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Fiscalisation of Land Use, Urban Growth Boundaries and Non-central Retail Sprawl in the Western United States

Robert W. Wassmer

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Summary. Do the ways that local governments raise own-source revenue and/or use urban growth boundaries exert distinct influences on the occurrence of retail activity outside a metropolitan area's central places? This question is addressed in this paper through a regression analysis that also accounts for economic factors that provide clear reasons for retail activity to locate in non-central places. Results indicate that state-wide reliance by municipalities on some forms of own-source revenue exert significant positive influences on retail sales in non-central places in metropolitan areas in the western US. 'Excessive' retail decentralisation generated through this 'fiscalisation of land use' is presented within the widely discussed concept of 'urban sprawl'. The continuing presence of one form of urban growth boundary is also found to reduce retail decentralisation.

1. Introduction

> Perhaps diffusion is too kind a word … In bursting its bounds, the city actually sprawled and made the countryside ugly … uneconomic [in terms] of services and doubtful social value (Earle Draper, Tennessee Valley Authority, 1937).

The pejorative use of the term 'sprawl' has been traced by Black (1996) back to this 1937 quote made to a national conference of planners. Urban planners have retained this term as part of their lexicon and apply it to undesirable patterns of urban land use. Beginning in the early 1990s, such disparate groups as the Sierra Club and the National Association of Homebuilders took an active stance against sprawl and embraced an urban development agenda based on the concept of 'smart growth'.

Given the renewed national interest in the US 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 with articles that summarise an economic approach to defining what constitutes smart urban growth. These economists emphasise the point that the metropolitan decen-

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tralisation of people and economic activity in the US 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, decentralisation 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 (1999) 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 decentralisation. The objective of this paper is to determine whether the state-wide system of local public finance and the use of urban growth boundaries work to further or deter retail decentralisation in a metropolitan area.

'Fiscalisation of land use' implies that the system of local public finance exerts an influence on local land-use decisions. Regression analysis is used here to test whether the real dollar value of retail activity in a metropolitan area's non-central places is independently influenced by relevant measures of local government revenue reliance. This measure of the fiscalisation 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 growth boundaries. The explanatory variables contained in the regression analysis (except those representing local revenue reliance and urban containment policies) represent factors that—many would argue—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 independently to increase non-central retail sales in a metropolitan area, then it can be considered a driver of excessive retail decentralisation or sprawl. At the same time, if the presence of an urban growth boundary reduces non-central retail sales, then it has achieved its stated policy goal of slowing the amount of retail decentralisation that would have occurred without it.

As a complete reading of this paper reveals, the regression analysis shows that state-wide measures of reliance by municipalities on two forms of own-source revenue exert a positive influence on the amount of non-central retail activity in metropolitan areas in the western US over the period 1977–97; while the continuing presence of one form of urban growth boundary reduces the amount of non-central retail activity.

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. Section 3 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. Section 4 of the paper offers a description of differences in the degree of retail decentralisation in 54 metropolitan areas in the western portion of the US for the years 1977, 1987 and 1997. Section 5 provides background on the regression test used to determine if state-wide averages for municipal revenue reliance and/or the presence of urban growth boundaries exert measurable influences on the location of retail activity in a metropolitan area. Section 6 contains a discussion of the regression results. The implications of the research are in the concluding section 7.

2. Urban Retail Sprawl

Urban planners, and increasingly the general public, use the term sprawl to mark undesirable forms of urban land use. Observing this

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now-common application, researchers have developed a list of land-use characteristics that are most often associated with being labelled 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, transport dominance by private automobiles and strip commercial development. Myers and Kitsuse (1999) 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 labelled sprawl. His review points out the subtle distinction between undesirable non-compact development in a metropolitan area (sprawl) and desirable polycentric development. Polycentric development, which now characterises most large metropolitan areas in the US, is often more efficient—in terms of clustering land uses to reduce trip lengths and reduce congestion—than development in a compact centralised pattern. This is also the line of reasoning offered by economists who have written on this issue. Both planners and economists recognise that there are socially beneficial reasons for activity to locate in non-central locations of a metropolitan area. A reasonable position to take is that decentralised 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 fiscalisation of land use influences the amount of retail decentralisation observed in a metropolitan area. A regression analysis uses the real dollar value of retail activity in non-central places as the dependent variable. This is a practical choice because excessive retail sales activity, and the 'big-box' and/or 'strip-mall' ways in which it generally occurs in US suburbs, represents much of what planners and the public perceive as sprawl. Suburban retail activity that is greater than warranted by economic factors also coincides with other rudiments of how sprawl has been defined: a lower density of development in the metropolitan area's central places; greater possible leapfrog development at the urban fringe; greater auto reliance for retail shopping; and, 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).

