The Connection between Local Government Finance and the Generation of Urban Sprawl in California

By

Robert W. Wassmer

Graduate Program in Public Policy and Administration
California State University, Sacramento
6000 J Street
Sacramento, CA 95819
Tel: (916) 457-4765

rwassme@csus.edu
http://www.csus.edu/indiv/w/wassmerr

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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. Wassmer earned his doctorate in economics from Michigan State University in 1989. He previously taught at Wayne State University and Eastern Michigan University. For the 2000-2001 academic year he is serving as a visiting consultant to the California Senate Office of Research. Professor Wassmer's research and teaching interests are in policy-orientated microeconomic analysis, state and local public finance, and urban economics. He has authored over 20 published articles on these subjects 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). As the coordinator of the system-wide California State University Faculty Research Fellows Program, he also manages a group of academic public policy consultants to the state of California. In the fall of 2000, he received the President's Award for Research and Creative Activity from Sacramento State. Visit his web site at www.csus.edu/indiv/w/wassmerr .

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EXECUTIVE SUMMARY

Legislatures throughout the country continue to examine the issue of urban sprawl and options to mitigate its effect on quality of life in the U.S. metropolitan areas. In California, the Legislature has convened a "Smart Growth" caucus and a local government finance conference committee. Both of these efforts seek to recommend policy for California State government to protect and promote "livable cities" with sensible planning and financing strategies. To assist in this effort, this Faculty Research Fellows report addresses the following general questions.

- How do metropolitan development patterns in California compare with other metropolitan areas in the United States?

- How do these metropolitan development patterns vary within the state of California?

- Has the system of local government finance in California, adopted after the 1978 passage of Proposition 13 and which minimizes local reliance on property taxes and maximizes reliance on site based local sales taxes, contributed to land use decisions in the state that have aggravated urban sprawl?

Specifically, these questions are addressed in two separate reports. The first report, *An Economist's Perspective on Urban Sprawl: With an Application to Metropolitan Areas in California and the American West*, offers a background on the origin and meaning of the term urban sprawl, provides an economic interpretation of the term, and then lists comparative data on the degree of sprawl in metropolitan areas in California and other western states. The second report; *Retail Sprawl, Urban Containment, and the "Fiscalization" of Land Use in the Western United States*, specifically looks at the influence that California and other western state's systems of local government finance exert on the degree of retail urban sprawl in these state's metropolitan areas. Summaries of both of these reports follow.

I.

An Economist's Perspective on Urban Sprawl: With an Application to Metropolitan Areas in California and the American West

Background

For more than sixty years, urban planners have used the catch phrase of "urban sprawl" to categorize much of what people dislike about suburban life in metropolitan areas. In the early 1990s, the term urban sprawl grew to common usage by the public and is now a policy concern that is debated at both the national and state level. In California, where the U.S. Census Bureau anticipates that population will grow from 32.5 million in 2000 to 49.3 million in 2025, the question of how to accommodate a greater than 50 percent increase in population in 25 years is widely asked. How pleasant will it be to live and work in

California's metropolitan areas if a majority of this growth occurs at low density at the fringe of current metropolitan areas?

The purpose of this report is to offer a better understanding of urban sprawl in California. First, an economic way of thinking about urban sprawl is presented. Then the previous planning and popular literature is examined to derive a consensus on ways to quantify the degree of urban sprawl in a metropolitan area given the available data. Values for these measures are provided for urbanized and metropolitan regions in California, and for similar regions throughout the western United States. Some conclusions are drawn from this data and a policy course for dealing with sprawl in California is suggested.

In its broadest sense, urban sprawl is just another word for "excessive" metropolitan decentralization or suburbanization. According to economists, the least value-laden way to do determine when suburbanization has become excessive is when further decentralization imposes greater total costs on everyone in the metropolitan area than if the development had remained more centralized.

