**The Influence of Local Fiscal Structure
and Growth Control Choices on "Big Box"
Urban Sprawl in the American West**

Robert W. Wassmer

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Abstract

Is the amount of total retail sales and two forms of "big box" retail (auto and home improvement) sales that occur outside of a western United States metropolitan area's central place(s) influenced by the ways that local governments raise own-source revenue and/or growth controls? This paper offers an answer to this timely policy question through a regression analysis that accounts for other economic factors that naturally cause retail activity to locate in non-central places. Results indicate that statewide reliance by local governments on some forms of own-source revenue exert significant positive influences on overall retail sales, and even greater positive influences on two forms of big box retail sales occurring in non-central places. Certain forms of urban growth boundaries are also found to reduce aggregate retail decentralization in the American West and exert an even greater negative influence on the decentralization of auto sales.

About the Author

Rob Wassmer is a professor of public policy and economics in the Graduate Program in Public Policy and Administration at California State University, Sacramento. He earned his doctorate in economics from Michigan State University in 1989 and previously taught at Wayne State University and Eastern Michigan University. Wassmer's research and teaching interests are in policy-orientated microeconomic analysis, state and local public finance, and urban economics. He has authored or co-authored over 20 published articles on these subjects in journals such as *Urban Studies,* the *National Tax Journal,* and the *Journal of Urban Economics*; and two books: *Readings in Urban Economics: Issues and Public Policy* (Blackwell, 2000) and *Bidding for Business: The Efficacy of Local Economic Development Incentives in a Metropolitan Area* (with co-author John Anderson, W.E. Upjohn Institute, 2000). For the 2000-02 academic years, he is serving as a visiting consultant to the California Senate Office of Research. As the past coordinator of the system-wide California State University Faculty Research Fellows Program, he also managed a group of academic public policy consultants to the state of California. In the fall of 2000, Wassmer received the President's Award for Research and Creative Activity from Sacramento State.

Graduate Program in Public Policy and Administration
California State University
Sacramento, California 95819-6081
Phone: 916.278.6304
Fax: 916.278.6544
E-mail: rwassme@csus.edu
Web: www.csus.edu/indiv/w/wassmerr

Table of Contents

The Influence of Local Fiscal Structure and Growth Control Choices on "Big Box" Urban Sprawl in the American West

Introduction

Though forbidden to raise property taxes, [California] city governments do get sales taxes from stores. Result: what's called "fiscalization of land use," meaning a wild scramble for retail base especially for mega auto malls and big box retailers The result's not just more suburban sprawl, but real ugliness what California urban planning expert William Fulton describes as "sales tax canyons bleak relentless [zones] designed not to encourage or facilitate community, but simply to empty passing wallets."

This opening quote by newspaper columnist Neil Peirce (1998) represents what some observers in California and other states believe is a cause and effect relationship that generates profound social consequences. Municipalities that rely on local sales taxes for the provision of local services seek retail for not only the consumption needs of their citizens, but also for the discretionary fiscal surplus it yields. Such local governments seek out new retail stores and draw it away from central places in a metropolitan area where economics would have naturally caused it to occur where it not for local sales tax reliance. In policy discussions this issue has received increased attention due to the claim that this "fiscalization of land use" contributes to urban sprawl. Salient to the motivation of this paper is that all of this has occurred with little to no empirical evidence regarding the importance of local fiscal structure to land use decisions in a metropolitan area.

Given the renewed national interest in the United States in spatial patterns of urban growth, prominent urban economists such as Gordon and Richardson (1997), Mills (1999) and Brueckner (2000) have weighed in on the issue of urban sprawl with articles that summarize an economic approach to defining what constitutes smart urban growth. These economists emphasize that the metropolitan decentralization of people and economic activity in the United States has occurred for well over 50 years and has been driven in large part by population increases, real income increases, and decreases in the real cost of automobile use. To most economists, decentralization is only an undesirable pattern of urban land use if the total costs it imposes upon a metropolitan region are greater than the total benefits generated from it.

Conversely, other analysts like Ewing (1997), Downs (1999), and Myers and Kitsuse (2000) have pointed out that a purely market-based approach to defining excessive spatial growth ignores the institutional environment in which economic actors in a metropolitan area make land use decisions. These analysts highlight the fact that government institutions influence local land use decisions and can generate or slow urban decentralization. The objective of this paper is to determine whether the statewide structure of local public finance and the metropolitan-wide use of urban growth boundaries work to further or deter retail decentralization in a metropolitan area. This paper offers an extension of my earlier work (Wassmer, forthcoming) on this issue in that

these influences are derived for two forms of "*big box*" retail (auto and home improvement) sales.[1]

Fiscalization of land use implies that the system of local public finance influences local land use decisions. Regression analysis is used here to test whether the real dollar value of different forms of retail activity in a metropolitan area's non-central places is independently influenced by statewide measures of the structure of local government revenue reliance. This measure of the fiscalization of land use is appropriately sought after controlling for non-central place population, income, age distribution, farmland price, previous growth rate, and the presence of different forms of urban containment.

The explanatory variables contained in the regression analysis, except those representing local revenue reliance and urban containment policies, represent factors that fittingly drive the non-central location of retail activity in a metropolitan area. From the social perspective of what is best for the entire region, local revenue reliance is a poor basis for determining retail location decisions. If local revenue reliance is found to independently increase non-central retail sales in a metropolitan area then it can be considered a cause of excessive retail decentralization or sprawl. At the same time, if the presence of an urban containment policy reduces non-central retail sales then it has achieved its stated policy goal of slowing the amount of retail decentralization that would have occurred without it.

The regression analysis that follows indicates that statewide measures of reliance by municipalities on some forms of own-source revenue exerts a positive influence on the overall amount of non-central retail activity in metropolitan areas in the western United States over the period 1977 to 1997. Regarding local reliance on general sales taxation, this positive influence is much greater when non-central retail activity is measured in terms of auto or building material sales. In addition, the continuing presence of some forms of urban containment reduces the overall amount of some forms of non-central retail activity. The negative influence of urban containment is also much larger when its influence is gauged in regard to *big box* retail sales.

The concept of urban retail sprawl is developed in the next section of the paper in a discussion of the ways that both planners and economists have thought about it. The third section grounds the regression analysis in theory by reviewing previous literature on the determinants of retail location in a metropolitan area. This section also contains a discussion of why the way that local governments raise revenue in a state could influence the intrametropolitan location of retail activity in that state, and how this influence is expected to be even greater on *big box* forms of retail activity. Section four of the paper offers a description of differences in the degree of *big box* retail decentralization in 47 metropolitan areas in the western portion of the United States. Section five provides background on the regression test used to determine if statewide averages for municipal

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[1] "Big box" is a commonly used in the United States to describe retail outlets that generate a large amount of taxable retail sales per customer visit. In a normative sense many also use it as an interchangeable description of what they consider urban sprawl.

2

revenue reliance and/or the presence of urban containment policies exert measurable influences on the location of different forms of retail activity in a metropolitan area. The sixth section contains a discussion of the regression results. The implications of the research are in the concluding section.

Urban Retail Sprawl

Urban planners, and increasingly the general public, label undesirable forms of suburban land use with the term sprawl. Observing this now common application, a few researchers have developed a list of land use characteristics that are most often associated with being labeled sprawl. Downs (1999) defines urban sprawl by observable traits such as unlimited outward extension of new development, low-density developments in new areas, "leapfrog" development, transportation dominance by private automobiles, and strip commercial development. Myers and Kitsuse (2000) frame the issue of sprawl in terms of patterns of urban population density that produce undesirable social outcomes.

Ewing (1994) surveyed academic articles written on sprawl between 1957 and 1992 and found that low-density, strip, scattered, and leapfrog are the forms of urban development most often labeled sprawl. In his review he highlights the fine distinction between undesirable non-compact development in a metropolitan area (sprawl) and desirable polycentric development (multiple centers in an urban area). Polycentric development, which now characterizes most large metropolitan areas in the United States, is often more efficient (in terms of clustering land uses to reduce trip lengths and reduce congestion) than development in a just one compact centralized pattern. This is also the line of reasoning offered by economists who have written on this issue. Planners and economists recognize that there are socially beneficial reasons for activity to locate in non-central locations of a metropolitan area. Decentralized development should only fall under the pejorative label of sprawl to the degree that it is being driven by reasons that are unlikely to promote social optimality.