3. 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 summarised in DiPasquale and Wheaton (1996) and O'Sullivan (2000), economic theory predicts that a profit-maximising retail firm chooses a location in a metropolitan area based upon the location of its customers, transport 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 locate primarily 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.

Between 1950 and 1990, the proportion of the US metropolitan population living in central cities fell from 64 to 38 per cent. The fraction of metropolitan retail employment in US central cities accordingly fell from about two-thirds in 1950 to a little less than one-half in 1990. This suburbanisation 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 transport costs

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which reduced ties to a central shopping location.[1]

In a review of the economic thinking on the causes of metropolitan suburbanisation, Miezkowski and Mills (1993) find valuable insights offered by both the natural evolution and fiscal/social approaches. The natural evolution approach emphasises the significance of income, population, transport, and technological changes in determining the degree of decentralisation in a metropolitan area. The fiscal/social approach is a generalisation of Tiebout's (1956) model of 'voting with one's feet' and points to increased suburbanisation as partially the result of citizens' desires to form and fund more homogeneous 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. The fiscal/social approach is particularly relevant when considering how local revenue reliance could generate retail decentralisation.

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 state-wide reliance on a municipal revenue instrument that generates a local fiscal surplus through greater local retail activity may generate greater retail decentralisation. 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 excessive retail activity from the central places where historically it had been located.[2]

Other researchers have also recognised that local fiscal factors can contribute to the generation of urban decentralisation. Harvey and Clark (1965) assert that local reliance on property taxation discourages the designation 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) popularised the use of the phrase 'fiscalisation 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 complementary 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 decentralisation 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 a US urban area. Using 1970 data and relying on traditional urban theory, they regressed the census-defined size in square miles of the 40 largest urbanised areas in the US against the

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urbanised 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 state-wide measures of municipal revenue reliance in a regression designed to explain retail activity in non-central places in western US 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.

4. Metropolitan Retail Decentralisation in the Western US

An empirical study of the degree of metropolitan retail decentralisation 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 US, less the 7 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 6 of the 8 states defined as western enacted state-wide 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, the state legislature took similar steps. (Sokolow (2000) offers a comprehensive survey of property-tax limitation in the western US. See Chapman (1998) for a summary of the local public finance consequences of California's 1978 passage of Proposition 13.) These restrictions, which Sokolow (2000) classifies as harsher than in any other region in the US, offer natural experiments by which to test the influence of changes in state-wide municipal fiscal structure on metropolitan retail decentralisation. Furthermore, most metropolitan areas in the western US grew up in an era of rising populations, rising real incomes and declining transport 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.[3]

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).[4] Since the focus of this paper is retail activity in suburban locations, the suburban area within a metropolitan area is the component counties in a MSA or PMSA, less the 'central places' included in the 1990 definition of urbanised areas in a metropolitan area.[5] Central places are considered by the Census to be the dominant employment and residential centres in each urbanised 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 an attempt to account for the polycentric nature of most US metropolitan areas through the use of existing data sources.

Table 2 offers a comparison of the ratio of non-central place retail sales to total metropolitan area retail sales for all 54 metropolitan areas in the sample.[6] The first three data columns in Table 2 illustrate the variation in the degree of retail sales decentralisation across metropolitan areas and within a metropolitan area over time. The last two data columns in Table 2 indicate the percentage change in retail decentralisation for each area, for the periods 1977–87, and 1987–97. The top eight data rows in this table report the averages for each state using the metropolitan area as the unit of observation.

Metropolitan areas in Arizona, on average between 1977 and 1987, experienced a slight 4 per cent decrease in metropolitan retail sales in non-central places. This measure

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Table 1. Urban area definitions for the western US, as of 1990

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

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Table 1. *Continued*

Metropolitan area name	Counties in metropolitan area	Central places (cities) in metropolitan area
Denver CO, PMSA	Adams CO, Arapahoe CO, Denver CO, Douglas CO, Jefferson CO	Denver CO
Fort–Collins–Loveland CO, MSA	Larimer CO	Fort Collins CO
Grand Junction CO, MSA	Mesa CO	Grand Junction CO
Greeley CO, MSA	Weld CO	Greeley CO
Pueblo CO, MSA	Pueblo CO	Pueblo CO
Las Vegas NV & AZ, MSA	Clark NV, Mohave AZ, Nye NV	Las Vegas NV
Reno NV, MSA	Washoe NV	Reno NV
Albuquerque NM, MSA	Bernalillo NM, Sandoval NM, Valencia NM	Albuquerque NM
Las Cruces NM, MSA	Dona Ana NM	Las Cruces NM
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
Salt Lake City–Ogden UT, MSA	Davis UT, Salt Lake UT, Weber UT	Salt Lake City UT, Ogden UT
Bellingham WA, MSA	Whatcom WA	Bellingham WA
Bremerton WA, PMSA	Kitsap WA	Bremerton WA
Olympia WA, PMSA	Thurston WA	Olympia WA
Richland–Kennewick–Pasco WA, MSA	Benton WA, Franklin WA	Kennewick WA, Pasco WA, Richland WA
Seattle–Bellevue–Everett WA, PMSA	Island WA, King WA, Snohomish WA	Auburn WA, Everett WA, Seattle WA
Spokane WA, MSA	Spokane WA	Spokane WA
Tacoma WA, PMSA	Pierce WA	Tacoma WA
Yakima WA, MSA	Yakima WA	Yakima WA

