

COUNTERACTING INEFFICIENT URBAN DEVELOPMENT

AN ANALYSIS OF THE NEGATIVE EFFECTS OF URBAN SPRAWL

Bachelor's Thesis
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Fall 2022

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Title of thesis	Counteracting inefficient urban development – an analysis of the negative effects of urban sprawl		
Degree	B. Sc. (Economics and Business Administration)		
Degree programme	Economics		
Thesis advisor(s)	Mitri Kitti and Tuukka Saarimaa		
Year of approval	2022	Number of pages	22
		Language	English

Abstract

Urban sprawl refers to the spatial expansion of cities, typically as a result of an increased demand for low-density residential areas. The OECD has identified urban sprawl as a key policy concern in the coming decades due to the global trend of urban living. This literature review aims to study the externalities of urban sprawl and highlight some of the tools economists have at their disposal in addressing the phenomenon.

While urban sprawl offers numerous advantages to individuals such as larger and cheaper dwellings, it results in externalities such as congestion, air pollution, and social inequality. Many of the externalities associated with sprawl are not perceived by economists as relevant or challenging. Inefficient land use and car-based externalities have received the most attention.

Land value taxation is the most effective measure in discouraging sprawl, but gasoline taxation offers an interesting alternative as it targets the main externalities more directly, without necessarily reducing the consumption benefits of sprawl. The future relevance of the study of sprawl is largely dependent on the development of transportation technology, as many of the externalities associated with sprawl would be largely eliminated by greener transport.

Keywords Urban sprawl, externalities, land value taxation, property value taxation, fuel taxation, monocentric city model

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1. Introduction

This literature review studies urban sprawl and its effects. Urban sprawl refers to the expansion of urban land area, typically as a result of low-density residential development. Urban sprawl has interested researchers across the academic spectrum since the Second World War, however the issue entered the public consciousness towards the end of the 20th century. The commercialization of the automobile allowed people to move farther from the city centre, and subsequently consume more land and housing at a lower cost (Nechyba & Walsh, 2004). Despite these positive effects, sprawl is generally viewed as a negative development due to the externalities it creates. Scholars in other fields such as environmental studies and health have been largely united in their opposition to sprawl, while economists have sought to quantify the costs and benefits of the phenomenon, without necessarily condemning the trend outright.

In my bachelor's thesis, I intend to answer the question: *“how do economists view urban sprawl, and what methods have been suggested in limiting the negative effects and externalities resulting from the phenomenon?”*

This review is focused on the field of urban economics, with studies conducted by researchers in other fields playing a supporting role. Urban sprawl is primarily a microeconomic phenomenon, as individual preferences are key in understanding why sprawl occurs. However, some researchers have looked at the phenomenon from a macroeconomic perspective, seeking to establish a link between sprawl and total output.

1.1. Rationale for the study

The Organisation for Economic Co-operation and Development (OECD) has identified urban sprawl as one of the key sustainability concerns of the coming decades (OECD, 2018). They estimate that by 2050, 70% of the global population of 9,7 billion will live in cities. In 2021, 56,6% of the world's population of 7,8 billion was urban (The World Bank, 2021). By these estimates, the urban population will increase by roughly 2,4 billion people in just 29 years. A large portion of the urban areas which will house this staggering amount of people are yet to be built, which has prompted researchers from a wide array of fields to consider the implications of this feat.

Despite growing concern from both intergovernmental organizations and researchers in other fields, economists have been wary to condemn sprawl outright. After all, the adverse effects

of sprawl are externalities, the cost of which must be accurately assessed before choosing how to react to the phenomenon. Unfavourable urban design could decrease welfare and rushing to correct poorly understood externalities could have longstanding negative implications. Thus, a review of the benefits and consequences of urban sprawl as well as the tools available is relevant.

1.2. Previous research

American city planner Earl Draper introduced the concept of urban sprawl in 1937 (Nechyba & Walsh, 2004). Since then, many researchers have studied the phenomenon. Due to the close link between urban sprawl and automobiles, much of the empirical literature concerns the United States, but China has also emerged as an interesting research setting. In the early 2000's, many economists (Brueckner, 2001; Glaeser & Khan, 2003; Nechyba & Walsh, 2004) found the negative effects of sprawl to be rather mild and easily correctable. Nonetheless, concern about the phenomenon has increased in line with concern about the environment. Most of my empirical literature concerns the United States, but I have used studies from other countries such as Portugal and Finland as well.

