Sprawl: The Houses That Externalities Built?

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Since World War II, North America has seen tremendous growth in the amount of land used by cities. In the United States[1] the rate of growth of urban land coverage has outpaced the rate of growth of urban populations by at least a factor of four (Leinberger 2008, 72). Because of the way that the United States Department of Agriculture and United States Census define urban areas, these statistics do not include land occupied by extremely low population density suburbs, such as 'McMansion' neighbourhoods. If these very low population density developments were included, it is estimated that land coverage growth would outpace population growth by a factor of between six and eight (Leinberger 2008, 72). This dramatic increase in land coverage and associated decrease in average population density is referred to as sprawl.

Sprawl and suburban development are frequently thought of as the same thing, although this is not accurate. Strictly speaking, suburban development simply refers to development outside a city. Suburban development dates back to the Roman suburbium, which was the area of development outside the city walls (Bruegmann 2005, 23). Suburban development has existed in numerous cultures and historical periods, including early modern London, and Chinese cities of the Ming dynasty (Bruegmann 2005, 23-24). In the present day, suburban development tends to connote a much lower population density and more automobile-dependent land use than historical suburbs. This type of development is more accurately termed sprawl. Soule (2008, 3) offers a working definition of sprawl:

> Sprawl is low density, auto-dependent land development taking place on the edges of urban centers, often 'leapfrogging' away from current denser development nodes, to transform open, undeveloped land, into single-family residential subdivisions and campus-style commercial office parks and diffuse retail uses.

Unfortunately, sprawl is often considered a pejorative term; Breugmann (2005, 18) notes that "most people don't believe they live in sprawl. Sprawl is where other people live." Despite the negative connotation of 'sprawl', it is useful for describing a specific sub-category of suburban development.

Many of the reasons for negative attitudes toward sprawl are cultural and/or aesthetic. Muzio and Halper (2002, 556-558) discuss both academic and non-academic criticisms of sprawl's cultural inauthenticity and its promotion of conformity. While these critiques are not necessarily without merit, of greater concern are the economic costs associated with sprawl. If consumers are making a decision to consume a certain housing product in a

[1]As most of the research on sprawl has been in an American context, this paper will focus on the United States rather than on Canada.

free and competitive market, there can be little to criticize. Consumer research has shown that Americans have a variety of preferences regarding housing. A survey found that 29% of Atlantans and 40% of Bostonians preferred urban housing, 41% of Atlantans and 30% of Bostonians preferred sprawl housing, and the remaining 30% in each city did not have a strong preference. These preferences are not reflected in where Americans actually live; 70% of the Bostonians and just 35% of Atlantans who desired urban housing were able to live in it (Leinberger 2008, 94-96). The reason for the discrepancy between desires and reality is that sprawl housing is much less expensive than urban housing. Depending on the methodology used, housing prices drop between 1.5 and 6 percent per mile as one moves away from the central business district (Burchell et al. 2002, 128). Normally, this discrepancy between desire and reality would not be a problem; many luxury goods are desired by consumers but are not affordable. However, sprawl development's price advantage is at least partially the result of externalized costs. These externalized costs primarily take the form of pollution, congestion, and infrastructure.[2] Once these external costs have been established, an estimate will be made as to the significance of external costs in promoting sprawl development.

The most important external cost of sprawl development is seen in the personal automobile. The personal automobile is one of the defining features of sprawl development. An important part of the movement toward sprawl was the General Motors sponsored Futurama exhibit at the 1939-40 New York World's Fair (Leinberger 2008, 15-30). This football-field sized model of the imagined future city of 1960 prominently featured superhighways and low density suburban residences. The primary method of transportation in the city of 1960 was the personal automobile. It is estimated that approximately ten percent of the United States population saw the Futurama exhibit (Leinberger 2008, 17). The creation of the interstate highway system is, in addition to its stated purpose as a military road network, a strong endorsement of Futurama-style development and of the personal automobile (Leinberger 2008, 24). Almost every author writing on sprawl acknowledges the importance of the personal automobile in sprawl development (Leinberger 2008, Burchell et al. 2005, Nechyba and Walsh 2002). Sprawl development residents don't just drive, but drive significantly *more* than their urban counterparts; there is a negative correlation between population density and vehicle miles traveled (VMT) per person (Gardner 2006, 243).

The increased use of personal automobiles by sprawl residents increases their external costs. There are two major external costs associated with automobiles in sprawl development: pollution and congestion. Automobile pollution contributes to global warming as well as reducing local air quality. Global warming imposes significant economic costs on individuals around the world. There are many detrimental effects of global warming, some of the most important include rising sea levels, loss of biodiversity, damage to forests, and more intense storms (Gardner 2006, 245).