To an economist, urban sprawl results from thousands of individual choices. In effect, the negative outcomes attributed to urban sprawl can be thought of as the summation of the many public costs that individuals and businesses have chosen to ignore when deciding upon a location at the urban fringe.

Some social activists have chosen to conceptualize excessive suburbanization in a way that they are certain that the total costs of a described form of suburbanization are greater than the total benefits. These include low density, scattered, and/or dispersed development; the separation of where people live from where they work; and a lack of functional open space. These characteristics, along with the concept of excessive decentralization that occurs over time and measured in a relative sense, are what are relied on here to define ways of determining the degree of sprawl in urban areas in California and other western states.

Measuring Urban Sprawl in California and the Western United States

The unit of analysis used in this study is the urbanized and metropolitan areas in the states of Arizona, California, Colorado, Nevada, New Mexico, Oregon, Washington, and Utah. Specific findings are highlighted below:

- Central places are the dominant employment and residential centers in an urbanized area. In 1970, 54 percent of the U.S. population living in urbanized areas chose to live in their central places. By 1990, this percentage had fallen to 50 percent. In 1970, 41 percent of the land in U.S. urban areas was located in its central places; by 1990, this percentage had fallen to 39 percent. This indicates a slight increase in urban sprawl throughout the entire United States over this period.

- Alternatively, between 1970 and 1990, 13 of California's 25 urbanized areas (Antioch, Los Angeles, Oxnard, Palm Springs, Riverside, Sacramento, Salinas, San Diego, Santa

Barbara, Santa Cruz, Santa Rosa, Seaside, and Simi Valley) experienced a decrease in both the percentages of population and land area in central places (or more sprawl).

- In California, average metropolitan growth in urban fringe land between 1980 and 1990 was twice as great as growth in urbanized population. Though this statewide metropolitan average masks significant variation among California's metropolitan areas.

- Metropolitan land devoted to farming is the only widely available measure of how much open space exists in a metropolitan area. Between 1987 and 1997, the average percentage of a California metropolitan area's land devoted to farming fell by about 9.4 percent. But farmland losses in specific metropolitan areas varied from respective -53 and -46 percent declines in Los Angeles and Orange, to respective 29 and 12 percent farmland gains in Santa Cruz and Salinas.

- In both 1990 and 1998, nearly the same percentages of the state of California's metropolitan populations were living in central places. For Colorado, Oregon, Utah, and Washington, over the same period, smaller percentages were living in central places.

- For California, between 1990 and 1998, the Oakland metropolitan area led in central-place population loss with nearly a 10 percent decline in the percentage of metropolitan residents living in the cities of Alameda, Oakland, or Berkeley.

- A smaller percentage of total metropolitan retail activity in central places represents a greater degree of sprawl in an urban area. The Chico metropolitan area experienced the greatest increase in the degree of retail activity occurring at its core (57 percent), while Santa Cruz experienced the greatest decrease (-31 percent).

- The metropolitan averages calculated for California indicate that the state always falls somewhere in the middle of other western states in terms of degree of sprawl. This is likely due to the sheer size of California and the fact that it contains nearly half of the total metropolitan areas in the West. That said; there are clear indicators that some of California's metropolitan areas are more sprawled.

- By this accounting, Fresno, Los Angeles, Riverside, Merced, Sacramento, Oakland, San Francisco, San Luis Obispo, and Stockton have experienced the greatest increases in urban sprawl during the 1990s.

- The picture that emerges concerning the degree of urban sprawl in California (relative to other western states) is somewhat mixed, but definitely points to a comparably high degree of decentralization, and continuing decentralization in some of California's urban regions.

Conclusions and Policy Options

Whatever the form of data used to identify urban sprawl, analysts can learn from the economist's method of defining excessive suburbanization. If a type of suburbanization

generates more private and social costs, than it does private and social benefits, then an economist would consider it excessive. In reality, the exact measurement of all the costs and benefits associated with a type of suburbanization is difficult, if not impossible. No matter, if policymakers keep in mind the fact that all forms of suburbanization yields benefits and costs, they can eliminate from consideration many of the purely value-laden and one-sided discussions that this issue has been relegated to for so long.