1.3. Scope and structure

In the second section of the paper, I will briefly discuss key concepts and introduce a theoretical model relevant to my research. In sections three and four, I study some of the most relevant negative effects and externalities of urban sprawl and look at the tools economists have considered to correct them. While sprawl may have broader positive effects, these are beyond the scope of my thesis. I intend to summarize the main findings of previous studies and attempt to so assess to what extent the phenomenon of urban sprawl requires intervening, and also comment on the implications my findings might have on the near future.

Although urban sprawl is primarily a microeconomic phenomenon, some researchers have analyzed the macroeconomic implications of urban sprawl (for example Litynski & Holuj, 2021). However, to keep the scope of this exploration manageable, I have decided to focus on microeconomic studies.

2. Background

2.1. History of urbanization

Although humans have come together to build great cities throughout history, the dominance of urban living was ushered in by the industrial revolution. According to Hussain & Imityaz (2018), factories drew people to cities at a drastic pace, resulting in modern urbanization. This development, which began in the British Isles, spread through Europe and across the Atlantic. In 1850, the urban population of the United States was 16%; in 1950, it was 60% (Our World in Data, 2010). As cities grew, they also increasingly contributed to economic growth, as urbanization further increased agglomeration benefits: larger cities could house more specialized labour types and decreased the cost of inputs supplied by other firms (Brueckner, 2011). Though employment opportunities were a key appeal on the individual level, the convenience of cities and the agglomeration of services were also significant contributors to their popularity (Hussain, 2018). Cities have cemented their role in our economy and society, and the urban share of global population has not stopped growing.

2.2. Urban sprawl

The concept of urban sprawl and the surrounding debate has been relevant to researchers and public officials for almost a century (Nechyba & Walsh, 2004). After the second World War, the trend of dense city-living and tall buildings gradually subsided in the United States, and cities began to grow outwards instead of upwards. Ultimately it was the commercialization and widespread adoption of the automobile which allowed people to live further away from the city centre without incurring a significant increase in the length of their commutes. Urban sprawl has been more prevalent in the United States than in Europe, largely due to American reliance on cars. The country's individualistic culture can also be linked to the phenomenon, as personal freedoms and property are at the heart of American society.

The word sprawl refers to the spread of something over a large area in an untidy or irregular way. By definition the term carries negative connotations, but economists have sought to create a distinction between sprawl and *excess* sprawl, with the former being a product of an efficient market and the latter a result of unpriced externalities. These externalities distort the demand for suburban housing, resulting in further urban sprawl which would likely not occur if external costs were to be internalized (Anas & Rhee, 2006).

2.3. The monocentric city model

The monocentric city model is perhaps the most important theoretical framework in urban economics. First studied in the 1960's by Alonso, Mills, and Muth, the monocentric city model has since been further analyzed by many urban economists. It helps economists understand how cities grow and function and can be modified to study for example the distribution of income groups within city limits. The model has been expanded on to account for polycentricity, but in this exploration, I have chosen to use the more popular and streamlined model. This section is largely based on Brueckner's (2011) revised elaboration of the topic. The model described mid-20th century American cities rather accurately, but as urban environments have become more complex, the model in its simplest form has perhaps declined in relevance. Empirical applications have, however, been relevant when studying changes in urban spatial structures (Arribas-Bel & Sanz-Garcia, 2014; Kim, 2007).

The primary assumption of the monocentric city model is that the city has a single nucleus where all inhabitants work (known as the central business district or CBD). Their homes exist around the city, with the city forming a circle. Housing near the centre is more expensive, while commuting costs increase when moving further from the central business district. Inhabitants seek to maximize their consumption of other goods, with transport and housing costs representing necessary expenses. For an equilibrium to exist, we assume that all inhabitants must be equally well off regardless of their location within the city; if this were not the case, different housing options could offer more utility to consumers, and the model would not function.

Below is an illustration of the monocentric city model:

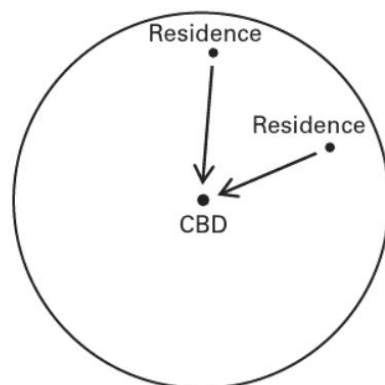


Figure 1. Commuting in the monocentric city model. (Brueckner, 2011, pg. 26) The circle around the CBD illustrates the urban boundary of the city, beyond which land is not used for residential development (usually considered as farmland).