The desire here is to test whether the fiscalization of land use influences the amount of retail decentralization observed in a metropolitan area. A regression analysis uses the real dollar value of aggregate retail activity and two forms of *big box* retail activity in non-central places as the dependent variables. Suburban retail activity, that is greater than warranted by economic factors, coincides with other rudiments of how sprawl has been perceived: (1) a lower density of development in the metropolitan area's central places, (2) greater possible leapfrog development at the urban fringe, (3) greater auto reliance for retail shopping, and (4) greater congestion and air pollution generated in getting to retail shops that are farther away from the customers that use them (central place citizens shopping in non-central place locations).

The Location of Retail Activity in a Metropolitan Area

If urban retail sprawl is defined as non-central retail activity that is greater than non-central economic factors warrant, then knowing the relevant economic factors that determine the intrametropolitan location of retail activity is important. As summarized in

3

DiPasqual and Wheaton (1996) and O'Sullivan (2000), economic theory predicts that a profit-maximizing retail firm chooses a specific location in a metropolitan area based upon the location of its customers, transportation costs, agglomeration economies, and the degree of scale economies in its particular form of retail production. In a metropolitan area with one central city, these factors push retailers that exhibit high and even moderate scale economies in production to primarily locate in the central city. Retailers with relatively small-scale economies in production base their intrametropolitan location on where their customers reside and a division of the region into profitable market areas. Big box retailers are more likely to exhibit at least moderate scale economies in production and thus, absent the fiscalization of land use, should be somewhat more likely to choose central place locations in a metropolitan area.

Between 1950 and 1990, the percentage of the U.S. metropolitan population living in central cities fell from 64 to 38 percent. The fraction of metropolitan retail employment in U.S. central cities accordingly fell from about two-thirds in 1950 to a little less than one-half in 1990. This suburbanization of retail activity was caused by the migration of existing metropolitan residents from central cities to the suburbs, an overall increase in metropolitan residents and a greater percentage of them choosing to live in the suburbs, and falling automobile transportation costs which reduced ties to a central shopping location.[2]

In a review of the economic thinking on the causes of metropolitan suburbanization, Miezkowski and Mills (1993) find valuable insights offered by both the natural evolution and fiscal/social approaches. The natural evolution approach emphasizes the significance of income, population, transportation, and technological changes to determining the degree of decentralization in a metropolitan area. The fiscal/social approach is a generalization of Tiebout's (1956) model of "voting with one's feet" and points to increased urban decentralization as partially the result of citizens' desires to form and fund more homogenous communities. To do this, suburban communities use land use controls and subsidies to attract residents and business that offer a fiscal surplus and do little to damage the local environment.

Municipal revenue from retail activity, that in most instances requires a relatively small amount of local government services and generates relatively little environmental damage, offers a good choice of funding for local services. If suburban communities actively seek retail activity for the purpose of the fiscal surplus it generates, then greater statewide reliance on a municipal revenue instrument that generates a local fiscal surplus through greater local retail activity may generate greater retail decentralization. Local fiscal structure is unlikely to induce more retail activity in a metropolitan area, but it can induce changes in where it locates. Within a metropolitan area, non-central places draw

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[2] Lang (2000) also writes about the declining percentage of metropolitan office space in U.S. central cities and refers to it as "office sprawl". In 1979, 74 percent of U.S. office space was in central cities, by 1999 the central city share of office space dropped to 58 percent.

retail activity greater than warranted by their population characteristics from the central places where historically it has been located.[3]

Other researchers have also recognized that local fiscal factors can contribute to the generation of urban decentralization. Harvey and Clark (1965) assert that local reliance on property taxation discourages the platting of land for a non-agricultural use because once done the land is subject to higher taxation. The hesitancy of jurisdictions to designate agricultural land for non-agricultural uses encourages leapfrog development. Misczynski (1986) popularized the use of the phrase "fiscalization of land use" in California policy circles to describe what he increasingly expected to happen after California's post-Proposition 13 abandonment of property taxation as a discretionary source of local revenue. Innes and Booher (1999) point to the complex and fragmented system of local finance in California, with its heavy reliance on sales taxation as a source of local discretionary revenue, as the single most important factor driving local land-use decisions in the state. Atkinson and Oleson (1996) believe the automobile to be the major culprit of sprawl, but maintain that this would not have been possible without complimentary local finance policies. Kotin and Peiser (1997) have looked at public/private partnerships for high volume retailers and the degree that municipalities benefit from them. In a monograph-length study of sales taxation in California, Lewis and Barbour (1999) conclude that local sales tax reliance has influenced local land use decisions in the state.

In addition, Brueckner and Kim (2000) demonstrate that the theoretical influence of local property tax reliance on the generation of metropolitan decentralization is indeterminate. Greater reliance on local property taxation reduces individual housing consumption, which raises population density, and reduces urban sprawl. Concurrently, greater local property taxation reduces the intensity of land development, lowers population density, and encourages urban sprawl. A simulation using reasonable real world values suggests that the likely influence of greater local property taxation in generating urban sprawl, through its influence on capital use, is slightly positive.

Finally, Brueckner and Fansler (1983) conducted one of the only regression studies of the determinants of the size of an urban area. Using 1970 data and relying on traditional urban theory, they regressed the Census defined size in square miles of the 40 largest urbanized areas in the United States against the urbanized area's population, median income, rent paid on agricultural land, and proxies for commuting costs. The empirical analysis that follows builds upon Brueckner and Fansler's study by including statewide measures of municipal revenue reliance in a regression designed to explain retail activity in non-central places in western U.S. metropolitan areas. Before the method to do this is described in greater detail, the next section of the paper offers a description of areas included in the study and differences over time in their non-central place retail activity.

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[3] This is a restatement of the most stringent hypothesis that Lewis and Barbour (1999) believe must hold in order to prove empirically that the fiscalization of land use is occurring.

Big Box Retail Decentralization in the Western United States

An empirical study of the degree of metropolitan retail decentralization must begin with a unit of analysis. For this study it is the 61 metropolitan areas in what the Census Bureau defined in 1990 as the continental western United States, less the seven metropolitan areas in Idaho, Montana, and Wyoming. The analysis is limited to metropolitan areas in the West for a few reasons. The first is that six of the eight states defined as Western enacted statewide ballot box or legislative restrictions on the local use of property taxes between 1977 and 1997. Through Proposition 13 (1978), Measures 5 and 47 (1990 and 1996), and Amendment 1 (1992); California, Oregon, and Colorado voters all used the citizen initiative to limit local property taxation. In Arizona, Nevada, and Utah, state legislatures took similar steps.[4] These restrictions, which Sokolow (2000) classifies as harsher than in any other region in the United States, offers natural experiments by which to test the influence of changes in statewide municipal fiscal structure on metropolitan retail decentralization. Furthermore, most metropolitan areas in the western United States grew up in an era of rising populations, rising real incomes, and declining transportation costs. Metropolitan areas in Idaho, Montana, and Wyoming are not included because the metropolitan development patterns in these three states are very different in comparison to the western states retained in the sample used here.[5]

Fifty-four metropolitan areas are used in the analysis. A metropolitan area consists of the relevant component counties in the 1990 Census definition of either a Metropolitan Statistical Area (MSA) or a Primary Metropolitan Statistical Area (PMSA).[6] Since the focus of this paper is retail activity in suburban locations, the suburban area within a metropolitan area is the constituent counties in a MSA or PMSA, less the "central places" included in the 1990 definition of urbanized areas in a metropolitan area.[7] Central places are considered by the Census to be the dominant employment and residential centers in each urbanized area. For instance, the suburban area in the San Diego MSA would be San Diego County less the cities of Coronado, Escondido, and San Diego. Table 1 contains a list of the 54 metropolitan areas in the sample, the areas' component counties, and the central places that are excluded from these counties to create the definition of a metropolitan area's non-central places that is used here. This designation of suburbia is

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[4] Sokolow (2000) offers a comprehensive survey of property tax limitation in the western United States. See Chapman (1998) for a summary of the local public finance consequences of California's 1978 passage of Proposition 13.

[5] The largest central cities in each of these excluded states only had 1992 populations of 136,000, 84,000, and 52,000 respectively.

[6] A PMSA consists of integrated counties that are divisible into smaller integrated units that consist of one or more counties. A MSA consists of counties that are not divisible into smaller integrated units.

[7] This approach should be considered conservative in regard to defining excessive decentralization because many would consider the location of retail activity in a place not a central place in 1977 and 1987, but classified as such in 1990, as sprawl.

an attempt to account for the polycentric nature of most U.S. metropolitan areas through the use of existing data sources.