rose to a 45 per cent increase between 1987 and 1997. By contrast, metropolitan areas in Utah on average experienced a 22 per cent increase in the decentralisation of retail activity between 1977 and 1987, and hardly any change between 1987 and 1997. Other than that there is a great deal of variation in the degree of non-central place retail activity occurring in different 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 observed variation.

5. State-wide Local Revenue Choices and Retail Decentralisation

The dependent variable for the empirical study discussed next is the real value of retail sales in non-central places for the 54 metropolitan areas described in the previous section, for the years 1977, 1987 and 1997.[7] The pooling of cross-sectional and time-series data allows for variation in non-central retail sales to occur across metropolitan areas and within an area over time. These data enable a regression test of whether state-wide averages for pertinent forms of own-source

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Table 2. Distribution of retail sales and changes in retail sales for non-central places in metropolitan areas in the western US

	Non-central place retail sales/metro retail sales			Percentage change in non-central place retail sales/metro retail sales	
Metropolitan area name, 1990	1977	1987	1997	1977–87	1987–97
Arizona average for MSAs	0.190	0.180	0.260	−4.28	45.39
California average for (P)MSAs	0.461	0.461	0.477	0.52	4.57
Colorado average for (P)MSAs	0.257	0.258	0.282	0.00	5.99
Nevada average for MSAs	0.423	0.439	0.406	5.71	−8.25
New Mexico average for MSAs	0.140	0.123	0.117	−9.41	−1.54
Oregon average for (P)MSAs	0.412	0.422	0.397	2.30	−3.13
Utah average for MSAs	0.403	0.470	0.492	22.04	−0.69
Washington average for (P)MSAs	0.406	0.420	0.463	1.66	6.75
Phoenix–Mesa AZ, MSA	0.202	0.190	0.238	−5.83	25.31
Tucson AZ, MSA	0.160	0.177	0.216	10.34	22.41
Yuma AZ, MSA	0.209	0.173	0.326	−17.33	88.44
Bakersfield CA, MSA	0.445	0.431	0.436	−3.05	1.09
Chico–Paradise CA, MSA	0.581	0.555	0.343	−4.45	−38.32
Fresno CA, MSA	0.417	0.364	0.412	−12.76	13.24
LA–Long Beach CA, PMSA	0.524	0.557	0.610	6.42	9.38
Merced CA, MSA	0.410	0.383	0.388	−6.73	1.36
Modesta CA, MSA	0.250	0.250	0.355	−0.11	41.74
Oakland CA, PMSA	0.720	0.748	0.808	3.89	8.06
Orange CA, PMSA	0.757	0.773	0.754	2.16	−2.54
Redding CA, MSA	0.272	0.227	0.167	−16.54	−26.41
Riverside–San Bernardino CA, PMSA	0.598	0.691	0.702	15.58	1.59
Sacramento CA, PMSA	0.694	0.722	0.768	4.05	6.41
Salinas CA, MSA	0.394	0.395	0.436	0.26	10.17
San Diego CA, MSA	0.450	0.477	0.467	6.02	−2.18
San Francisco CA, PMSA	0.532	0.555	0.598	4.20	7.79
San Jose CA, PMSA	0.326	0.299	0.261	−8.27	−12.67
SLO–Atasc–Paso Robles CA, MSA	0.436	0.353	0.533	−19.03	50.89
San Barb–Santa Maria–Lom CA, MSA	0.263	0.323	0.285	22.75	−11.82
Santa Cruz–Watsonville CA, PMSA	0.355	0.452	0.553	27.33	22.31
Santa Rosa CA, PMSA	0.446	0.312	0.340	−30.04	8.97
Stockton–Lodi CA, MSA	0.330	0.289	0.375	−12.34	29.57
Vallejo–Fairfield–Napa CA, PMSA	0.133	0.193	0.176	44.72	−8.61
Visalia–Tulare–Porterville CA, MSA	0.691	0.689	0.693	−0.27	0.58
Ventura CA, PMSA	0.760	0.761	0.807	0.14	6.02
Yolo CA, PMSA	0.280	0.248	0.288	−11.35	16.13
Yuba City CA, MSA	na	0.466	0.379	na	−18.65
Boulder–Longmount CO, PMSA	0.225	0.211	0.204	−6.10	−3.60
Colorado Springs CO, MSA	0.097	0.080	0.069	−17.13	−14.08
Denver CO, PMSA	0.632	0.711	0.735	12.41	3.45
Fort Collins–Loveland CO, MSA	0.401	0.361	0.411	−10.15	14.00
Grand Junction CO, MSA	0.105	0.156	0.162	49.19	3.85
Greeley CO, MSA	0.271	0.222	0.338	−18.21	52.30
Pueblo CO, MSA	0.069	0.063	0.054	−9.99	−13.99
Las Vegas NV & AZ, MSA	0.607	0.617	0.576	1.72	−6.75
Reno NV, MSA	0.238	0.261	0.236	9.71	−9.75
Albuquerque NM, MSA	0.154	0.117	0.168	−24.10	43.84
Las Cruces NM, MSA	0.098	0.104	0.098	6.84	−6.24
Santa Fe NM, MSA	0.167	0.149	0.086	−10.98	−42.23
Eugene–Springfield OR, MSA	0.362	0.212	0.235	−41.42	10.85