The individual consumer in the monocentric city model maximizes their utility based on the following conditions and constraints:

$$c + pq = y - tx$$

Where c represents all consumption except for housing, q the size of homes in square meters, p the rental price per square meter. On the right side of the equation, y represents income, t represents the commuting cost, and x the distance to the CBD. For simplicity, I will use a uniform income model, although the model also functions with multiple income groups.

To analyse the effects of fuel taxation, we must also consider how housing developers operate. The production function for housing floor space is:

$$Q = H(N, l)$$

Where Q is the floor space of a building, H the production function, N units of building materials, and l the land input.

Developer revenue is:

$$\text{Revenue} = pH(N, l)$$

Where p is price per square meter.

Lastly, the production cost is:

$$\text{Production cost} = iN + rl$$

Where i represents the rental rate of materials and r is land rent.

With a fixed population level, the size of the city as well as demand and supply for housing within it are determined using these four equations. They can be used to study, for example, the size and composition of cities. Below is a figure from Brueckner's book, which illustrates the price of land in the city:

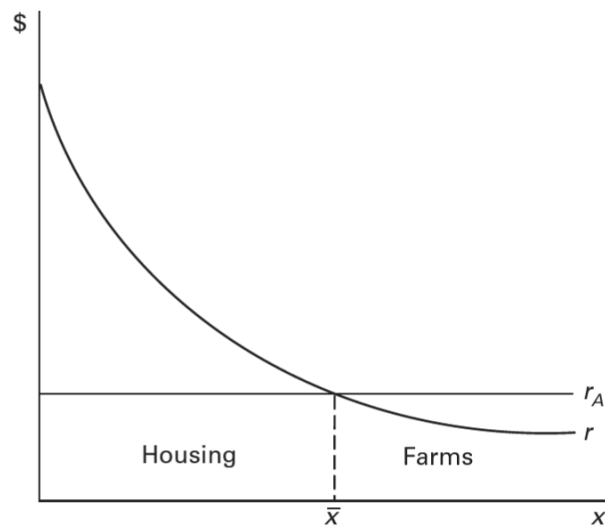


Figure 2. The land rent curve faced by developers. (Brueckner, 2011, pg. 43). r_A represents agricultural rent; when $r_A > r$, land is used for agricultural purposes rather than housing, as developers could not make a profit on new construction. The urban boundary of the city is \bar{x} .

Figure 2 is central to the study of urban sprawl. If population is fixed, a larger \bar{x} indicates a lower population density. Such a city will, in theory, require more resources to both construct and function. Changes in prices faced by both consumers and developers will affect the city's spatial equilibrium. The monocentric city model underpins many urban economic studies, and I will be returning to it in section four.

2.4. Externalities

The origination, incidence, and significance of externalities is at the heart of the debate surrounding urban sprawl, and it is hence relevant to introduce the concept.

In economics, an externality is a consequence of an action which affects a third party who was not involved in the action itself. Externalities can be both positive and negative, knowledge spillover being an example of the former and environmental damage an example of the latter. Some externalities can be corrected fairly easily by mutual agreement. However, when property rights are poorly defined, as is the case with air quality and open space benefits, for example, issues arise (Varian, 2019). Quantifying the amount of damage as well as identifying those affected is more challenging, and thus an accurate response to the externality is harder to conduct.

The graph below depicts an externality.

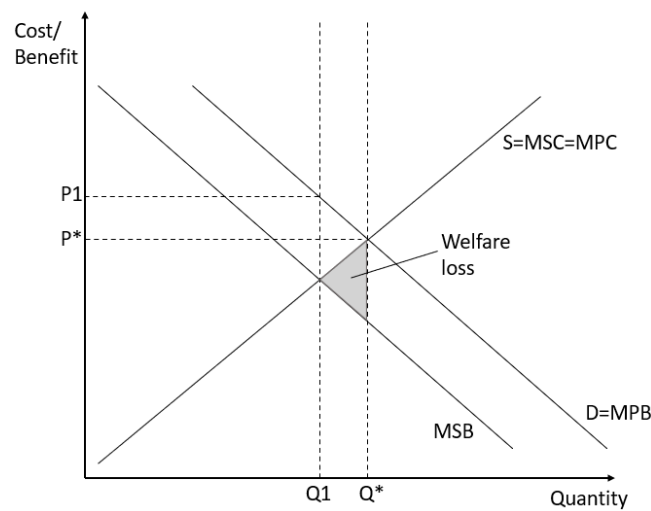


Figure 3. Graphical illustration of a consumption externality. S: supply, MSC: marginal social cost, MPC: marginal private cost, MSB: marginal social benefit, MPB: marginal private benefit, D: demand.