[2]Some, such as Leinberger (2008), argue in favour of a broader range of costs associated with sprawl development, such as obesity-related costs. These types of lifestyle costs will not be explored. Although they are often associated with sprawl housing, they are not an integral part of it.

One of the major causes of global warming is carbon dioxide. It has been found that residents of the "least walkable"[3] neighbourhoods of Atlanta are responsible for approximately 20% more carbon dioxide emissions than residents of the "most walkable" Atlanta neighbourhoods, even after controlling for age, income, and gender (Goldberg et al. 2007, 22). Local air quality reductions as a result of pollution impose quality of life as well as monetary costs on others. Automobiles are responsible for 32% of nitrogen oxide emissions and 26% of volatile organic compounds (Gardner 2006, 244). Nitrogen oxides and volatile organic compounds react in the presence of sunlight to produce ground-level ozone which can cause asthma, bronchitis, reduced lung function, chronic obstructive pulmonary disease, and premature death (Gardner 2006, 244). Vehicle emissions were found to account for 3% of total mortality in Austria, France, and Switzerland (Künzli 2000). Automobile use negatively affects the health of others and creates healthcare costs which are not paid by the driver.

The second aspect of personal automobile transportation which imposes external costs is the creation of traffic congestion. Once traffic reaches a certain volume, each additional driver who uses the road reduces the average speed of traffic. The additional drivers who slow the speed of traffic impose costs on all other motorists on the road by wasting their time and, if traffic actually stops, their fuel. The costs of congestion are significant: the Texas Transportation Institute calculates that in 2005 congestion cost the United States $78.2 billion, or approximately $707 per driver, in lost time and fuel (Shrank and Lomax 2007, B-20). In addition, the 2.9 billion gallons (10.98 billion litres) of fuel wasted due to congestion cause additional pollution (Shrank and Lomax 2007, B-20). Since residents of sprawl development are more dependent on personal automobiles than urban residents, they create more congestion-related costs. These costs are paid largely by other motorists, but pollution from idling imposes local and global costs.

If these costs of personal automobile use were borne by the automobile operator instead of by the general public, the cost of operating a vehicle—ceteris paribus—would increase. The increased cost of automobile operation would affect sprawl dwellers more than their urban counterparts, due to sprawl's greater reliance on personal automobiles. Bid-rent curves would become steeper and create incentives to increase population densities in order to decrease transportation costs. One simple but crude method to internalize these costs is through an increased fuel tax. It is relatively easy to implement, as already existing fuel taxes would simply need to be raised, although there may be substantial political obstacles to increasing fuel taxes. Unfortunately, it is an imprecise method of internalizing automobile costs (Parry and Small 2005, 1276). Fuel taxes are an effective method of internalizing global warming costs, but local pollution and congestion would be better internalized by taxes based on miles travelled depending on location and time of day. Fuel taxes apply equally whether the motorist is on a congested or uncongested road; in the former they are imposing costs on others, in the latter they are not. Similarly, fuel taxes apply equally whether the motorist is in an urban or rural area, even though local pollution externalities are higher in the urban area. However, more

[3]In Golberg et al's (2007) analysis, walkability is an index of density, street connectivity, and degree of mixed land uses.

optimal internalizing taxes depend on administrative ability and political willpower that do not yet exist (Parry and Small 2005, 1276). Fuel taxes are, for the time being, the most effective and realistic method to internalize personal automobile costs.

Infrastructure and service costs are another way in which sprawl development externalizes its costs. Sprawl development, which typically takes place away from existing development, requires large investments in infrastructure and services. Infrastructure costs include roads, water mains, and sewers, while service costs include new schools, police, firefighters, parks, and libraries. Lower density development requires more miles of infrastructure to serve the same number of households (Burchell et al. 2005, 50). A study of infrastructure costs in Florida showed that utility and road infrastructure costs were 40% and 60% higher respectively per dwelling unit than more compact forms of development (Burchell et al. 20005, 51). Service costs are also higher in sprawl development than in compact development (Burchell et al. 2005, 79). If these infrastructure and service costs are paid out of general municipal and state coffers, which are funded by property, sales, and income taxes, all residents of the municipality or state are paying for the infrastructure of sprawl residents (Nelson and Moody 2003, 1). Once again, the full costs of sprawl development are not borne by those who receive the benefit.