Population growth in California appears inevitable, but in many respects, the state should not fear it. What the state does need to fear is growth that is allowed to proceed in a manner that fails to maximize the benefits to be derived from it, and fails to minimize the costs that can arise from it. Public policymakers can advocate and institute approaches designed to steer California's growth in a manner that maximizes the benefits to be derived from it, while minimizing the costs. Getting people or businesses to consider the social consequences of their location choices offers a reason for government to incentivize the intra-metropolitan location decisions of individuals and firms. This economic solution by no means calls for a complete ban on where people and businesses locate, only that they take into consideration the social costs imposed upon others when choosing urban fringe locations.

Since the social benefits and costs of intra-metropolitan location decisions extend beyond city and county borders, a regional strategy is necessary. Metropolitan areas in California, like most throughout the United States, lack a binding regional governance structure. With little prospect of such being established in the near future, state government or coalitions of county governments in a region, are the appropriate arenas in which a discussion should be convened to consider directing reinvestment into more centralized locations. Perhaps the optimal role for the state of California would be to provide incentives for the creation of metropolitan-wide collaborative bodies (where they do not already exist) throughout the state that could approach this issue with appropriate solutions tailored to region-specific needs.

II.

Retail Sprawl, Urban Containment, and the "Fiscalization" of Land Use in the Western United States

Background

The term "urban sprawl" is widely used in the United States by planners and the public as a pejorative label for undesirable urban land use patterns. Economists underscore that the metropolitan decentralization of people and economic activity is driven by population increases, real income increases, and decreases in the cost of automobile transportation. To most economists, metropolitan decentralization only represents an "undesirable urban land use pattern" if the total costs generated by it exceed the total benefits,

Conversely, some policy analysts point out that a purely market-based approach to defining and correcting urban sprawl ignores the institutional environment in which

economic actors in a metropolitan area make land use decisions. These analysts highlight the fact that state and federal regulations, including state imposed ways of raising local revenue, influence local land use decisions in the United States, and can generate urban sprawl. In this report, this recognition is taken a step further by performing an empirical test of the relevance of a state's system of local government finance to the generation of retail urban sprawl.

In addition, urban growth boundaries and other forms of metropolitan-wide containment are used in some metropolitan areas in the western United States to slow the spread of activity into non-central places. The statistical analysis within this report measures the possible influence that the presence of these policies can have on reducing retail urban sprawl.

As a complete reading of this report demonstrates, statewide reliance by municipalities on some forms of own-source revenue exert a significant positive influence on the degree of retail decentralization in metropolitan areas in the western United States over the period 1977 to 1997. The continuing presence of certain forms of urban containment policies also reduces the degree of retail decentralization.

The full report is laid out in the following manner. First, the general concept of urban retail sprawl is examined. Second, a brief review of the previous literature on the location of retail activity in a metropolitan area is offered and reasons offered why the way that municipal governments raise revenue in a state can influence the intra-metropolitan location of retail activity in that state. Third, there is a description of differences in the degree of retail decentralization in 54 metropolitan areas in the western portion of the United States for the years 1977, 1987, and 1997. Fourth, there is an empirical test that is used to determine if urban containment policies and statewide averages for municipal revenue reliance exert an influence on the location of retail activity in a metropolitan area. Finally, the policy implications of this research are in the concluding section.

Urban Retail Sprawl

The inherent difficulty in performing an empirical examination of urban sprawl is that it is not easily quantifiable. Planning experts may know sprawl when they see it, but such a normative identification does not easily lend itself to an objective measure of the degree of sprawl in an urban area. Fortunately, a few researchers have recognized this shortcoming and developed a list of land use characteristics that are most often associated with what planners and the public usually regards as urban sprawl:

- low-density, strip, scattered, and leapfrog development;
- "non-compact" development;
- unlimited outward extension of new development, low-density developments in new areas, and transportation dominance by private automobiles;
- best to consider it as a matter of degree.

