is attacked with an instrument such as a development tax, then the city ultimately shrinks, and housing prices rise everywhere, as noted above. By raising the return to real estate investment, this price escalation is likely to spur redevelopment efforts in central neighborhoods. Thus, one by-product of an attack on sprawl at the urban fringe may be upgrading and redevelopment in decaying central neighborhoods (for an empirical analysis of the redevelopment process, see Rosenthal and Helsley 1994).

Many commentators criticize the process of suburbanization, and its attendant "car culture," as weakening the nation's social bonds by spreading residences out in low-density patterns that discourage interaction. These critics wish to return to a previous type of urban existence, one characterized by the interactive street life that results from high densities and intermixing of residences and commercial establishments. Hayward (1998) presents a clear statement of this position.

Yet, by opting for the suburban lifestyle, with its promise of spacious houses and its segregation of residential and commercial land uses, consumers have apparently

rejected this earlier pattern in favor of something different. Despite this choice, some commentators in effect argue that people may not really know what is good for them, concluding that a return to an earlier urban lifestyle may actually make society better off. If these critics are correct, then an attack on urban sprawl, by partly dismantling the offending suburban lifestyle, may produce benefits via greater social interaction in cities.

CONCLUSION: TAKE A CAUTIOUS APPROACH

When crafting policies to address sprawl, policy makers must recognize that the potential market failures involved in urban expansion are of secondary importance compared to the powerful, fundamental forces that underlie this expansion. For example, although the failure to fully charge for infrastructure costs may impart a slight upward bias to urban expansion, the bulk of the substantial spatial growth that has occurred across the United States cannot be ascribed to such a cause. Instead, this growth mostly reflects fundamentals such as the nation's growing population and the higher incomes of its citizens. Because of the secondary role of market failure, a draconian attack on urban sprawl is probably not warranted. By greatly restricting urban expansion, such an attack might needlessly limit the consumption of housing space, depressing the standard of living of American consumers. Instead, a more cautious approach, which recognizes the damage done by unwarranted restriction of urban growth, should be adopted.

Such caution is a built-in feature of the development taxes and congestion tolls discussed above, which attack sprawl at its source by correcting specific market failures. UGBs, by contrast, can easily yield undesirably draconian outcomes because they are not directly linked to the underlying market failures responsible for sprawl. However, because UGBs simply require an extension of existing zoning powers, local policy makers may find them more convenient to use than taxes or tolls. UGBs may therefore end up as the instrument of choice for attacking urban sprawl. Policy makers should resist the temptation to impose stringent UGBs, recognizing that a substantial restriction of urban growth is likely to do more harm than good.

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