The three dependent variables in the regression analyses that follow are (1) total retail sales, (2) building material sales, and (3) new and used auto sales. Big box retail sales are represented by building material and new/used auto sales due to popular perceptions of what big box is ("Home Depots" and "Automalls") and the availability of comparable data for 1977, 1987, and 1997 for the 54 metropolitan areas under consideration.[8] Table 2 offers a comparison of the ratio of non-central place building material (auto) sales to total metropolitan area building material (auto) sales for the 47 metropolitan areas in the sample for which data is available.[9] The top eight data rows in this table report the averages for each state, where available, using metropolitan area as the unit of observation.

As shown at the top of Table 2, for building material and auto sales where multiple year averages are available, some western states (5 out of 12 cases) experienced an increase in the percentage of these forms of big box sales occurring in non-central locations relative to all metropolitan locations, while the other western states (7 out of 12 cases) experienced a decrease. Just based on these percentages it is hard to distinguish whether these forms of urban retail sprawl have increased or decreased over time. But as indicated above, it is perhaps best to not designate an increase in the percentage of retail activity occurring in non-central places as sprawl if population, income, and demographic shifts warrant such changes. In addition, there are many distinct metropolitan areas that experienced a decrease in the percentage of building material sales occurring in non-central places between 1987 and 1997 (Chico-Paradise, Sacramento, Denver, Bellingham, and Tacoma) and even more for auto sales (Chico-Paradise, Denver, Las Vegas, Medford-Ashland, Salem, and Spokane). Other than that there is a great deal of variation in the degree of non-central place big box retail activity occurring in western metropolitan areas and over time, it is hard to draw any specific conclusions from the information in Table 2. A regression analysis of the determinants of suburban retail activity is necessary to comprehend the causes of the observed variation.

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[8] Data gathering was complicated by the fact that the U.S. Census Bureau switched from using Standard Industrial Codes (SIC) in 1987 to designate different types of retail activity, to North American Industrial Classification System (NAICS) codes in 1997. For many types of retail this made switch made multi-year comparisons impossible. This was not a problem for new and used auto sales that is represented by SIC 551 (motor vehicle dealer—new and used cars) in 1977 and 1987, and NAICS 4411 (automobile dealers—new and used) in 1997. Building materials is represented by SIC 521,3 (building materials and supply stores) and SIC 525 (hardware stores) in 1977 and 1987, and NAICS 4441 (building materials and supply dealers) in 1997.

9 Table I in Wassmer (forthcoming) offers similar information for aggregate retail sales for all 54 of the western state metropolitan areas in the full sample.

Table 1: Urban Area Definitions for the Western United States

1990 Metropolitan Area Name	1990 Counties in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area	1990 Metropolitan Area Name	1990 Counties in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Phoenix-Mesa AZ, MSA	Maricopa AZ, Pinal AZ	Mesa AZ, Phoenix AZ, Scottsdale AZ, Tempe AZ	San Diego CA, MSA	San Diego CA	Coronado CA, Escondido CA, San Diego CA
Tucson AZ, MSA	Pima AZ	Tucson AZ	San Francisco CA, PMSA	Marin CA, San Francisco CA, San Mateo CA	San Francisco CA
Yuma AZ, MSA	Yuma AZ	Yuma AZ	San Jose CA, PMSA	Santa Clara CA	Gilroy CA, Palo Alto CA, San Jose CA, Santa Clara CA, Sunnyvale CA
Bakersfield CA, MSA	Kern CA	Bakersfield CA	San Luis Obispo-Atascadero-Paso Robles CA, MSA	San Luis Obispo CA	Atascadero CA, Paso Robles CA, San Luis Obispo CA
Chico-Paradise CA, MSA	Butte CA	Chico CA	Santa Barbara-Santa Maria-Lompoc CA, MSA	Santa Barbara CA	Lompoc CA, Santa Barbara CA, Santa Maria CA
Fresno CA, MSA	Fresno CA, Madera CA	Fresno CA	Santa Cruz-Watsonville CA, PMSA	Santa Cruz CA	Santa Cruz CA, Watsonville CA
Los Angeles-Long Beach CA, PMSA	Los Angeles CA	Lancaster CA, Long Beach CA, Los Angeles CA, Pasadena CA	Santa Rosa CA, PMSA	Sonoma CA	Petaluma CA, Santa Rosa CA
Merced CA, MSA	Merced CA	Merced CA	Stockton-Lodi CA, MSA	San Joaquin CA	Lodi CA, Stockton CA
Modesta CA, MSA	Stanislaus CA	Modesto CA, Turlock CA	Vallejo-Fairfield-Napa CA, PMSA	Napa CA, Solano CA	Fairfield CA, Napa CA, Vacaville CA, Vallejo CA
Oakland CA, PMSA	Alameda CA, Contra Costa CA	Alameda CA, Berkeley CA, Oakland CA	Ventura CA, PMSA	Ventura CA	San Buenaventura (Ventura) CA
Orange CA, PMSA	Orange CA	Anaheim CA, Irvine CA, Santa Ana CA	Visalia-Tulare-Porterville CA, MSA	Tulare CA	Porterville CA, Tulare CA
Redding CA, MSA	Shasta CA	Redding CA	Yolo CA, PMSA	Yolo CA	Davis CA, Woodland CA
Riverside-San Bernardino CA, PMSA	Riverside CA, San Bernardino CA	Hemet CA, Palm Dessert CA, Palm Springs CA, Riverside CA, San Bernardino CA, Temecula CA	Yuba City CA, MSA	Sutter CA, Yuba CA	Yuba CA
Sacramento CA, PMSA	El Dorado CA, Placer CA, Sacramento CA	Sacramento CA	Boulder-Longmount CO, PMSA	Boulder CO	Boulder CO, Longmount CO

1990 Metropolitan Area Name	1990 Counties in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area	1990 Metropolitan Area Name	1990 Counties in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Salinas CA, MSA	Monterey CA	Monterey CA, Salinas CA	Colorado Springs CO, MSA	El Paso CO	Colorado Springs, CO
Denver CO, PMSA	Adams CO, Arapahoe CO, Denver CO, Douglas CO, Jefferson CO	Denver CO	Salt Lake City-Ogden UT, MSA	Davis UT, Salt Lake UT, Weber UT	Salt Lake City UT, Ogden UT
Fort-Collins-Loveland CO, MSA	Larimer CO	Fort Collins CO	Bellingham WA, MSA	Whatcom WA	Bellingham WA
Grand Junction CO, MSA	Mesa CO	Grand Junction CO	Bremerton WA, PMSA	Kitsap WA	Bremerton WA
Greeley CO, MSA	Weld CO	Greeley CO	Olympia WA, PMSA	Thurston WA	Olympia WA
Pueblo CO, MSA	Pueblo CO	Pueblo CO	Richland-Kennewick-Pasco WA, MSA	Benton WA, Franklin WA	Kennewick WA, Pasco WA, Richland WA
Las Vegas NV & AZ, MSA	Clark NV, Mohave AZ, Nye NV	Las Vegas NV	Seattle-Bellevue-Everett WA, PMSA	Island WA, King WA, Snohomish WA	Auburn WA, Everett WA, Seattle WA
Reno NV, MSA	Washoe NV	Reno NV	Spokane WA, MSA	Spokane WA	Spokane WA
Albuquerque NM, MSA	Bernalillo NM, Sandoval NM, Valencia NM	Albuquerque NM	Tacoma WA, PMSA	Pierce WA	Tacoma WA
Las Cruces NM, MSA	Dona Ana NM	Las Cruces NM	Yakima WA, MSA	Yakima WA	Yakima WA
Santa Fe NM, MSA	Los Alamos NM, Santa Fe NM	Santa Fe NM			
Eugene-Springfield OR, MSA	Lane OR	Eugene OR, Springfield OR			
Medford-Ashland OR, MSA	Jackson OR	Medford OR			
Portland-Vancouver OR, PMSA	Clackamas OR, Columbia OR, Multnomah OR, Washington OR, Yamhill OR, Clark WA	Portland OR, Vancouver WA			
Salem OR, PMSA	Marion OR, Polk OR	Salem OR			
Provo-Orem UT, MSA	Utah UT	Provo UT, Orem UT			

Table 2: Distribution of Building Material and Auto Sales for Non-Central Places in Metropolitan Areas in the Western United States