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Table 2. *Continued*

Metropolitan area name, 1990	Non-central place retail sales/metro retail sales			Percentage change in non-central place retail sales/metro retail sales	
	1977	1987	1997	1977–87	1987–97
Medford–Ashland OR, MSA	0.308	0.438	0.370	42.31	−15.54
Portland–Vancouver OR, PMSA	0.593	0.670	0.612	12.98	−8.67
Salem OR, PMSA	0.386	0.368	0.371	−4.68	0.86
Provo–Orem UT, MSA	0.249	0.338	0.273	35.96	−19.33
Salt Lake City–Ogden UT, MSA	0.557	0.603	0.711	8.12	17.94
Bellingham WA, MSA	0.309	0.325	0.327	5.29	0.33
Bremerton WA, PMSA	0.400	0.597	0.731	49.09	22.39
Olympia WA, PMSA	0.450	0.407	0.472	−9.71	16.14
Richland–Kennewick–Pasco WA, MSA	0.344	0.139	0.097	−59.44	−30.51
Seattle–Bellevue–Everett WA, PMSA	0.541	0.626	0.663	15.68	5.94
Spokane WA, MSA	0.339	0.326	0.420	−3.71	28.91
Tacoma WA, PMSA	0.490	0.535	0.601	9.25	12.31
Yakima WA, MSA	0.375	0.401	0.395	6.81	−1.48

municipal revenue reliance exert 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 increase. Suburban retail activity may be slowed by a higher acquisition price for agricultural land upon which to build new retail centres. The availability of transport options can also influence where people in a metropolitan area shop. These four factors (population, income, price of agricultural land and transport options) are what Brueckner and Fansler expect to influence the size of an urbanised area.[8] With the exception of proxies for transport options, the model of suburban retail sales used here also relies on these same causal factors. Metropolitan transport options are excluded for two reasons: demographics, population and income largely determine the transport options available in a metropolitan area; and, the influence of transport options on suburban retail activity is not the focus of this investigation.[9] Further refinement of Brueckner and Fansler's model of urban size is necessary to assess accurately 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 non-central places, the 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

$$\text{Retail sales}_{i,t} = f(Income_{i,t}, Population_{i,t}, Previous\ decade's\ population\ growth_{i,t}, Presence\ of\ the\ urban\ containment\ policy_{i,t}, Price\ of\ agricultural\ land_{i,t}, Percentage\ population\ less\ than\ age\ 18_{i,t}, Percentage\ population\ greater\ than\ age\ 64_{i,t}, Percentage\ state\text{-}wide\ discretionary\ municipal\ revenue\ from\ property\ taxes_{i,t}, Percentage\ state\text{-}wide\ discretionary\ municipal\ revenue\ from\ general\ sales\ taxes_{i,t}, Percentage\ state\text{-}wide\ discretionary\ municipal\ revenue\ from\ other\ taxes_{i,t})$$

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

The degree of state-wide 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, sales taxes, other taxes and user charges/special assessments.[10] The chosen term discretionary also refers to the fact that if a state-wide policy were instituted to reduce percentage reliance on one of these local revenue instruments, the percentage reliance on the others would be likely to have to increase. Only three of the four discretionary revenue sources are accounted for in the regression model because the third, *Percentage state-wide discretionary municipal revenue from charges*, equals 100 per cent less the sum of the included three.

As widely documented, municipalities and unincorporated areas of counties in the US regulate local land uses with an eye on the fiscal bottom-line.[11] Municipal and county governments in the US also use local incentives to attract desirable land uses within their boundaries.[12] 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 state-wide 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 it will be that local officials zone for retail land uses and use local incentives to encourage it. Kotin and Peiser (1997), in their study of the fiscal benefits that retailers offer cities in California, include local sales taxes, property taxes and business licence 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 US *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 are excluded from the regression model.