Given this background, the amount of retail activity in non-central places is used as a surrogate for the degree of sprawl in a metropolitan area. Non-central retail activity is considered retail urban sprawl only if it is greater than justified by economic factors.

The Location of Retail Activity in a Metropolitan Area

Economic theory predicts that a retail firm chooses a location in a metropolitan area based upon the location of its customers, transportation costs, agglomeration economies, and the degree of scale economies in retail production. The natural evolution approach to causes of retail decentralization emphasizes the significance of income, population, transportation, and technological changes to determining the degree of decentralization in a metropolitan area. The fiscal/social approach to causes of retail decentralization points to increased suburbanization as partially the result of citizen 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.

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 can generate a local fiscal surplus through greater local retail activity may be a factor in the generation of further retail decentralization. The idea being that local fiscal structure does not induce more retail activity in a metropolitan area, but may induce changes in where it locates. Non-central places draw retail activity from the central places where it has been historically located. The extensive use of local economic development incentives makes this possible.

Metropolitan Retail Decentralization in the Western United States

This empirical study of the degree and causes of retail decentralization uses 1977, 1987, and 1997 data from the 61 metropolitan areas in what the U.S. Census Bureau defined in 1990 as the continental western United States, less the seven metropolitan areas in Idaho, Montana, and Wyoming. Since the focus of this paper is retail activity in suburban locations, the suburban area within a metropolitan area is defined as the component counties in a MSA or PMSA, less the central places included in 1990 in the urbanized areas in a metropolitan area. Other than that there is a great deal of variation in the degree of non-central place retail activity occurring in western metropolitan areas between 1977 and 1997, it is hard to draw any specific conclusions from the raw data. A regression analysis is needed.

Statewide Local Revenue Choices and Retail Decentralization

A regression test is performed to see if the presence of urban containment policies and statewide averages for relevant 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. Holding other factors that determine non-central retail sales constant, the expectation is that the greater the percentage statewide reliance on a municipal revenue source that

generates greater local fiscal surplus for local retail activity, the more likely that local officials zone for retail land uses and use local incentives to try and encourage it.

Economic theory also 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 retail development specified by population and retail sales may be smaller, holding other factors constant, in an area that previously experienced high population growth. In addition, suburban 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.

The regression model used to explain non-central retail activity in a metropolitan area also contains three explanatory variables that control for the three different types of urban containment policies (UCPs) that could be used to control the path of urban development in the area. UCPs are designed to reduce urban sprawl and could thus reduce the amount of non-central retail activity in metropolitan areas were they are in place.

Specific findings from the regression analysis are:

- A one-percent increase in suburban population results in about 0.8 percent increase in suburban real retail sales.

- A one-percent increase in the price per acre of agriculture land results in about a 0.1 percent decrease in real retail sales. This is the expected effect of higher prices for suburban land slowing down the amount of suburban retail expansion and subsequent retail sales.

- A one-percent increase in the percentage of the non-central population over age 64 yields about 0.3 percent increase in non-central retail sales.

- For every year that a western metropolitan area used a policy of closed-region urban containment (a metropolitan-wide boundary which preserves open space outside it and consciously shifts demand for regional development to within it), the real value of retail activity in non-central places, holding other factors constant, fell by about $37.5 million.

- For every one-percent increase in statewide sales tax reliance at the municipal own-source level, real retail sales in non-central metropolitan places in the western United States rose by nearly 0.11 percent.

- For every one percent increase in reliance on other forms of local taxation (business license fees), real retail sales in non-central places rose by nearly 0.20 percent.

- A one-percent increase in the fraction of statewide own municipal revenue from relevant local charges is associated with a 0.80 percent increase in non-central place retail activity.