1990 Metropolitan Area Name	1977 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales	1987 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales	1997 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales		1977 Non-Central Places Auto Sales / Metro Auto Sales	1987 Non-Central Places Auto Sales / Metro Auto Sales	1997 Non-Central Places Auto Sales / Metro Auto Sales
Arizona average for MSAs			0.23			0.10	0.15
California average for (P)MSAs	0.81	0.59	0.51		0.50	0.53	0.45
Colorado average for (P)MSAs		0.40	0.38		0.20	0.35	0.33
Nevada average for MSAs		0.46	0.51			0.57	0.25
New Mexico average for MSAs		0.26	0.04				0.13
Oregon average for (P)MSAs			0.33		0.37	0.25	0.27
Utah average for MSAs			0.10		0.46	0.73	0.53
Washington average for (P)MSAs	0.65	0.55	0.48		0.35	0.34	0.38
Phoenix-Mesa AZ, MSA			0.265			0.201	0.216
Tucson AZ, MSA			0.189			0.000	0.081
Bakersfield CA, MSA			0.592		0.239	0.195	0.296
Chico-Paradise CA, MSA		0.538	0.258			0.473	0.406
Fresno CA, MSA			0.308			0.409	0.467
LA-Long Beach CA, PMSA			0.629			0.618	0.699
Orange CA, PMSA			0.670			0.708	
Ventura CA, PMSA	0.913				0.677	0.701	0.789
Merced CA, MSA			0.452			0.176	
Modesta CA, MSA							0.484
Redding CA, MSA			0.070				
Sacramento CA, PMSA		0.803	0.704			0.781	0.877

1990 Metropolitan Area Name	1977 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales	1987 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales	1997 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales		1977 Non-Central Places Auto Sales / Metro Auto Sales	1987 Non-Central Places Auto Sales / Metro Auto Sales	1997 Non-Central Places Auto Sales / Metro Auto Sales
Salinas CA, MSA		0.422			0.416		
San Diego CA, MSA							0.474
Oakland CA, PMSA						0.782	
San Francisco CA, PMSA	0.706	0.606	0.677		0.657	0.737	0.814
San Jose CA, PMSA							0.098
Santa Rosa CA, PMSA			0.497				0.160
Vallejo-Fairfield-Napa CA, PMSA							0.080
Visalia-Tulare-Porterville CA, MSA			0.782				
SLO-Atasc-Paso Robles CA, MSA			0.669				
San Barb-Santa Maria-Lom CA, MSA							0.221
Stockton-Lodi CA, MSA			0.295			0.272	0.383
Boulder-Longmount CO, PMSA							0.153
Colorado Springs CO, MSA		0.080	0.118				0.003
Denver CO, PMSA		0.712	0.597			0.875	0.806
Fort Collins-Loveland CO, MSA			0.427		0.388	0.327	0.391
Grand Junction CO, MSA						0.194	
Greeley CO, MSA					0.219		0.301
Pueblo CO, MSA					0.000	0.000	
Las Vegas NV & AZ, MSA			0.548			0.567	0.490
Reno NV, MSA		0.455	0.469				0.013
Albuquerque NM, MSA		0.256					
Las Cruces NM, MSA			0.037				
Santa Fe NM, MSA							0.130

11

1990 Metropolitan Area Name	1977 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales	1987 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales	1997 Non-Central Places Building Mat. Sales / Metro Building Mat. Sales		1977 Non-Central Places Auto Sales / Metro Auto Sales	1987 Non-Central Places Auto Sales / Metro Auto Sales	1997 Non-Central Places Auto Sales / Metro Auto Sales
Eugene-Springfield OR, MSA							0.340
Medford-Ashland OR, MSA			0.334			0.222	0.202
Salem OR, PMSA			0.330		0.368	0.287	0.263
Provo-Orem UT, MSA			0.095				0.295
Salt Lake City-Ogden UT, MSA					0.456	0.730	0.773
Bellingham WA, MSA		0.417	0.252			0.255	
Bremerton WA, PMSA			0.556				0.304
Olympia WA, PMSA			0.502				0.060
Seattle-Bellevue-Everett WA, PMSA			0.668				0.671
Spokane WA, MSA	0.551		0.388		0.333	0.366	0.341
Tacoma WA, PMSA	0.743	0.681	0.516		0.395	0.470	0.578
Yakima WA, MSA					0.326	0.276	0.318

Statewide Local Revenue Choices and Retail Decentralization

The three dependent variables for the empirical study discussed next are real values of retail sales, building material sales, and auto sales in non-central places for the available metropolitan areas described in the previous section.[10] For each of these dependent variables, where available, information is gathered from 1977, 1987, and 1997. The pooling of cross section and time series data permits variation in non-central retail sales to occur across metropolitan areas and within an area over time. This data allows a regression test of whether statewide averages for pertinent forms of own-source municipal revenue reliance exert any significant influences on the amount of non-central retail sales in a state's metropolitan areas. A model of what determines non-central retail sales in a metropolitan area is necessary to formulate this regression test. The model that follows builds upon the earlier work of Brueckner and Fansler (1983).

Economic theory indicates that the real dollar value of retail sales in the non-central portion of a metropolitan region increases as non-central population and real household income increases. Suburban retail activity may be slowed by a higher acquisition price for agricultural land upon which to build new retail centers on. The availability of transportation options can also influence where people in a metropolitan area shop. These four factors (population, income, price of agricultural land, and transportation options) are what Brueckner and Fansler (1983) expect to influence the size of an urbanized area.[11] With the exception of proxies for transportation options, the model of suburban retail sales used here also relies on these same causal factors. Metropolitan transportation options are excluded for two reasons: (1) demographics, population, and income largely determine the transportation options available in a metropolitan area, and (2) the influence of transportation options on suburban retail activity is not the focus of this investigation. If metropolitan transportation options were to be included as explanatory variables 7 in the regression analysis, they would need to be considered a simultaneously

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[10] Alternative dependent variables would be the percentage of total retail (or building material or auto) sales in a metropolitan area occurring in its non-central places (the values in the data columns of Table 2). A model of what determines this percentage contains the same explanatory variables as included in the model below except that some of the explanatory variables (population, household income, and demographics) need to be in percentage form (noncentral value relative to total value in the metropolitan area). Such a regression specification was tried and the results offered low overall explanatory power (R-squared) and little statistical significance of specific explanatory variables. As described next, using total retail (or building material or auto) sales in non-central places as dependent variables lends itself to more direct modeling and the resulting regression analysis offers quite different results.

[11] A mathematical description of the formal urban model that yields these four causal factors—originally developed by Muth (1969) and Mills (1972)—is contained in Brueckner and Fansler (1983).

determined variable and appropriately modeled.[12]

Further refinement of Brueckner and Fansler's model of urban size is necessary to accurately assess the influence of local government fiscal institutions on non-central retail activity. This is in the form of controlling for demographic differences in the type of population located in noncentral places, previous decade's growth in non-central population, and any forms of urban growth controls that may be present. The model used to delineate the regression analysis is thus:

Retail Sales$_{i,t}$ = f (Income$_{i,t}$, Population$_{i,t}$, Previous Decade's Population Growth$_{i,t}$, Presence of Urban Containment Policy$_{i,t}$, Price of Agricultural Land$_{i,t}$, Percentage Population Less than Age 18$_{i,t}$, Percentage Population Greater than Age 64$_{i,t}$, Percentage Statewide Discretionary Municipal Revenue from Property Taxes$_{i,t}$, Percentage Statewide Discretionary Municipal Revenue from General Sales Taxes$_{i,t}$, Percentage Statewide Discretionary Municipal Revenue from Other Taxes$_{i,t}$);

where,

i = 1, 2, 3, …, or 54 (for each metropolitan area's non-central places), and t = 1977, 1987, or 1997.

The degree of statewide reliance on different forms of own-source municipal revenue can influence the amount of retail activity in non-central metropolitan places through local fiscal zoning and the offering of local economic development incentives. Municipal revenue reliance for a specific category is calculated as a percentage of locally generated revenue from sources most likely to be influenced by local land use decisions. The term used here to describe this form of local revenue source is "discretionary". Discretionary revenue sources include locally generated property taxes, general sales taxes, other taxes, and user charges/special assessments.[13] Discretionary also refers to the fact that if a statewide policy were instituted to reduce percentage reliance on one of these local revenue instruments the percentage reliance on one or all of the others would likely have to increase. Only three of the four discretionary revenue sources are accounted for in the

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[12] As further evidence that this is appropriate, Brueckner and Fansler (1983) found their variable proxies for commuting cost (percentage of commuters using public transit and percentage of households owning one or more autos) to never be statistically significant factors in explaining the size of an urbanized area.