The census classifies municipal taxes in the forms of property, sales, individual income, corporate income, motor vehicle licence, and other taxes. None of the eight western states under consideration here allows local personal or corporate income taxes. All other forms of local taxation, except motor vehicle taxes, are accounted for in the regression analysis because they offer the potential for a local suburban government to benefit from a fiscal surplus gained through the attraction of greater retail activity within its boundaries.[13]

Brueckner and Kim (2000) have theoretically shown that the expected influence of greater local reliance on property taxation on urban decentralisation 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

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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.[14]

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, Lewis and Barbour (1999) found 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, that 'new sales tax revenues' always finished first or second in terms of the position most often given. Interestingly, only the 36 central-city officials in the sample ranked sales tax considerations consistently lower. The lure of collecting other taxes, like a licence 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. Likewise, suburban areas with a higher percentage of senior citizens or families with children are likely to exhibit different retail consumption patterns; however, the directions of these influences are uncertain.[15]

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, for how long has it been in existence. UCPs are commonly referred to as urban growth boundaries and are designed to slow the degree of decentralisation 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 a metropolitan area.

The regression accounts for the three different types of UCP catalogued 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 centre. The second type is 'open-region containment'. It is also metropolitan-wide, does nothing explicitly to preserve open space at the fringe, but does endeavour to shift development back to the centre 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 only to preserve limited land outside some jurisdictional boundaries and does nothing to shift development occurring outside 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 given 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.

The high level of variation in own-source municipal revenue reliance across states and across time is indicated by the values recorded in Table 4. For instance, on average between 1977 and 1997, municipal governments in New Mexico drew only 22.4 per

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Table 3. Year that a type of urban containment policy (UCP) began in a 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		

cent of their discretionary local revenue from property taxation. The comparable figure for municipal governments in Oregon was 52.6 per cent. For general sales taxation over the same 20-year period, municipal governments in Oregon relied on it for none of their own-source revenue, while municipal governments in Colorado gained 41.1 per cent 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 per cent of discretionary revenue from property taxation; by 1997, this value had fallen to 25.7 per cent. General sales taxation totalled 12.1 per cent of New Mexico's own-source municipal revenue in 1977; by 1997, it had risen to 37.0 per cent. Nevada municipalities relied on other taxes for 22.9 per cent of their discretionary revenue in 1977; by 1997, this figure had fallen to 15.0 per cent.

The top of Table 5 lists the mean and standard deviation of the regression's dependent variable in millions of dollars. The same descriptive statistics are given for each of the explanatory variables in the table's first data column. The non-central-place values of median household income and population are calculated from the US Department of Housing and Urban Development's *State of the Cities Data System*.[16] 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 US Census *City and County Databook* offer the data necessary to calculate the desired measures of metropolitan age distribution. Interpolation yields the

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Table 4. Percentage of state-wide discretionary municipal revenue from component sources for western US states

Year and state	Percentage of state-wide discretionary municipal revenue from			
	Property taxes	General sales taxes	Other taxes	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

1977 and 1987 values, while extrapolation results in the values for 1997. A suitable 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 US *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 to be 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 (see Kennedy (1992, pp. 222–223) for a further description of these possibilities). 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 54 specific metropolitan locations

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Table 5. Descriptive statistics and regression results using real value metropolitan retail sales ($ millions) in non-central places as dependent variable (dependent variable's mean (standard deviation): $3844.12 ($7017.49))

Explanatory variables	Mean (standard deviation)	Ordinary least squares	Fixed-effect ordinary least squares[a]
Constant		−1 853.64	*not reported*
		(1 966.63)	
1987 year dummy		−713.90**	−255.37
		(365.06)	(204.05)
1997 year dummy		−1 341.80***	−184.95
		(514.26)	(288.14)
Real value median household income in non-central places ($)	41 808	**0.598**	
	(8 543)	0.055***	−0.006
		(0.014)	(0.019)
Population in non-central places	453 085	**1.061**	**0.825**
	(730 899)	0.009**	0.007***
		(0.001)	(0.001)
Previous 10-year percentage growth in non-central places	28.99	**−0.090**	
	(19.01)	−11.97**	−0.847
		(5.71)	(3.737)
Dummy if closed-region urban containment in place	0.099		
	(0.300)	662.87	1 031.15***
		(625.23)	(374.84)
Years that closed-region urban containment in place	0.894		**−0.021**
	(3.152)	−42.85	−89.53**
		(59.47)	(35.41)
Dummy if isolated urban containment in place	0.130		
	(0.338)	19.31	122.22
		(485.40)	(145.03)
Years that isolated urban containment in place	1.354		
	(4.297)	−0.538	−9.50
		(38.04)	(9.38)
Dummy if open-region urban containment in place	0.019		
	(0.136)	−92.33	−306.18
		(1 544.92)	(239.90)

