Property tax and urban sprawl:
Theory and implications for US cities

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Abstract

We develop a model that adopts a log-linear utility function with a variable elasticity of substitution greater than one and show that increasing the property tax reduces city size unambiguously. We then test this result using a dataset of effective property tax rates we developed using GIS methods for 448 urbanized areas. The empirical analysis estimates a regression equation relating an urbanized area's size to the property tax rate measure and other control variables such as population, income, agricultural rent, and transportation expenditure. We find that higher property taxes indeed result in smaller cities.
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1. Introduction

Urban Sprawl is characterized by scattered and poorly planned low-density development beyond the edge of urbanized areas. Over the past century, US cities have expanded and density per capita has declined drastically. Here are some facts:

• Nationwide, land consumed for building far outpaces population growth. According to the American Farmland Trust, between 1960 and 1990, the amount of developed land in metropolitan

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areas more than doubled, while population grew by less than half. For example, between 1970 and 1990, greater Cleveland lost 11 percent of its population, yet developed land grew by 33 percent; the population of greater Chicago increased by 4 percent compared with a 46 percent rise in residential land; Los Angeles' population grew by 45 percent while its developed land increased by 300 percent. Between 1982 and 1997, Upstate New York gained 2.6 percent in population but witnessed a 30 percent expansion in urbanized land.

• Census Bureau figures show that in 1920, the average density of urbanized areas (which includes cities, suburbs, and towns) was 6160 persons per square mile. In 1990, that number had fallen to 2589.

Urban sprawl is a major concern in many US cities and is associated with a host of economic, social, and environmental consequences. Sprawling development wastes resources by increasing public expenditures to provide infrastructure and services. Urban sprawl increases travel distance and commuting time and low-density development reduces the feasibility of mass transit, thus increasing reliance on private automobile usage. This automobile excess increases pollution, congestion, alienation, and the use of scarce energy resources. Sprawl is also associated with excessive loss of farmland (for overviews on urban sprawl issues, see Brueckner [3], Nechyba and Walsh [14], and Glaeser and Kahn [10]).

Urban sprawl cannot be attributed to a single cause. In a recent study by Burchfield et al. [6], ground water availability, temperate climate, rugged terrain, decentralized employment, early public transport infrastructure, uncertainty about metropolitan growth, and unincorporated land in the urban fringe are found to increase sprawl. In addition, the long-standing debate on land taxation and its virtues (George [9], Skaburskis and Tomalty [17]) reveals that the property tax might be one of the potential causes of urban sprawl. The property tax can be viewed as a tax levied at equal rates on both the land and capital embodied in structures while, in a pure land tax, the tax on capital (i.e., improvements) is set to zero. The literature—for example, Arnott and MacKinnon [1], Case and Grant [7], Oates and Schwab [15], Mills [13], and Brueckner and Kim [5]—provides an abundance of arguments for how property tax may influence land development.

Brueckner and Kim [5] provide the only theoretical analysis that incorporates a land market to investigate the connection between urban spatial expansion and the property tax. Specifically, as Brueckner and Kim [5] assert, there are two countervailing effects of the property tax on the spatial sizes of cities. The improvement effect refers to the impact of the property tax in lowering the equilibrium level of improvements chosen by the developer. The lower level of improvements per acre implies a reduction in the intensity of land development and this lower density associated with property tax appears to encourage urban sprawl. On the other hand, the dwelling size effect operates through the property tax's impact on the consumer's choice of dwelling sizes. As the tax on land and structures is partly shifted forward to consumers, dwelling size decreases due to a higher cost of housing floor space. The reduction in dwelling size implies an increase in population density and thus, a decrease in the city's size or spatial extent. In Brueckner and Kim's full analysis, the net effect of the property tax on the spatial extent of a city is ambiguous. A review of the literature indicates that there has been no empirical study that formulates a regression equation relating a city's spatial extent to a property tax measure and other relevant variables. This paper seeks to fill this gap by first proposing a theoretical model of the net effect of the property tax on the spatial extent of cities and then testing it using data collected from a set of urbanized areas in the United States.

We first develop a theoretical model that investigates the property tax's effects on urban sprawl. As stated above, the main paper in this literature is that of Brueckner and Kim [5], which shows that for Constant Elasticity of Substitution (CES) preferences with an elasticity of