The conflict of interests surrounding many consumption decisions is illustrated in figure 3. For example, this graph could depict the external costs of gasoline consumption. The private benefits of gasoline consumption (i.e. personal car use) are greater than the social benefits ($MPB > MSB$). The adverse effects of petrol consumption, i.e. pollution and health issues, are incurred by society. These costs are illustrated by the welfare loss triangle. The socially optimal quantity Q_1 is smaller than the equilibrium quantity Q^* , as the market does not account for external costs on its own. With petrol, taxes are often imposed to limit consumption due to higher prices, and shift costs from society to the consumers themselves. In figure 3, an optimal tax would increase prices from P^* to P_1 and thus decrease consumption to the socially optimal level.

Many of the externalities attributed to urban sprawl are consumption externalities (land use, petrol consumption), but the phenomenon does result in production externalities as well (production of housing, road infrastructure, and automobiles). In general, external costs occur due to the differences in private and social costs and benefits. In the next section, I will discuss some of the main externalities associated with urban sprawl.

3. Externalities and adverse effects of urban sprawl

Scholars studying urban sprawl are generally of the opinion that excess urban sprawl creates numerous negative externalities, which warrant correction by means of government intervention. I will now explore some of the most pressing externalities associated with urban sprawl, and briefly mention some of the broader negative effects of sprawl which are not strictly externalities. Some of these effects can be reduced by limiting sprawl, but the methods used in addressing them are beyond the scope of this thesis. The methods which economists have suggested to correct externalities are discussed in section 4.

3.1. Congestion

Traffic congestion, and the subsequent effects of congestion, are often cited as the most pressing externalities created by urban sprawl. The cost of time lost due to congestion for Americans was estimated at nearly 88bn dollars, or about 1377 dollars per resident per year (INRIX, 2020). In addition to the lost hours spent in traffic, congestion and car-dependency also increase greenhouse gas emissions.

Although the monetary cost attributed to congestion is significant, economists are not convinced that public transit systems are a better option. Over 30 years ago, Gordon, Kumar and Richardson (1989) found that in most cities, particularly those which can be approached by land from all directions, commuting by car is relatively faster than using public transport. This finding is echoed by a survey conducted by the United States Census Bureau in 2019, which reported that the average public transport commute took roughly 47 minutes, whereas driving alone took only 26 minutes. While public policy is likely largely to blame for the sluggishness of U.S. public transportation, the incentives of personal automobiles to individuals are evident.

Congestion is a unique externality as many of the direct costs are incurred by drivers themselves. Drivers do not simply suffer *from* traffic, they *are* traffic. Nonetheless, the broader effects of congestion are significant and may warrant correction even if individuals are in a sense choosing to suffer from it.

3.2. Pollution

Of all the consequences of urban sprawl, air pollution has perhaps raised the most concern. While air pollution is accelerated by congestion, a sprawling urban environment, particularly one which is reliant on cars, will generate more emissions than a dense city with a

functioning public transit system. Over 40% of Americans live in areas with poor air quality, with cars accounting for a significant portion of the deterioration (Jones, 2022). However, Glaeser and Khan (2004) point out that as automobiles become more fuel-efficient, the environmental damages generated as a by-product of urban sprawl are constantly declining. Nonetheless, the widespread use of combustion engines in conjunction with the sprawling of urban areas creates external costs.

3.3. Land use

Non-economists point to the loss of farmland and forests to urban areas as one of the adverse effects of urban sprawl. Brueckner (2001) argues, however, that changes in land use is a nonissue, both with regards to farmland and open space benefits. In the US, agricultural output is consistently greater than consumption. The large subsidies received by the agricultural sector point to an inefficient use of both land and public resources. Further, Brueckner states that governments can simply purchase land for recreational use, and that a correctly organized democracy will assign funds to match the preferences of the public.

The increased use of land for residential development may also cause environmental damage, as forests may be sacrificed to further urban expansion. The environmental damage attributed to inefficient land use is hard to measure but is particularly relevant in regions which may be considered biodiversity hotspots. An interesting example is Costa Rica, where urban sprawl diminished the size of forests for decades before public officials took initiative in restoring forest areas (UNEP, 2021).