Years that open-region urban containment in place	0.174 (1.421)	39.11 (145.43)	**0.003** 72.79*** (23.20)
Real value agriculture products in metro area per acre in agriculture ($)	860.85 (891.76)	0.068 (0.114)	**− 0.135** − 0.601*** (0.203)
Percentage population in non-central places than age 18	29.16 (6.43)	8.23 (17.39)	0.727 (16.82)
Percentage population in non-central places greater than age 64	10.80 (3.10)	51.16 (40.01)	**0.288** 102.73** (40.79)
Percentage state-wide discretionary municipal revenue from property taxes	29.14 (10.45)	− 15.99 (25.59)	17.92 (20.57)
Percentage state-wide discretionary municipal revenue from general sales taxes	23.47 (11.36)	− 4.48 (22.70)	**0.242** 39.60** (17.49)
Percentage state-wide discretionary municipal revenue from other taxes	10.03 (4.02)	− 10.91 (39.66)	**0.282** 107.94** (45.28)
Observations	161	161	161
R^2 statistic		0.976	0.995
Adjusted R^2 statistic		0.973	0.992
F-test statistic			7.022***
Lagrange multiplier test statistic			36.81***
White heteroscedasticity corrected		yes	yes

[a]Also includes dummy variables for each of the 54 metropolitan areas included in sample of non-central places. The regression coefficients for these area dummies are not reported here, but are available from author on request.

***indicates statiscally significant in two-tailed test at greater than 99 per cent confidence; **indicates 91 to 99 per cent confidence.

Significant elasticities calculated from means in bold.

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in the sample. A final option is to do nothing to account for specific area effects. The regression results recorded in Table 5 include two of these possibilities and the results of statistical tests that indicate which is preferred.[17]

6. Regression Findings

The second column of numbers in Table 5 is the ordinary least squares (OLS) result and includes no attempt to calculate a constant intercept term for each metropolitan area. These results, and the fixed-effect regression results next to them that include a separate constant term for each of the 54 metropolitan areas, use White's method of adjusting the regression coefficient's standard errors for possible heteroscedastic bias from an unknown source.[18] The regression entries in Table 5 first contain, in bold, the mean elasticity values for the statistically significant regression coefficients. Below these are the actual regression coefficients and, in parenthesis, the coefficient's standard errors.[19] 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 exerts a significant influence on retail sales. The statistical significance of the Lagrange multiplier statistic, also at the bottom of Table 5, indicates that the use of the fixed- or-random-effect model is preferred to simple ordinary least squares. A Hausman statistic, which indicates whether the random-effect model is preferred to the fixed-effect model, could not be calculated due to correlation between the calculated random-effect errors and the random-effect regressors. Such correlation is likely to bias the regression coefficients in the random-effect model. Based upon these test statistics, the preferred results are from the fixed-effect regression model. The ordinary least squares regression results are provided to show the difference in magnitude and statistical significance of regression coefficients after area-specific effects are appropriately controlled for.

As expected, non-central-place population exerts a significant influence on non-central-place retail sales. In the fixed-effect model, a 1 per cent increase in suburban population from its mean results in about a 0.83 per cent increase 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 US metropolitan areas recorded a slightly larger 1.1 per cent increase in urbanised land area for a 1 per cent increase in urbanised population. Notice that this is the same as the population elasticity of non-central retail sales recorded in the OLS regression in Table 5.

In the fixed-effect regression, household income exerted no statistically significant influence on real retail sales. However, in the OLS regression, an increase in suburban household income did result in a statistically significant increase in suburban retail sales.[20] Another significant influence in the fixed-effect regression, that is non-fiscal in nature, is that a 1 per cent increase in the price per acre of agricultural land in the metropolitan area resulted in about a 0.14 per cent decrease in real retail sales. This is the expected effect of higher prices for suburban land slowing down suburban retail expansion.[21] Brueckner and Fansler (1983) record a higher elasticity of −0.20 for a similar explanatory variable's effect on the size of the urbanised land area, but recall this came from a regression analysis using a single cross-section and no controls for fixed effects. In addition, a 1 per cent increase in the percentage of the non-central population over age 64 yields about a 0.29 per cent increase in non-central retail sales.

Particularly notable are the six 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 $1 billion more retail activity in the metropolitan area's non-central places. But this effect should not be observed in

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isolation, for the fixed-effect regression also reveals that, for every year that closed-region containment is in place, the real value of retail activity in non-central places (holding other causal factors constant) fell by about $90 million. Although this yearly decrease is not large relative to the average real value of non-central retail activity of $3.8 billion, after 20 years of closed-region urban containment, the resulting $1.8 billion reduction in non-central retail sales is a sizeable amount.

The fixed-effect regression indicates 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 1031 by 90) it begins to have less. These findings are as expected if regions with greater sprawl are more likely to adopt closed-region containment and over time this policy reduces decentralisation. The increased effect over time is likely to be 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 real retail activity in non-central places.