[13] In 1997 these four sources of local revenue accounted for nearly 50 percent of the total local revenue collected in the western states in the sample. Statewide average reliance on local revenue reliance, rather than metropolitan-wide averages or local reliance, is used to insure the exogenous nature of these explanatory variables to each metropolitan area. Since pertinent land use decisions are made in the unincorporated portions of U.S. counties, statewide municipal revenue reliance is intended to also proxy for the average reliance that counties in a state have upon these forms of local revenue.

regression model because the third, Percentage Statewide Discretionary Municipal Revenue from Charges, equals 100 percent less the sum of the included three.

As widely documented elsewhere, municipalities and unincorporated areas of counties in the United States regulate local land uses with an eye on the fiscal bottom-line.[14] Municipal and county governments in the United States also use local incentives to attract desirable land uses within their boundaries.[15] Both of these activities can result in greater local retail activity in a metropolitan area's non-central places than economic factors alone would dictate. Different degrees of statewide reliance, on different forms of own-source municipal revenue, could thus yield different amounts of fiscal surplus generated by local land devoted to retail activity. The greater the reliance on a municipal revenue source that generates a local fiscal surplus from local retail activity, the more likely that local officials zone for retail land uses and use local incentives to encourage it. In their study of the fiscal benefits that retailers offer cities in California, Kotin and Peiser (1997) include local sales taxes, property taxes, and business license fees (which fall into the category of other taxes used above) as the three forms of city revenues that need to be accounted for.

The U.S. *Census of Governments* divides municipal own-source revenue into two categories: current charges/miscellaneous revenue and taxes. The Census describes current charges as fees for specific local services delivered to a local citizen or business. For the purpose of this study, charges equal current charges plus special assessments. Special assessments are included with charges because of their Census definition as "compulsory contributions collected from owners of property benefited by special public improvements". The Census includes interest earnings, special assessments, sale of property, and other general revenue under its definition of miscellaneous revenue. With the possible exception of special assessments, these forms of miscellaneous revenue are unlikely to generate a local fiscal surplus through greater retail activity and excluded from the regression model.

The Census classifies municipal taxes in the forms of property, general and selective sales, individual income, corporate income, motor vehicle license, and other taxes. None of the eight western states considered here allow local personal or corporate income taxes. All other forms of local taxation, except motor vehicle taxes and selective sales taxes (on motor fuels, alcohol, tobacco and public utilities), are accounted for in the regression analysis because they offer the potential for a local suburban government to

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[14] Fischel's (1985) book on *The Economics of Zoning Laws*, especially Chapter 14, offers an excellent introduction to zoning in the United States and the use of fiscal zoning described here. Ladd (1998) provides a recent summary of land use regulation as a local fiscal tool widely used in the United States.

[15] See Bartik (1991) and Anderson and Wassmer (2000) for book-length descriptions of the use and influence of local economic development incentives in the United States. Lewis and Barbour (1999, pp. 73-74) describe the specific forms of local incentives that are available to local governments in California.

benefit from a fiscal surplus gained through the attraction of greater retail activity within its boundaries.[16]

Brueckner and Kim (2000) have theoretically shown that the expected influence of greater local reliance on property taxation on urban decentralization through capital use is uncertain. Aside from altering capital use, greater local reliance on property taxes can also encourage local land use decisions that are more likely to generate a fiscal surplus through property taxation (property tax revenue greater than the cost of local services required by the retail property). The influence that this has on suburban retail activity depends upon how retail does in generating a property tax fiscal surplus relative to alternative uses (housing or manufacturing) for a municipality's land.[17]

Throughout a state, greater average local reliance on general sales taxation as a source of discretionary local revenue offers a reason for suburban governments in the state to lure retailers away from traditional business districts in central place communities and increase the amount of retail sales in the suburbs. In support, through a survey of officials in 300 California cities that asked them to rank 18 different motivations for evaluating the desirability of various forms of development projects, Lewis and Barbour (1999) found that "new sales tax revenues" always finished first or second in terms of the importance most often given. Interestingly, only the 36 central city officials in the sample systematically ranked sales tax considerations consistently lower. The lure of collecting other taxes, like a license fee or other business tax, from retailers offers an additional motivation for non-central place governments to draw retail activity away from traditional central place locations.

Economic theory indicates that suburban income and population should exert a positive influence on suburban retail sales, while the influence of the price of agricultural land in the metropolitan area should be negative. After a previous decade's surge in population growth, retail developers may have not been able to keep pace with the amount of development specified by population and retail sales may be smaller, holding other factors constant, in an area that previously experienced high population growth. Alternatively, developers may view high population growth in the past as an indicator of

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[16] Business taxes and franchise/license fees are included in the category of Percentage Statewide Discretionary Municipal Revenue from Other Taxes. In most states, revenue from businesses make up more than half of the amount accounted for in this category, with the other half coming from various sources like severance taxes, death taxes, and gift taxes. It is impossible to separately account for business related fees because distinct business values are not given.

[17] For the *a priori* purpose of predicting the expected influence of local property taxation on non-central retail activity it would be informative to know the amount of fiscal surplus through property taxation generated by retail activity relative to alternative forms of local activity. Unfortunately a search of the literature revealed no previous estimates of this and a full evaluation would require at least another paper-length treatment.

even greater growth expected for the future and consequently develop more than existing population and income itself would call for. Urban areas with a higher percentage of senior citizens or families with children are likely to exhibit different retail consumption patterns; though, the directions of these influences are uncertain.[18]

The regression model used to explain non-central retail activity in a metropolitan area also includes six explanatory variables that account for whether a certain type of Urban Containment Policy (UCP) exists in a metropolitan area, and if it does, how long has it been in existence. UCPs are commonly referred to as urban growth boundaries and are designed to slow the degree of decentralization in a metropolitan area that would have occurred over time. The presence of a UCP could thus reduce the amount of non-central retail activity in metropolitan areas where they are in place.[19] The regression includes the three different types of UCPs cataloged by Nelson (2001) in his recent examination of these policies. The first type is "closed-region containment." Nelson defines this as metropolitan wide, explicitly preserving land at the urban fringe, and attempting to shift displaced development back to the center. The second type is "open-region containment." It is also metropolitan wide, but does nothing to explicitly preserve open space at the fringe, but does endeavor to shift development back to the center of the urban area. The final type of UCP is "isolated containment." By Nelson's definition, a policy of isolated containment does not exist on a metropolitan wide basis, intends to only preserve limited land outside some jurisdictional boundaries, and does nothing to shift development occurring outside of these intrametropolitan boundaries back to the urban core.

As taken from Nelson, a description of the western metropolitan areas that had one of the three urban containment policies in place in 1997 is in Table 3. Further investigation yielded the recorded information on the approximate year that each of these UCPs began. Since development patterns are more likely to be constrained by an urban containment policy the longer it has been in place, the explanatory variables in the regression include three dummy variables for whether a type of UCP exists, and three other variables that account for the number of years since a certain UCP began in the metropolitan area.

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[18] To account for the spillover of retail customers between contiguous metropolitan areas, a dummy variable representing such metropolitan areas was included in preliminary regressions. This dummy was never statistically significant in the OLS and random effect models, and could not be included in the fixed effect regression model due to perfect colinearity. A separate dummy for whether a metropolitan area is a PMSA yielded similar results. Both of these dummies are not included in the final regression analysis.

[19] The approach taken here in measuring the influence of a UCP on non-central retail activity is conservative given that a UCP's influence on decentralization may also impact the amount of population that exists in non-central places. This separate influence is not measured.