Policy Implications

The regression simulations confirm the hypothesis put forth earlier that retail sprawl – in the form of greater retail activity in non-central places than population, population growth, demographics, land prices, and income warrant – is advanced by some forms of local government revenue reliance and reduced by the more restrictive forms of urban containment policies. A policy implication that follows from this analysis is that states consider reducing reliance on municipal sales taxation even further. However, the reality is that most voters prefer sales taxation to other forms of raising local revenue. The real connection between retail sprawl and local sales taxation comes from the local retention of all, or even a significant portion, of the sales tax revenue generated in a jurisdiction. If this bond is broken, then it is unlikely that non-central places in metropolitan areas will continue to desire, and draw retail activity from central places, for just the fiscal surplus it provides. A workable alternative would be to collect at least a portion of local retail sales revenue on a regional basis, and then distribute it back to communities in the region on a per-capita basis. California is currently considering such legislation.

I.

AN ECONOMIST'S PERSPECTIVE ON URBAN SPRAWL:

With An Application To Metropolitan Areas In California And The American West

I.A. Background

> *In the next three or four years, Americans will have a chance to decide how decent a place this country will be to live in, and for generations to come. Already, huge patches of once green countryside have been turned into vast smog-filled deserts that are neither city, suburb, nor country and each day – at a rate of some 3,000 acres a day – more country is being bulldozed over… It is not merely that the countryside is receding; in the great expansion of the metropolitan areas, the subdivisions of one city are beginning to meet up with the subdivisions of another.*

The above quote offers nothing new to those who regularly follow current events. The statement sounds like it comes from a recent commentary written in any newspaper or newsmagazine in the United States. Many would be surprised to learn that it appeared in the opening paragraph of an article by the sociologist William Whyte that he titled "Urban Sprawl" in the January 1958 (p. 103) edition of *Fortune* magazine. In fact, Thomas Black (1996) has traced the pejorative use of the term "sprawl" back to a speech made in 1937 by Earle Draper of the Tennessee Valley Authority to a national conference of planners:

> *Perhaps diffusion is too kind of word… In bursting its bounds, the city actually* ***Sprawled*** *and made the countryside ugly… uneconomic [in terms] of services and doubtful social value.*

For more than sixty years, urban planners have used the catch phrase of "urban sprawl" to categorize much of what people dislike about suburban life in metropolitan areas. In the early 1990s, coinciding with Joel Garreau's (1991) publication of *Edge City: Life on the New Frontier*, the term urban sprawl grew to common usage in the public's lexicon and is

now a policy concern that is debated at the national and state level. In his 1999 State of the Union Address, President Clinton devoted nearly 20 percent of his time to issues related to metropolitan development; he only spent more time on foreign policy. Vice President Al Gore, running for President, followed up with campaign speeches last year that attributed road rage, loss of fertile land, central city decay, and even a decline in family life to urban sprawl in the United States.

In California, where the U.S. Census Bureau anticipates that population will grow from 32.5 million in 2000 to 49.3 million in 2025, the question of how to accommodate a greater than 50 percent increase in population in 25 years is widely asked. How pleasant will it be to live and work in California's metropolitan areas if a majority of this growth occurs at low density at the fringe of current metropolitan areas? "Smart Growth" is often cited as the solution, and the California Legislature has formed a caucus of members and staff dedicated to pursuing it.

Alternatively, conservative commentators like Thomas Sowell (1999) and George Will (1999), attribute this focus on urban sprawl and the necessity of government directed Smart Growth, as the most recent crisis contrived by Liberals to justify government interference in what they believe are location decisions better left to individuals and business. Even so, it is hard to find a policymaker who at least publicly, favors urban sprawl. At the same time, it is equally difficult to find someone who can concisely define what urban sprawl is and how to measure the degree to which it has occurred in a region. Though it is not hard to find a policymaker in the United States and California concerned over the negative outcomes that are widely attributed to urban sprawl: loss of open space and farmland, traffic

congestion, air pollution, a greater percentage of the poor living in the inner-city, central city blight, etc.