Infrastructure costs are the simplest costs of sprawl to internalize: municipalities must charge developers a fee for the infrastructure they receive. To accomplish this, many municipalities have introduced impact fees, which are "onetime assessments by local governments on new development, or the owners of new development, to help pay for the existing, new, or expanded infrastructure needed to serve that development"(Nelson and Moody 2003, 1). If impact fees are implemented and priced equal to the cost the municipality pays to provide infrastructure and services, new developments will impose no costs on other residents of the municipality. Depending on the incidence of fee, it will be paid by homeowners in higher housing prices, by developers in reduced profits, or by rural landowners in reduced prices paid for development land.[4] In all of these cases, the infrastructure costs will be internalized.

While the distribution of housing between urban and sprawl is not efficient due to market failures, it is not as important as some anti-sprawl activists believe. An analysis of the magnitude of suburban externalities will show that even if pollution, transportation, and infrastructure costs are internalized, there is unlikely to be a strong change from sprawl to urban development. To internalize pollution and congestion resulting from personal automobile use, fuel taxes should be increased.

Currently, fuel taxes are less than half of what they should be in order to restore market efficiency in the United States (Parry and Small 2005, 1277). More than doubling fuel taxes seems dramatic, but the effect of this action on land allocation would not be. Currently fuel taxes across the United States are approximately 40 cents per gallon and, based on Parry and Small's (2005, 1276-1277) analysis, should be raised to $1.01 per

[4]For more information on the incidence of impact fees, see Ihlanfeldt and Shaughnessy (2004).

gallon. Based on data from the US Department of Energy (2008), the average price of fuel from October 2007 to October 2008 was $3.39 per gallon. If fuel taxes were increased to the level that internalizes automobile costs, we would expect retail fuel prices to increase to approximately $4.00 per gallon, an increase of 17.99%. This is obviously a sizable increase, but the effects on sprawl depend on whether that price increase actually reduces driving. Puller and Greening (1999, 45) have calculated the elasticity of VMT per year with respect to the retail price of fuel at approximately -.69.[5] A 17.99% percent increase in fuel prices would therefore cause a 12.41% decrease in VMT. Puller and Greening (1999, 45) further note that VMT reductions tend to come from long discretionary trips, such as vacations. A 12.41% reduction in VMT is a moderate effect, but is unlikely to affect commuting patterns strongly, and therefore is not likely to shift land drastically toward high density urban development.

Impact fees are similarly unlikely to make a large difference in land usage patterns. In order to create an efficient market outcome, impact fees would need to be levied on higher density development as well as lower density development. Therefore, the absolute value of impacts fees is not as important as the difference between single-family and multi-family buildings on a per dwelling basis. If this difference is high, the price of sprawl development increases relative to urban development and quantities would adjust accordingly.

A nationwide survey of impact fees within the United States calculated average impact fees for broad categories of land use. Single-family buildings averaged $11,239 in impact fees per dwelling unit while multi-family buildings averaged $7,092 per dwelling unit (Mullen 2008, 5). While the 58% premium for single family dwellings over multi-family dwellings is significant in relative terms, the $4,147 difference is somewhat insignificant when compared to the purchase price of a house or condominium. Some contend, however, that impact fees are frequently underpriced relative to the marginal cost of providing infrastructure (Nelson and Moody 2003, 5). Even if we accept the highest impact fees in the United States, those charged by the city of Ripon, California, as accurate, the impact on land usage is still likely to be small. In Ripon there is a difference of $23,029 between single-family buildings and multi-family buildings per dwelling unit (Mullen 2008, 9, 16). Even a relative change of this magnitude is unlikely to overcome the price advantage and other factors that attract consumers to sprawl development.

The correction of housing externalities is unlikely to result in a significant change in housing patterns. While there are externalities associated with sprawl development, they are small relative to the price of housing. Internalizing personal automobile costs through increased fuel taxes would result in a 12.41% reduction in VMT, although much of that reduction comes from discretionary trips rather than commutes, and internalizing infrastructure costs would, even in the most extreme scenario in the United States, increase the cost of single-family dwelling units by $23,029 compared to multi-family

[5]This elasticity could be underestimated. Puller and Greening base their calculations on 9 years of household level data. While a 9 year period ensures that the vehicle stock is not fixed, it is not long enough to ensure the housing stock is not fixed. In the very long term, we could expect the elasticity to be more elastic (< -.69) than the calculated value.

dwelling units. Neither of these is likely to lead to drastic changes in land use or development among the general public, although a very small number of consumers at the margin will move from sprawl to urban housing. With externalized costs rejected as a reason for the increasing amount of sprawl development, future research should focus on what consumers find so compelling about sprawl development. Is it simply a desire for larger living spaces? Do consumers feel safer in suburban neighbourhoods? Is there a perceived increase in social status associated with living in sprawl housing? Are suburban schools superior to urban schools? Is it the result of racial tensions, so-called 'white flight?' These are just a few of the possible reasons for increased sprawl development which could be investigated in the future.

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