In general, zoning laws which balance the desire for open spaces and larger dwellings are likely enough to offset the potential issues regarding land use. If land use is structured intelligently, the irregularity and unevenness of urban development associated with sprawl can be reduced.

3.4. Infrastructure costs

Low-density living creates an increased need for public spending. Sewage and water lines, as well as road networks, are typically managed by the government. Sprawl increases the need for infrastructure and public services such as healthcare. While urban sprawl doesn't have a significant effect on basic healthcare, providing more specialized services becomes more costly as urban areas become polycentric and population spreads out over a larger area. Road

infrastructure deteriorates more quickly as reliance on the automobile becomes more widespread.

While economists agree that the broader costs created by the development of low-density urban areas must be addressed, they have not been especially concerned with the matter in their research. According to Nechyba & Walsh (2004), infrastructure costs can be easily allocated to the parties responsible by charging “impact fees” from developers, which would then be reflected in costs to consumers as well. Infrastructure costs have not been the focus of many studies but can be expected to decrease as a consequence of limiting sprawl.

3.5. Social inequality

A criticism of urban sprawl which has perhaps seen more attention from non-economists concerns the social issues and inequality which may be attributed to the phenomenon. Critics of urban sprawl argue that as richer inhabitants relocate further from the city proper, the rift in standard of living between the suburbs and the more densely populated areas widens.

Economists have suggested pragmatic approaches to the issue: accurately directing government resources to education, transfer payments, and developing central areas should minimize the social impacts of urban sprawl (Nechyba & Walsh, 2004). Glaeser and Khan suggested in 2004 that given the America is a car-based nation, one solution to prevent low-density areas from becoming too homogenous would be to offer car subsidies to the poor, which would then subsequently make a move further from the city center entirely possible.

The link between urban sprawl and social inequality is less apparent than for example between congestion and land use concerns, and thus these considerations are beyond the scope of this thesis.

3.6. Lifestyle effects

In addition to the emissions associated with sprawl, poorly designed sprawling environments contribute to unhealthy lifestyles. As distances between homes, services, and workplaces increase, commuting on foot or by bicycle becomes more arduous. Bassett (2008) finds that Europeans walk and cycle far more than Americans, which may contribute to the difference in obesity rates. The connection between urban sprawl and obesity has been studied by many researchers (for example Ewing et al., 2003; Zhao & Kaestner, 2010) who have suggested that car-dependence and the reduction in walkable environments resulting from sprawl has negatively affected health and physical activity.

4. Policy measures for correcting externalities of urban sprawl

Researchers from numerous fields have studied the different means available to authorities to discourage sprawl. In this section, I will explore some of the most realistic and common methods analyzed in the literature. Though economists recognize the benefits of sprawl, most of the policies studied and suggested aim at limiting its extent. I will also look at fuel taxation and congestion tolls as methods which target the most pressing externalities of sprawl rather than the root cause, but overall, the focus of urban economists has largely mirrored the aims of researchers from other fields. I will consider the importance of limiting urban sprawl more thoroughly in section five.

4.1. Land value tax

Economists tend to favor land value taxation as a source for government revenue. When implemented correctly, a land tax should not be distortionary, as the supply of land is fixed (Banzhaf & Lavery, 2010). Land tax has also been considered as an anti-sprawl measure, as it encourages more efficient land use, i.e. more dense construction. In this section, I will be discussing the main findings of Banzhaf & Lavery's study on the effect of changes in land and property taxes on urban sprawl in Pennsylvania.

In the 1980s and 1990s, several jurisdictions in Pennsylvania introduced a property taxation reform by adopting a split-rate tax. The tax level on land was increased, while property taxes were decreased. The change in legislation allowed the researchers to study whether the adjustment would influence the capital/land ratio, which is a measure of the total expenditure per unit of land. The capital/land ratio is affected by two components: the density of living, and the size/quality of housing units. An increase in density would, according to Banzhaf & Lavery, suggest that land taxation could be an effective anti-sprawl measure.

The researchers employed a regression model using US census data from 1970 to 2000. They studied the capital/land ratio by determining the total number of rooms per unit of land area. This outcome was decomposed into two parts, which illustrated changes in both home size and population density. A more specific overview of their "difference-in-difference-in-differences model" (Banzhaf & Lavery, 2010, pg. 172) is not relevant to this thesis, however the results of the study are relevant to the discussion surrounding urban sprawl.