To begin to think about and examine the causal connection between urban sprawl and these negative outcomes in California, ways are needed to assess the degree that urban sprawl has occurred in metropolitan areas throughout this state. Once this measurement is chosen, factors cited as causes of urban sprawl can be tested for validity, and if appropriate, these tests can then form the basis for public policies designed to reduce sprawl and the negative urban outcomes attributed to it.

Ken Small, an urban economist, offers an interesting medical analogy for how the public and even policymakers think about the "disease" of sprawl. We all recognize the undesirable symptoms of the disease, policymakers have already come up with many cures for the disease (all under the label of Smart Growth); unfortunately, most people – and even policymakers – lack a clear understanding the underlying disease.

This purpose of this paper is to offer a better understanding of the "disease" of urban sprawl in California. First, an economic way of thinking about urban sprawl is presented. Then the previous planning and popular literature is examined to derive a consensus on ways to quantify the degree of urban sprawl in a metropolitan area given the available data. Values for these measures are provided for the 25 metropolitan regions in California, and for other metropolitan regions throughout the western United States. Some conclusions are drawn from this data and a policy course for dealing with sprawl in California is suggested.

I. B. What Is Urban Sprawl?

In its broadest sense, urban sprawl is just another word for "excessive" metropolitan decentralization or suburbanization. Suburbanization occurs over time when a larger

percentage of a metropolitan area's residential and/or business activity takes place outside of its central locations. Though, determining when urban decentralization has become excessive is not an easy task.

As discussed by two prominent urban economists, Ed Mills (1999) and Jan Bruekner (2000), the process of suburbanization has occurred in the United States for well over 75 years. In 1950, 57 percent of the population lived in the single central cities designated for each U.S. metropolitan area. While in 1950, 70 percent of the employment in the U.S. took place in these central cities. By the mid-1990s, these percentages had respectively declined to 35 and 45 percent. Urban economists have extensively documented, modeled, and statistically examined this occurrence. Their conclusion being that 20th Century suburbanization occurred due to population growth, rising incomes, falling commuting costs, and to some extent, changing tastes on where and how Americans wish to live, work, and shop.

As population rises in a metropolitan area, it becomes increasingly more difficult to locate the same percentage of residential and business activity in a central city whose boundaries remain fixed. Higher income residents, generally, demand larger quantities of housing and the cheap land to build it is more likely on the fringe of currently developed urban areas. The construction of federally subsidized highways, and the relatively low private cost of using an automobile to get to work, has further facilitated the 20th Century movement to the suburbs. In addition, many people and businesses just prefer a suburban setting; though there is some debate as to whether this preference is at least in part induced by the limited choices provided them (see Ewing, 1997).

An economic concept of urban sprawl

Sprawl, in its current usage, means more than just suburbanization; it is now a code word for excessive suburbanization. To identify sprawl in a metropolitan area we must be able to identify the point when further decentralization becomes excessive. According to economists, the least value-laden way to do this is when further decentralization imposes greater total costs on everyone in the metropolitan area, than if the development had remained more centralized. An economist's definition of total costs refers to both the private costs born by the individuals and businesses making the decision to locate in the more decentralized location in a metropolitan area, plus the public costs that result from the decentralized location decisions of others. Total costs are used in the sense that they are net of (or after) the private and social benefits that arise from the decentralized location decisions.

This form of economic thinking can help us to better understand why a household, new to a metropolitan area, decides to live in the outer suburbs, even though the primary wage earner works in the central city. The household makes this decision by weighing the private benefits of a decentralized location (possibly better public schools, cheaper land to build larger housing on, newer infrastructure, neighbors they would rather associate with, closer to public open space, etc.) against the private costs of the decentralized location (possibly longer commuting times, less urban amenities, etc.). In this example, the household determines that the private benefits are greater than the private costs at an outer location, and choose their residence in the urban fringe. In making this decision, they are unlikely to fully consider the social costs of their decision to the entire metropolitan area (perhaps greater air pollution from a longer commute, greater freeway congestion, increased

publicly-funded infrastructure costs, the social and economic isolation of those left behind at the core of the metropolitan area, etc.)