The positive regression coefficient on the variable representing the number of years that open-region urban containment has been in place in the metropolitan area 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 drawn boundaries. The adoption of such a policy in the San Luis Obispo–Atascadero–Paso Robles and Santa Fe metropolitan areas was likely to have been a response to a belief that sprawl is coming 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 decentralisation 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 decentralisation that was anticipated in the earlier adoption of this ineffective policy.

Regression coefficients of equal interest are the ones relating to how state-wide measures of reliance on various forms of own-source municipal revenue affect non-central retail sales. In the fixed-effect regression, the percentage of state-wide own-source municipal revenue from property taxes exerted no statistically significant influence on the value of real non-central retail sales. Although the simulation finding of Brueckner and Kim (2000), and the additional motivation of suburbs seeking fiscal surplus, indicate an expected positive influence, there is also the possibility that property tax reliance discourages capital consumption, promotes greater density and reduces retail decentralisation. These offsetting occurrences could be the reason for the insignificant influence that this variable exerts on non-central retail sales.

Alternatively, the percentage of state-wide discretionary municipal revenue from general sales taxation exerted a significant positive influence on non-central retail activity. For every 1 per cent increase in sales tax reliance, real retail sales in non-central metropolitan places in the West rose by 0.24 per cent. State-wide reliance on other taxes, which includes various types of business taxes and franchise/licence fees, also yielded a significant influence. For every 1 per cent increase in reliance on these other forms of local taxation, real retail sales in non-central places rose by 0.28 per cent.[22]

7. Implications

The regression findings in Table 5 confirm the *a priori* 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 US. The regression analysis also generated evidence in support of the fiscalisation of land use for retail activity and that over time the most restrictive form of an urban growth boundary reduces the de-

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centralisation of retail sales in metropolitan areas. 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 incomes warrant; this paper has shown that two forms of local government revenue reliance contribute to a greater amount of it.

Looking over the data offered in Table 4, New Mexico emerges as one of only two western states where discretionary municipal revenue reliance on sales taxation increased between 1977 and 1997. In 1977, municipalities in New Mexico drew 12.1 per cent of their local discretionary revenue from general sales taxation; by 1997, this measure had increased to 37.0 per cent. In 1977, New Mexico municipalities concurrently gained 8.7 per cent of their discretionary revenue from other taxation; by 1997, this measure had fallen to 2.0 per cent. Over the same period, this state's municipal reliance on property taxes decreased and reliance on charges increased. As the regression indicated, these changes in property tax and charge reliance should exert no significant influence on non-central retail activity. The increase in general tax reliance is expected to have contributed to further non-central retail activity, while the decrease in other tax reliance decreased it.

A simulation based on the regression findings indicate that New Mexico's 206 per cent increase in reliance in local sales taxation resulted in about a 50 per cent increase in the dollar value of retail activity occurring in New Mexico's non-central metropolitan places.[23] Also, New Mexico's 69 per cent decrease in other tax reliance resulted in about a 20 per cent decrease in non-central retail activity. The expected end-result of these discretionary revenue changes is approximately 30 per cent more non-central retail activity in New Mexico's metropolitan areas than would have occurred without it.

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 state-wide reliance on general sales taxation as a source of discretionary revenue and instead replace it with greater local property taxation or charges. However, such a lesson needs to be tempered by the reality that most voters in the US prefer sales taxation to alternate forms of raising local revenue and the clear movement in the US is away from property taxation.[24] The real connection between retail sprawl and local sales taxation comes from the local retention of a portion of the general 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 practical 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 fiscalisation of land use demonstrated here could be slowed if this portion was large enough to reduce the current fiscal surplus that communities enjoy by favouring retail in local land-use decisions. The Sacramento region is currently considering the adoption of such a scheme through California state legislation (Assembly Bill 680, 2001), but the route to passage has proved thorny.[25] The political reality is that some jurisdictions have grown accustomed to the fiscal surplus generated by local land policies that favour retail activity and loathe losing it.

Avenues for future research on this topic include an expansion of the data-set to include other metropolitan areas in the US. Perhaps the influence of state-wide local fiscal structure is greater in the previously less developed and more quickly developing West than in the rest of the US. It would also be valuable to break the level of retail activity observed in non-central metropolitan places into less aggregated categories. If retail decentralisation is measured in terms of non-central sales of big-box items, the effects of state-wide reliance on various forms of local revenue on retail decentralisation may

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even be greater. As a final point, as done in Brueckner and Fansler (1983), it would be interesting to use the Census collected square miles in the urbanised area as the dependent variable in a regression study and check if state-wide local fiscal structure and the presence of urban growth boundaries exert similar influences on the geographical size of a metropolitan area.