Table 3: Year that Type of Urban Containment Policy (UCP) Began in Western Metropolitan Area

Western Metropolitan Areas with an Urban Containment Policy (UCP)	Type of UCP		
	Closed-Region Containment	Open-Region Containment	Isolated Containment
Yuma AZ, MSA			1996
Chico-Paradise CA, MSA			1983
Fresno CA, MSA			1984
Sacramento CA, MSA			1993
San Diego CA, MSA	1979		
San Jose CA, MSA			1972
Santa Rosa CA, PMSA			1996
Vallejo-Fairfield-Napa CA, PMSA			1980
Visalia-Tulare-Porterville CA, MSA			1974
San Luis Obispo-Atascadero-Paso Robles CA, MSA		1981	
Santa Barbara-Santa Mraia-Lompoc CA, MSA			1989
Yolo CA, PMSA			1987
Yuba City CA, MSA			1989
Boulder-Longmount CO, PMSA			1978
Fort Collins-Loveland CO, MSA			1980
Santa Fe NM, MSA		1991	
Eugene-Springfield OR, MSA	1982		
Medford-Ashland OR, MSA	1982		
Portland-Vancouver OR, PMSA	1979		
Salem OR, PMSA	1981		
Bellingham WA, MSA	1992		
Olympia WA, PMSA	1992		
Seattle-Bellevue-Everett WA, PMSA	1992		
Tacoma WA, PMSA	1992		
Yakima WA, MSA	1992		

The high level of variation in own-source municipal revenue reliance across states and across time is denoted by the values recorded in Table 4. For instance, on average between 1977 and 1997, municipal governments in New Mexico drew only 22.4 percent of their discretionary local revenue from property taxation. The comparable figure for municipal governments in Oregon was 52.6 percent. For general sales taxation over the same 20-year period, municipal governments in Oregon relied on it for none of their discretionary revenue, while municipal governments in Colorado gained 41.1 percent of

their discretionary revenue from it. As well, within state variations over time for some states were large. In 1977, local governments in California drew 41.7 percent of discretionary revenue from property taxation; by 1997 this value fell to 25.7 percent. General sales taxation totaled 12.1 percent of New Mexico's discretionary municipal revenue in 1977; by 1997 it had risen to 37.0 percent. Nevada municipalities relied on other taxes for 22.9 percent of their discretionary revenue in 1977; by 1997 this figure fell to 15.0 percent.

The bottom of Table 5 lists the number of observations included in each of the three separate regressions. Due to missing data, as shown in Table 2, there are respectively only 69 and 87 observations in the building material and auto sales regressions. The descriptive statistics for variables included in the three regressions are also listed in Table 5. The non-central place values of median household income and population are calculated from the U.S. Department of Housing and Urban Development's *State of the Cities Data* System.[20] Actual income values were not available for 1997 and had to be extrapolated from the available 1979 and 1989 values. Interpolation from the available decennial census years was also necessary to determine population and income values for 1967, 1977, and 1987. The 1997 population value is an estimate provided by the Census. Various editions of the U.S. Census *City and County Databook* offer the data necessary to calculate the desired measures of metropolitan age distribution. Interpolation yields the 1977 and 1987 values, while extrapolation results in the values for 1997. An appropriate proxy for the real price of agricultural land in a metropolitan area's non-central places is the real value of agricultural products sold in the metropolitan area divided by the number of agricultural acres in the area. These amounts come from the U.S. *Census of Agriculture.*

A concern for the regression analysis is how to control for non-measurable factors that are fixed in a given year across all areas, or fixed in a given area for all years, and can influence the real value of non-central retail activity. Since the factors fixed in a given year are likely related to the position of the national economy in the business cycle, a dummy variable for observations from 1987, and another dummy variable for observations from 1997 are included in all regressions.

To control for factors fixed across all observed years, but that vary by metropolitan area, a few regression options are available.[21] The first is the "fixed effect" method of dropping the constant term and including a set of dummy variables representing each of the metropolitan areas in the sample. This allows different constant terms to control for the fixed contribution of the unmeasured characteristics of a specific area. A second option is to treat ignorance on the specific fixed contribution of an area to its retail sales in the same manner as the general ignorance represented by the regression's error term. Using this "random effect" method the regression's error is composed of the traditional component plus a second component that varies by each of the specific metropolitan

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[20] Available at http://webstage1.aspensys.com/SOCDS/SOCDS_Home.htm

[21] See Kennedy (1992, pp. 222-223) for a further description of these possibilities

locations in the sample. A final option is to do nothing to account for specific area effects. The regression results recorded in Table 6 use the fixed effect method based upon the results of statistical tests that indicate that it is preferred in at least two of the three regressions.

**Table 4: Percentage Statewide Discretionary Municipal Revenue
from Component Sources for Western United States**

Year and State	Percentage Statewide Discretionary Municipal Revenue from Property Taxes	Percentage Statewide Discretionary Municipal Revenue from General Sales Taxes	Percentage Statewide Discretionary Municipal Revenue from Other Taxes	Percentage Statewide Discretionary Municipal Revenue from Charges
1997 Arizona	15.6	39.0	5.5	39.9
1997 California	25.7	20.1	11.9	42.4
1997 Colorado	10.8	40.3	4.1	44.8
1997 Nevada	24.9	0.0	15.0	60.1
1997 New Mexico	14.6	37.0	2.7	45.7
1997 Oregon	46.7	0.0	12.7	40.6
1997 Utah	24.5	28.9	5.7	41.0
1997 Washington	24.5	22.0	10.5	43.0
1987 Arizona	18.7	36.0	5.5	39.8
1987 California	28.1	23.2	13.7	35.0
1987 Colorado	14.6	43.1	4.9	37.5
1987 Nevada	23.8	0.0	22.6	53.6
1987 New Mexico	18.3	31.5	2.6	47.6
1987 Oregon	55.7	0.0	7.2	37.0
1987 Utah	29.1	27.6	4.7	38.6
1987 Washington	25.9	22.5	12.1	39.5
1977 Arizona	25.5	43.4	3.9	27.2
1977 California	41.7	23.1	10.2	25.0
1977 Colorado	23.8	39.8	5.1	31.4
1977 Nevada	37.0	0.9	22.9	39.2
1977 New Mexico	34.3	12.1	8.7	44.8
1977 Oregon	55.3	0.0	8.0	36.7
1977 Utah	28.1	31.8	5.6	34.5
1977 Washington	31.5	18.4	12.4	37.7

Table 5: Descriptive Statistics for variables Included in Regression Analysis

Variable Description	Total Retail Sales Mean (Standard Deviation)	Building Material Sales Mean (Standard Deviation)	Auto Sales Mean (Standard Deviation)
Respective Dependent Variable ($1,000,000s)	$3,844.121 ($7,017.489)	$395.151 ($605.331)	$1,089.884 ($1,935.023)
Real Value Median Household Income in Non-Central Places	$41,801 ($8,543)	$43,077 ($8,713)	$43,255 ($8,588)
Population in Non-Central Places	453,085 (730,899)	571,754 (870,910)	520,814 (779,437)
Previous 10 Year Percentage Growth in Non-Central Places	28.99 (19.01)	27.62 (17.42)	27.87 (17.60)
Dummy if Closed-Region Urban Containment in Place	0.099 (0.300)	0.116 (0.322)	0.138 (0.347)
Years that Closed-Region Urban Containment in Place	0.894 (3.315)	*not relevant*	1.391 (4.050)
Dummy if Isolated Urban Containment in Place	0.130 (0.338)	0.159 (0.369)	0.161 (0.370)
Years that Isolated Urban Containment in Place	1.35 (4.30	1.72 (4.74)	1.83 (5.00)
Dummy if Open-Region Urban Containment in Place	0.019 (0.136)	*not relevant*	*not relevant*
Years that Open-Region Urban Containment in Place	0.174 (1.421)	*not relevant*	*not relevant*
Real Value Agriculture Products in Metro Area Per Acre in Agric.	$860.85 ($891.76)	$984.21 ($978.01)	$850.10 ($804.72)
Percentage of Population in Non-Central Places Less than Age 18	29.16 (6.43)	27.82 (7.72)	27.95 (7.10)
Percentage of Population in Non-Central Places Greater than Age 64	10.80 (3.10)	11.35 (3.12)	11.25 (3.04)
Percentage Statewide Discretionary Mun. Revenue from Property Taxes	29.14 (10.45)	26.19 (7.24)	27.88 (9.69)
Percentage Statewide Discretionary Mun. Revenue from General Sales Tax	23.47 (11.36)	23.13 (9.89)	22.81 (11.22)
Percentage Statewide Discretionary Municipal Revenue from Other Taxes	10.03 (4.02)	11.25 (3.72)	10.67 (3.75)
Observations	161	69	87

Regression Findings

All of the regression results in Table 6 use White's method of adjusting the regression coefficient's standard errors for possible heteroskedastic bias from an unknown source.[22] The regression entries in Table 6 first contain, in bold, the mean elasticity values for the statistically significant regression coefficients.[23] Below these are the actual regression coefficients, and in parenthesis are the coefficient's standard errors.[24] The statistical significance of the F statistic, recorded at the bottom of the table, indicates that the group of area dummies included in the fixed effect model, as a whole, exerts a significant influence on the determination of total retail sales. The statistical significance of the Lagrange Multiplier statistic, also at the bottom of Table 6, indicates that the use of the fixed or random effect model is preferred to simple ordinary least squares for total and auto retail sales. Based upon these test statistics, and the fact that a Hausman test statistic—that would indicate whether the random effect method is preferred—could not be calculated, the preferred results are from the fixed effect regression model.[25]

As expected, non-central place population exerts a significant influence on all forms of non-central place retail sales. A one-percent increase in suburban population from its mean results in anywhere from a 0.83 to 1.01 percent increases in real retail sales from its mean for the average metropolitan area in the sample. Brueckner and Fansler (1983), using ordinary least squares for a single cross section of U.S. metropolitan areas record a slightly larger 1.10 percent increase in urbanized land area for a one percent increase in urbanized population.