Banzhaf & Lavery's found that relative to control areas, the total number of rooms per unit of land increases. This is an improvement from a broader welfare perspective, as it implies that

existing urban areas are being used more efficiently. Further, the researchers found that the number of housing units per unit of land increased by roughly five percent, which translates to an increase in population density, and thus a decrease in the extent of urban sprawl. Interestingly, the split-rate tax also resulted in a modest increase in average dwelling size. This improvement is relevant as it suggests that one of the main appeals of urban sprawl, larger homes, does not necessarily have to be sacrificed to manage sprawl.

Banzhaf & Lavery conclude that the split-rate tax should lead to greater economic efficiency, which further strengthens the argument in favor of the land taxation. However, the researchers emphasize that a split-rate tax should not be applied as a blanket measure, as increasing density in rural areas could represent an increase in sprawl as well (Banzhaf & Lavery, 2010). Thus, a split-rate tax is most effective when it can be employed at a small enough scale; in a country like Finland, for example, such a reform could be ineffective if applied at a provincial level but could be fruitful if applied at a municipal level.

4.2. Property value taxation

Property taxation, unlike land taxation, is not viewed as favorably by economists as a mere source of revenue. Vickrey (1999) argued that property tax is one of the worst taxes, with many others echoing his critique, pointing out that property taxation is regressive and discourages the construction and development of structures (Dye & England, 2010; Oates & Schwab, 2009).

Despite its lack of popularity as a source of revenue, some scholars have considered the role of property taxation in countering urban sprawl. Making housing more expensive could inhibit construction and decrease dwelling size, which would limit sprawl. Studies have reached different conclusions as to the effectiveness of property taxation in this regard, and in this section, I will consider some of their findings.

Song & Zenou (2006) study the connection between property taxation and urban sprawl using a theoretical model which assumes a monocentric city. Using a dataset consisting of 448 urbanized areas in the US, the researchers model the effects of changes in the property tax rate on the geographical size of these areas. They find that increasing property taxes reduces city size. This result is, however, contingent on the assumption that the elasticity of substitution between housing and other goods (which in the model are combined into one composite good) is greater than one, suggesting that the composite good and housing are good substitutes for one another. This assumption is not in line with the findings of Davidoff

& Yoshida (2013), who estimate the elasticity of substitution for housing to be between 0.4 and 0.9. Intuitively, this estimation seems more likely, as housing satisfies a specific need and is not easily replaced by goods like food and clothing, for example. Further, it should be noted that in their model, Song & Zenou levy taxes on a statutory level and do not control for area specific fixed effects. This simplification may limit the real-world applicability of the model.

Mendonça et al. (2020) assess the merits of different policy instruments by simulating changes in property, land, and fuel taxation, as well as public transport subsidies. They study the Portuguese region of Aveiro, which experienced rapid area growth between 1990 and 2000. Property tax levels are low, and land taxes are absent.

Mendonça et al. (2020) find in their simulation results that a flat property tax results in a decrease in urban residential area size. They note that although high income groups are slightly more affected, the tax influences the behavior of all income groups. Inhabitants of the city relocate to more central areas and closer to major thoroughfares, and further, real estate values increase.

Somewhat in contrast, Wassmer (2016) found that higher levels of residential property taxation accelerate the sprawling of urban areas. In his study, Wassmer uses a regression model with panel data from 370 urban areas in the United States. He found that property taxation discourages the development of existing urban areas and increases urban land consumption, subsequently decreasing population density.

The findings of Wassmer (2016) are at odds with the findings of both Song & Zenou (2006) and Mendonça et al. (2020). Although Song & Zenou do use real-world data in their study, their findings are based on a theoretical model, whereas Wassmer employs empirical data. The hedonic pricing model used in Mendonça et al.'s simulation combines a plethora of factors including environmental amenities and estimates of consumer preferences and may be an inaccurate representation of consumer preferences.

4.3. Fuel taxation

In this section, we return to the monocentric city model. Recall that the supply-demand equilibrium for housing, as well as the size of the city, was dependent on the budget constraints of both consumers and producers. A tax on gasoline is reflected in the commuting cost, which was a component of the consumer's utility function. The fuel tax is illustrated in the graph below:

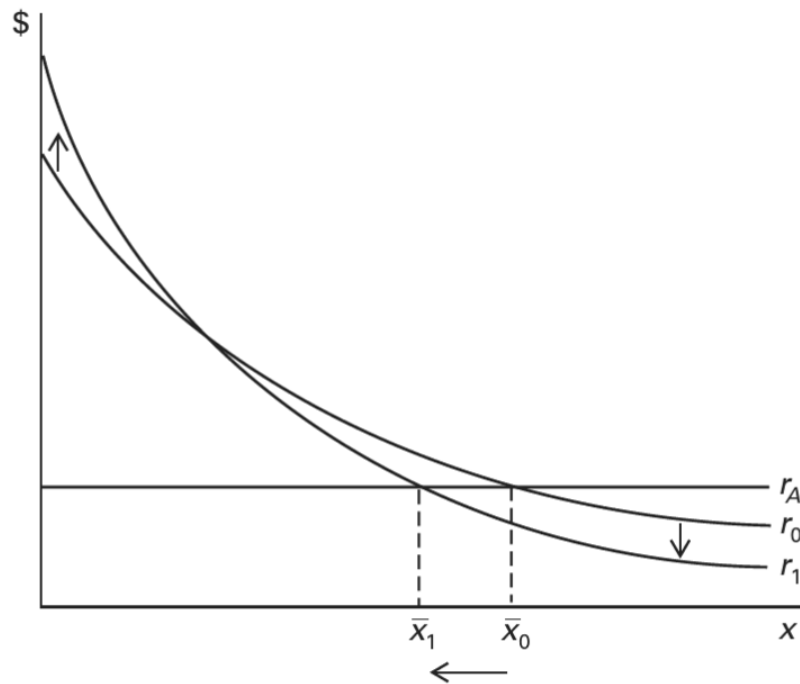


Figure 3. The effect of increased commuting costs on city size. (Brueckner, 2011, pg. 48). The increase in commuting cost, land rents and housing costs increase near the CBD. Building height increases as the population remains the same.

As we can see, the increase in commuting costs moves the urban boundary towards the CBD (from \bar{x}_0 to \bar{x}_1), shrinking the size of the city. Thus, in the context of the monocentric city model, increasing commuting costs decreases the extent of sprawl. As the population of the city is fixed, the city is now denser, which indicates a more efficient use of resources in both construction and commuting. However, the increase in commuting costs and subsequent shrinking of the city is also reflected in the cost of housing, as housing near the CBD becomes more expensive than before the tax was implemented (illustrated by the shift of the urban land rent curve from r_0 to r_1).

Although the theoretical basis for the effectiveness of a gas tax exists, it is important to look at real-world examples as well. I did not find empirical studies on the link between urban sprawl and fuel taxation, but studies on the correlation between consumption and price level were available. If we assume that inhabitants of a sprawling urban environment consume more fuel (due to the increased distances within the city), we can consider the merits of petrol taxation in decreasing urban sprawl. This method is particularly appealing as it targets two externalities, both congestion and pollution.

Palanne & Sahari (2021) study the CO₂-emissions of Finland's entire car base and the effects of different taxation schemes on fuel consumption and kilometres driven. They focus on fuel taxation and automobile taxation, which are levied both upon purchase and on a yearly basis.

Palanne & Sahari find that fuel taxation is an effective tool in decreasing fuel consumption. This finding is entirely logical, and also points to a decrease in total kilometres driven. However, they found that the decrease in consumption is small in comparison to the overall trend towards more fuel-efficient vehicles, which suggests that to have a significant impact, the tax level would have to be very high. This finding is in accordance with the of Mendonça et al. (2020), who found that although fuel taxation did shrink the total urban area, it was not as impactful as the other methods studied.

The difficulty with using fuel taxation as a broader policy tool arises from its inelastic demand. Levin et al. (2017) found that on average, the price elasticity of demand for petrol was between -0.27 and -0.35, indicating that a 10% increase in the price of fuel would only decrease demand by roughly 3%. While the inelasticity of demand makes fuel taxation a good source of government revenue and ensures that the tax incidence is largely on consumers, it is not as effective in promoting changes in behavior. At present, roughly half of the price of fuel in Finland is comprised of different taxes, i.e., a 100% tax rate (Finnish Information Center of Automobile Sector, 2022). Fuel taxation could be a relevant supporting measure for combatting sprawl in the US, where fuel is both significantly cheaper and taxed less heavily than in the EEA (Kim, 2015). However, American society is built around the automobile, and thus increasing fuel taxes could ultimately cause greater issues such as social unrest and increase economic inequality.

4.4. Congestion tolls

Congestion tolls are a direct response to two significant externalities of urban sprawl: traffic congestion and pollution. Congestion tolls shift the social costs of traffic to individuals, and thus affect decisions regarding mode of transport. Consequently, congestion tolls also reduce pollution and improve local air quality.