Notes

1. Lang (2000) also writes about the declining percentage of metropolitan office space in US central cities and refers to it as 'office sprawl'. In 1979, 74 per cent of US office space was in central cities, by 1999 the central-city share of office space had dropped to 58 per cent.
2. This is a restatement of the most stringent hypothesis that Lewis and Barbour (1999) believe must hold in order to prove empirically that the fiscalisation of land use is occurring.
3. The largest central cities in each of these excluded states only had 1992 populations of 136 000, 84 000, and 52 000 respectively.
4. 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.
5. This approach should be considered conservative in regard to defining excessive decentralisation because many would consider the location of retail activity in a place not considered a central place in 1977 and 1987, but classified as such in 1990, as sprawl.
6. Information on the dollar amount of retail activity in metropolitan areas comes from the 1977, 1987 and 1997 US *Census of Retail Trade*.
7. An alternate dependent variable would be the percentage of retail sales in a metropolitan area occurring in its non-central places (i.e. the values in the first three data columns of Table 1). A model of what determines this percentage contains the same explanatory variables as included in the model below, but some of the explanatory variables (population, household income and demographics) would need to be in percentage form (non-central value relative to total value in the metropolitan area). Such a regression specification was tried and the results offered low overall explanatory power (R^2) and little statistical significance of specific explanatory variables. As described next, using total retail sales in non-central places as the dependent variable lends itself to more direct modelling and the resulting regression analysis offers quite different results.
8. 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).
9. If metropolitan transport options were included as explanatory variables in the regression analysis, they would need to be considered simultaneously determined and appropriately modelled. 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) never to be statistically significant factors in explaining the size of an urbanised area.
10. In 1997, these 4 sources of local revenue accounted, on average, for nearly 50 per cent of the total local revenue collected in the western states in the sample. State-wide average reliance on local revenue reliance, rather than metropolitan-wide averages or local reliance, is used to ensure the exogenous nature of these explanatory variables to each metropolitan area. Since pertinent land-use decisions are made in the unincorporated portions of US counties, state-wide municipal revenue reliance is intended also to proxy for the average reliance that counties in a state have upon these forms of local revenue.
11. Fischel's (1985) book on *The Economics of Zoning Laws*, especially ch. 14, offers an excellent introduction to zoning in the US 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 US.
12. See Bartik (1991) and Anderson and Wassmer (2000) for book-length descriptions of the use and influence of local economic development incentives in the US. Lewis and Barbour (1999, pp. 73–74) describe the specific forms of local incentives that are available to local governments in California.
13. Business taxes and franchise/licence fees are included in the explanatory variable category of *Percentage state-wide discretionary municipal revenue from other taxes*. In most states, revenue from businesses makes 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 account separately for business-related fees because distinct business values are not given.

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14. 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.
15. 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.
16. Available at: http://webstage1.aspensys.com/SOCDS/SOCDS_Home.htm.
17. There is also the specification issue of whether a log-linear functional form is more appropriate than the linear form used here. 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 final decision to use the linear form recorded in Table 5.
18. See Kennedy (1992, ch. 8) for a description of what heteroscedasticity is and the problems it presents for regression analysis. White's method of correction is described on p. 130.
19. The regressions use only 161 of the possible 162 observation (54 areas over 3 areas) because the Yuba City CA, MSA was not in existence in 1977 and hence explanatory data could not be gathered for it.
20. The non-significance of the income coefficient in the fixed-effect regression may be due to the fact that 1997 income values are extrapolated. To test this hypothesis, the fixed-effect regression was rerun using only the 1977 and 1987 samples and again the regression coefficient on median household income was statistically insignificant; thus the basis for the decision to use the full sample.
21. The negative impact of higher agricultural prices on slowing retail decentralisation is only expected if the price of urban land in a metropolitan area is held constant. In the regression methodology used here, there is no measure of urban land price and thus it is not directly held constant—although there are dummy explanatory variables that control for the fixed year and metropolitan area effects and these could conceivably serve the purpose of controlling for differences in urban land prices across metropolitan areas.
22. To measure the independent influence of *Percentage state-wide discretionary municipal revenue from charges* on non-central activity, this category replaced the general sales tax category in another fixed-effect regression run. The result 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.
23. The 206 per cent increase in sales tax reliance comes from taking the 1997 reliance of 14.6 per cent, subtracting it from 34.3 per cent, and dividing by 14.6 per cent. The 50 per cent increase in non-central retail activity then is calculated by taking the 206 per cent increase in sales tax reliance and multiplying it by the sales tax elasticity of non-central retail sales (0.242) recorded in Table 5.
24. For a poll supporting this, see the Advisory Council on Intergovernmental Relations (1987).
25. See Johnson (2000). California State Senator Dede Alpert, in support of an earlier 2000 bill that failed, but would have distributed new local sales tax revenue in all California counties 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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