Household income never exerted a statistically significant influence on non-central retail sales.[26] Non-central places that experienced higher population growth in the previous ten-

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[22] See Kennedy (1992, Chapter 8) for a description of what heteroskedasticity is and the problems it presents for regression analysis. White's method of correction is described on p. 130.

[23] Statistical significance is defined in the standard manner of greater than 90 percent confidence in a two-tailed test.

[24] The Total Retail Sales regression uses only 161 of the possible 162 observation (54 areas over three years) because the Yuba City CA, MSA was not in existence in 1977 and hence certain needed explanatory data could not be gathered for it.

[25] There is also the specification issue of whether a log-linear functional form is more appropriate than the linear form. A log-linear form uses the log of the dependent variable and allows for non-linear relationships between explanatory variables and the dependent variable. This specification was tried and the result was less statistical significance for all regression coefficients and a few unexpected signs. Thus the decision to use the linear form recorded in Table 6.

[26] The non-statistical significance of the income coefficient may be due to the fact that 1997 income values are extrapolated. To test this hypothesis, all regressions were rerun using only the 1977 and 1987 samples. Again the regression coefficients on median

year period were more likely to exhibit greater auto sales. Another significant influence, that is non-fiscal in nature, is that a one-percent increase in the price per acre of agriculture land in the metropolitan area resulted in about a 0.14 percent decrease in real aggregate retail sales. This is the expected effect of higher prices for suburban land slowing suburban retail expansion.[27] Brueckner and Fansler (1983) record a twice-higher elasticity of -0.20 for a similar explanatory variable's effect on the size of urbanized land area, but recall this came from a regression analysis using a single cross section and no controls for fixed effects. In addition, a one-percent increase in the percentage of the non-central population over age 64 yields about 0.29 percent increase in non-central total retail sales. The magnitude of this influence (elasticity) on auto sales was about half as large. Perhaps not surprising, a greater percentage of young people (perhaps due to a greater number of new and remodeled homes) in non-central places only exerted a positive influence on building material sales.

Particularly notable are the regression coefficients calculated for the three different forms of urban containment policies. The presence of a closed-region urban containment policy (a metropolitan-wide urban growth boundary which preserves land outside it and attempts to shift demand for regional development to within it) is correlated with about one billion more dollars of aggregate retail activity in the metropolitan area's non-central places, and about $900 million more in auto retail activity. But these effects cannot be observed in isolation, for the total retail and auto sales regressions also reveal that for every year that closed-region containment in place, the real value of retail activity in non-central places (holding other causal factors constant) respectively fell by about $90 and $178 million.[28] Though these yearly decreases are not that large relative to the average real values of total and auto retail activity of $3.8 and $1.1 billion, after 10 years of closed-region urban containment, the resulting $0.9 and $1.8 billion reduction in non-central total retail and auto sales are notable amounts.

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household income were statistically insignificant; thus the basis for the decision to use the full sample.

[27] The negative impact of higher agricultural prices on slowing retail decentralization is only expected if the price of urban land in the area is held constant. Though no direct control for this in regression, the fixed effect method of including dummies for year observation from and for each specific metropolitan area should offer reasonable proxies for this.

[28] As shown in Table 2, there are only a limited number of observations on building material sales for western metropolitan areas that practiced a policy of closed-region urban containment. For this reason, perfect colinearity prevented the inclusion of a variable representing the number of years that closed-region policy in place in the building material regression. The same is true regarding the dummy explanatory variable for the presence of open-region urban containment and the number of years that open-region containment in place for both the building material and auto sales regressions.

Table 6: Descriptive Statistics and Regression Results Using Real Value of Various Types of Metropolitan Retail Sales ($1,000,000) in Non-Central Places as Dependent Variables

Explanatory Variables	Total Retail Sales Fixed Effect Ordinary Least Squares^	Building Material Sales Fixed Effect Ordinary Least Squares^	Auto Sales Fixed Effect Ordinary Least Squares^
1987 Year Dummy	-255.37 (204.05)	-469.91 (268.72)	57.07 (232.51)
1997 Year Dummy	-184.95 (288.14)	-416.02** (192.63)	74.86 (414.07)
Real Value Median Household Income in Non-Central Places	-0.006 (0.019)	-0.016 (0.039)	0.013 (0.031)
Population in Non-Central Places	**0.825** 0.007*** (0.001)	**1.013** 0.0007*** (0.0003)	**0.956** 0.002*** (0.001)
Previous 10 Year Percentage Growth in Non-Central Places	-0.847 (3.737)	-0.227 (2.239)	**0.367** 14.34** (6.67)
Dummy if Closed-Region Urban Containment in Place Containment in Place	1,031.15*** (374.84)	-94.74 (111.23)	894.82** (228.40)
Years that Closed-Region Urban Containment in Place	**-0.021** -89.53** (35.41)	*Not relevant*	**-0.227** -177.91*** (35.10)
Dummy if Isolated Urban Containment in Place	122.22 (145.03)	74.01 (73.98)	487.16* (321.73)
Years that Isolated Urban Containment in Place	-9.50 (9.38)	-8.66 (6.59)	**-0.079** -47.06* (32.09)
Dummy if Open-Region Urban Containment in Place	-306.18 (239.90)	*not relevant*	*not relevant*

Explanatory Variables	Total Retail Sales Fixed Effect Ordinary Least Squares^	Building Material Sales Fixed Effect Ordinary Least Squares^	Auto Sales Fixed Effect Ordinary Least Squares^
Years that Open-Region Urban Containment in Place	**0.003** 72.79*** (23.20)	*not relevant*	*not relevant*
Real Value Agriculture Products in Metro Area Per Acre in Agriculture	**-0.135** -0.601*** (0.203)	-0.073 (0.059)	0.336 (0.396)
Percentage Population in Non-Central Places Less than Age 18	0.727 (16.82)	**2.257** 32.06*** (11.64)	7.22 (15.24)
Percentage Population in Non-Central Places Greater than Age 64	**0.288** 102.73** (40.79)	27.81 (25.85)	**0.116** 163.56*** (49.32)
Percentage Statewide Discretionary Municipal Revenue from Property Taxes	17.92 (20.57)	-54.74 (45.23)	25.35 (37.01)
Percentage Statewide Discretionary Municipal Revenue from General Sales Taxes	**0.242** 39.60** (17.49)	**2.996** 51.19** (20.80)	**0.958** 45.76** (26.89)
Percentage Statewide Discretionary Municipal Revenue from Other Taxes	**0.282** 107.94** (45.28)	14.38 (48.19)	**1.698** 173.48*** (52.24)
Observations	161	69	87
R-Squared Statistic	0.995	0.988	0.982
Adjusted R-Squared Statistic	0.992	0.908	0.934
F-Test Statistic	7.022***	0.685	0.908
Lagrange Multiplier Test Statistic	36.81***	0.83	6.23**
White Heteroskedsaticity Corrected	yes	yes	yes

NOTES: *** = Statiscally significant in two-tailed test at greater than 99% confidence or ** = 91 to 99% confidence. ^ Also includes dummy variables for each of the 54 metropolitan areas included in the sample of non-central places. The regression coefficients for these area dummies are not reported but are available from author upon request. **Significant elasticities, calculated from means, in bold.**

The regressions indicate that a region that institutes a policy of closed-region containment at first exhibits more non-central retail activity; however, after 12 years (calculated by dividing 1,031 by 90) it continually has less. The corresponding turning point for auto sales is about 5 (894 / 178) years. These findings are as expected if regions with greater sprawl are more likely to adopt closed-region containment and over time this policy of urban containment is effective at reducing decentralization. The increasing cumulative effect over time is likely due to outer development patterns being increasingly constrained the longer a given closed-region policy has been in place.