Expanding on the monocentric city model, Kim (2015) studies the effect of congestion tolls on city size. Using two toll zones between the CBD, the central residential zone, and the suburban residential zone, he illustrates that as commuting from the suburban zone becomes more expensive relative to more central areas, the population density increases, and city size subsequently decreases. This finding is in line with the increase in commuting cost illustrated in section 4.3. Kim (2015) also suggests that congestion tolls work well in conjunction with fuel taxation.

Anas & Rhee (2006) find that congestion tolls can also be beneficial in polycentric situations. When jobs and services are dispersed (instead of existing solely in the CBD), tolls result in the more efficient allocation of infrastructure spending as well as a reduction in sprawl. This finding is relevant to present-day policy decisions, as although companies do often form clusters, monocentric cities are less common than in the mid-1900s.

Cohen-Blankshtain et al. (2022) study a creative modification of congestion tolls: a shift from toll payments to positive incentives. Such measures have been considered due to the unpopularity of toll systems. The researchers analysed the effects of an initiative by the Israeli government which offered participants small payments when they avoided personal car use at peak hours. As expected, participants opted for other modes of transport during rush hour. As the program was introduced on a small scale, the results on congestion were not very significant, though still positive. This method is however both unconventional and unwise. Although it would likely be possible to balance the increased public spending with the reduction in external costs, this method fails to internalize external costs, and simply shifts them to the public.

Overall, although numerous theoretical models and empirical studies have found congestion tolls to be effective in reducing traffic, they are rarely implemented. Despite internalizing externalities, public support for congestion tolls is low (Calfée & Winston, 1996; Cohen-Blankshtain et al., 2022). Thus, it is unlikely that a political party or candidate would openly support such measures.

5. Conclusions

The debate surrounding urban sprawl is muddled by the competing perspectives and interests of researchers from different fields of study. Sprawl occurs as a result of consumer preferences for larger and cheaper homes, and thus can be considered a positive development due to the increase in consumption it generates. Few economists are willing to promote policies which completely halt the trend but correcting externalities and allocating costs to the parties responsible has been a relevant field of study in recent decades.

In this literature review, I assessed the merits of different taxation methods in limiting the various externalities of urban sprawl. Property and land taxation, which can be thought of as two sides of the same coin, were considered. The efficacy of property taxation has been found to be mixed, and the measure has been associated with welfare loss (Dye & England, 2010). Discouraging the development and improvement of existing structures has negative implications not only for sprawl, but for the economy in general. In contrast, land taxation, which is favored by economists as a source of government revenue, was found to limit sprawl and encourage the more efficient use of existing structures and lots. The results point to land value taxation as a more favorable tool in limiting excess sprawl.

Fuel taxation, which has not been empirically studied as a means to curb sprawl, is an interesting alternative to the aforementioned tax policies. As sprawl itself improves welfare, targeting the externalities rather than their root cause is an effective way to correct market distortions. While increased fuel taxation has been found to decrease fuel consumption, due to inelastic demand, affecting urban sprawl itself is relatively unlikely. Thus, the merits of fuel taxation, although perhaps recognized by economists in correcting externalities, may not be recognized to a similar extent by researchers from other subject areas. The OECD wishes to address urban sprawl on a global scale, and due to the multifaceted nature of the phenomenon, the findings of many fields will likely be considered when drafting both national and international guidelines and legislation on the matter.

The methods considered can be used in conjunction with one another, and do not solely affect the specific externality they are used to target. Reducing city size and incentivizing other modes of transportation has positive implications on many of the effects considered, such as health and infrastructure costs. Thus, the value of sprawl-limiting measures should be considered on a broader scale. This could be considered as an avenue for further research:

establishing the broader connotations of limiting sprawl in one study could have a greater impact on public opinion and decision-making.

The private benefits of urban sprawl are undeniable, which complicates the task of sustainable urban development. By accurately internalizing external costs, the extent of the phenomenon could be directed towards the socially optimal equilibrium level. This equilibrium is, however, likely subject to change. As engine technology develops, the adverse effects of automobiles will be less significant, and the main externalities of sprawl may become less relevant. Nonetheless, the broader connotations of a car-based society on health and sustainability are evident, and thus avoiding a development path similar to the United States is imperative. Dense and walkable cities are more energy efficient, safer, and healthier than their sprawling counterparts. Technological advancements will ultimately determine to what extent sprawl requires intervening, and it seems likely that the private benefits of sprawl will be able to be consolidated with socially desirable sustainable urban development.

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