Isolated urban containment (open space preservation in place at only sub-metropolitan jurisdictional boundaries and no effort to direct development back to central places) exhibited no statistically significant influence on the amount of total and building material activity in non-central places. But notice that the auto regression does indicate a pattern similar to the influence of closed-region urban containment. A western metropolitan area, holding other factors constant, that adopts isolated urban containment again has more non-central auto retail activity ($490 million), but after about 10.5 (490 / 47) years it again has less. Due to its less constraining nature, the yearly reduction in non-central auto sales due to isolated urban containment is about one fourth of the reduction experienced with closed-region containment.

The positive regression coefficient on the variable representing the number of years that open-region urban containment in place in the total non-central retail regression deserves explanation. Recall that this form of urban containment policy is less restrictive than the closed-region form since it does not attempt to preserve open space outside of drawn boundaries. The adoption of such a policy in the San Luis Obispo-Atascadero-Paso Robles and Santa Fe metropolitan areas was likely a response to anticipated sprawl and a desire to do something about it. But as the regression indicates, without concentrated efforts to preserve open space at the fringe, open-region urban containment policies do not reduce the decentralization of retail activity. The positive coefficient on years of open-region urban containment is unlikely to be causal and just picking up the increased retail decentralization that was anticipated in the earlier adoption of this ineffective policy.

Regression coefficients of equal interest are the ones relating to how statewide measures of reliance on various forms of discretionary municipal revenue affect non-central retail sales. In all regressions the percentage of statewide discretionary municipal revenue from property taxes exerted no statistically significant influence on any of the three forms of non-central retail sales. Though the simulation finding of Brueckner and Kim (2000), and the additional motivation of suburbs seeking fiscal surplus, indicates an expected positive influence, there is also the possibility that property tax reliance discourages capital consumption, promotes greater density, and reduces retail decentralization. These offsetting occurrences could be the reason for the insignificant influence that this variable exerts on non-central retail sales.

Alternatively, the percentage of statewide discretionary municipal revenue from general sales taxation exerted a significant positive influence on all three forms of non-central retail activity. For every one-percent increase in sales tax reliance, real retail sales in non-

26

central metropolitan places in the West rose by 0.24 percent. The detected influence of general sales tax reliance on building material sales was over ten times as large. While a one-percent increase in sales tax reliance resulted in about a one-percent increase in non-central retail activity. Not surprising, these findings confirm the hypothesis that if fiscalization of land use is occurring, the measurable influence should be greater on big box forms of retail sales than all retail sales.

Statewide reliance on other taxes, which includes various types of business taxes and franchise/license fees, also yielded significant positive influences on non-central total and auto retail sales. For every one-percent increase in reliance on these other forms of local taxation, total retail sales in non-central places rose by 0.28 percent.[29] The comparable influence on auto sales was again as expected for a big box item: a one percent increase in other tax reliance resulting in an elastic 1.7 percent increase in non-central auto sales.

Implications

The regression findings confirm the expectations of economic theory. Population, available land prices, and demographics influence the real dollar amount of retail sales observed in non-central places in the western United States. The regression analysis also generated evidence in support of the fiscalization of land use for retail activity and that the more restrictive uses of urban growth boundaries reduce the decentralization of metropolitan retail sales. These effects are larger on the two chosen forms of big box retail sales than for total retail. If urban retail sprawl is defined as retail activity that is greater in a metropolitan area's non-central places than the non-central places' population, population growth, demographics, land prices, and income warrant; then this study has shown that two forms of local government revenue reliance contribute to a greater sprawl.

As an example, this empirical analysis demonstrates that a statewide shift in local own-source revenue towards greater reliance on sales taxation contributes to a further decentralization of total, building material, and auto retail activities in the state's metropolitan areas. Looking over the data offered in Table 4, reliance on general sales taxation as a source of discretionary municipal revenue greatly increased in New Mexico. In 1977, municipalities in New Mexico drew 12.1 percent of their discretionary revenue from general sales taxation; by 1997 this measure had more than tripled to 37.0 percent.

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[29] To measure the independent influence of Percentage Statewide Discretionary Municipal Revenue from Charges on non-central activity, this category replaced the general sales tax category in other fixed effect regression runs. The result for all three dependent variables was that the explanatory variable representing other taxes remained positive and statistically significant, the property tax variable continued to exert a statistically insignificant influence, while the charge variable also exerted no significant influence. Considering that the legal intent of charges is to generate little to no fiscal surplus, the insignificance of charges to non-central retail activity is as expected.

The regression findings indicate that such a 206 percent increase in reliance on general sales taxation is likely to have resulted in about a 50 percent increase in the dollar value of total retail activity occurring in New Mexico's non-central metropolitan places.[30] Even more interesting is the finding that due to this increased local reliance on general sales taxation, New Mexico is expected to have about 6.2 times more building material retail activity in its non-central places and about 2.0 times auto retail activity. Other states in the American West, with the exception of Colorado and Washington, having reduced their municipal discretionary revenue reliance on sales taxation between 1977 and 1997, have experienced less non-central retail activity than would have likely occurred if these reductions had not happened.

Equally important is the consistent finding that the percentage of statewide discretionary municipal revenue from property taxes was found to exert no statistically significant influence on the decentralization of retail activity in a metropolitan area. It appears that the continuing shift in the United States away from local property taxation as a primary source of discretionary revenue, and towards other alternatives like local sales taxation and other business taxes, has independently contributed to increasingly decentralized metropolitan land use patterns.

A policy lesson that one may be tempted to draw from this analysis is that states interested in reducing urban retail sprawl in their metropolitan areas consider reducing their statewide municipal reliance on the general sales tax. Such a lesson needs to be tempered by the reality that most voters in the United States prefer sales taxation to alternative forms of raising local revenue.[31] The real connection between retail sprawl and local sales taxation comes from the local retention of a portion of the sales tax revenue generated in a jurisdiction that is greater than necessary to cover the costs of providing additional local services to retailers. If this fiscal surplus is eliminated, then it is less likely that non-central places in metropolitan areas will continue to desire and draw retail activity from central places for purely fiscal reasons. A workable option would be to collect a portion of local retail sales revenue on a regional basis, and distribute it back to communities in the region on a per-capita basis. The fiscalization of land use demonstrated here could be slowed if this portion was large enough to reduce the current fiscal surplus that communities enjoys by favoring retail in local land use decisions. California is currently considering such legislation in the form of Assembly Bill 680 (2001). AB 680, which beginning in 2003 would put the growth in local sales tax revenue in the six county Sacramento Region into a regional pot in which one-third would be given back to the jurisdiction it came from, an additional one-third would also be given back to the jurisdiction it came from if they were building their fair share of low-income housing, and the remaining one-third would be shared on a per-capita basis.

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[30] This is calculated by taking the 206 percent increase in sales tax reliance and multiplying it by the sales tax elasticity of non-central retail sales (0.242) recorded in Table 6.

[31] For a poll supporting this see the Advisory Council on Intergovernmental Activity (1987).

Set to be voted upon in the 2002 legislative session, many are pessimistic about it being signed into law because of the political reality that jurisdictions accustomed to fiscal surplus generated through the encouragement of "excessive" retail activity are loathe to give it up.[32]

Avenues for future research on this topic include an expansion of the data set to include other metropolitan areas in the United States. Perhaps the influence of statewide local fiscal structure is greater in the less developed and more quickly developing West than in the rest of the United States. It would also be valuable, as done in Brueckner and Fansler (1983), to use square miles in the urbanized area as the dependent variable in a regression study and check if statewide local fiscal structure and the presence of urban growth boundaries exerts similar influences on the geographic size of a metropolitan area.

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[32] See Johnson (2000). California State Senator Dede Alpert, in support of her different spring 2000 bill that would have distributed new local sales tax revenue in a county on a per-capita basis instead of the current *situs basis,* believed that: "Retail sprawl leads to urban sprawl, which leads to traffic, pollution, and generally a pretty poor quality of life for communities. These communities could otherwise have been balanced with jobs and housing located near each other, full services provided by each level of local government and less fighting and more cooperation between local leaders. It is not rocket science. It is the incentives."

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