To define when new suburbanization becomes excessive, economists look to see if the total private and social costs of decentralization, after accounting for private and social benefits, are positive. This is the economist's realm of evaluating a decision based upon the tradeoffs involved in it. In the United States, people and businesses freely chose to decentralize their location in a metropolitan area and it is reasonable to assume that they only do so if the private benefits they receive from such are greater than the private costs. As Ned Levine (1997, p.280) points out: "What to one person is 'sprawl' to another is his/her home."

Suburbanization can be considered excessive when business and individuals ignore the social costs that their decision to decentralize imposes upon the metropolitan area, or the social benefits they would have generated if they had chosen a more centralized location. Economists refer to these privately ignored social costs and benefits as externalities.

Urban planners, environmentalists, and other social engineers have embraced the concept of excessive suburbanization, or sprawl, because it offers a theoretically based reason for government to redirect, or "plan," the intra-metropolitan location decisions of individuals and firms. However, the difficulty in deciding when to impose this redirection has always been in determining when the private and public costs of a form of suburbanization are greater than the private and public benefits.

To an economist, urban sprawl results from thousands of individual choices. If we agree that most U.S. households prefer low density living, spatial separation from others with lower incomes and social status, one-stop shopping, a location near open space; and that travel by private care is faster, cheaper, and safer than mass transit, it is not surprising that

many households end up choosing locations on the less developed fringe of urban areas. Given that many metropolitan residents have made these choices, many metropolitan businesses also desire low-density sites spread out across a metropolitan area for ease of shipping, employee, and market access. In effect, the negative outcomes attributed to urban sprawl can be thought of as the summation of the many public costs that individuals and businesses have chosen to ignore when deciding upon a location at the urban fringe. The immortal words of a Pogo comic strip from Earth Day 1971 still ring true in regard to what causes the disease of urban sprawl: "Yep Son, we have met the enemy and he is us."

A practical definition of urban sprawl

The previous explanation for the cause of urban sprawl is based in economics and rather abstract. It is not new, and Robert Harvey and W.A.V. Clark made a similar argument as early as 1965. As a more concrete alternative to trying to calculate the private and public benefits and costs of greater decentralization in a metropolitan area, policy analysts and social activists have chosen to conceptualize excessive suburbanization in a way that they are certain that the total costs of a described form of suburbanization are greater than the total benefits. For instance, in a widely cited 1998 study, the Sierra Club defines sprawl as "low-density development beyond the edge of service and employment, which separates where people live from where they work – thus requiring cars to move between zones." Continuing this theme, the *Planning Commissioners Journal* (2000) describes urban sprawl as "dispersed development outside of compact urban and village centers along highways and in rural countryside." Anthony Downs (1998), at the Brookings Institution, defines urban sprawl by observable traits such as unlimited outward extension of new development, low density

developments in new-growth areas, leapfrog development, and strip commercial development.

Reid Ewing (1994 and 1997), an urban planner, takes a very deliberate approach to conceptualizing what urban sprawl is. He surveyed 15 academic articles on the subject, written between 1957 and 1992, and found that the terms low-density, strip or ribbon, scattered, or leapfrog development are most often used to characterize urban sprawl. Ewing lumps these characteristics under the term "non-compact development," but he is not satisfied with such a simple archetype. In his mind, urban sprawl is always a matter of degree and the difficulty in crafting a rule to recognize it occurs in distinguishing the scale of non-compactness that typify the forms of polycentric development that exists in most U.S. metropolitan areas. In the end, Ewing equates the degree of urban sprawl in a region to the extent of residential inaccessibility to jobs and shopping, and lack of functional open space in the region. Ewing's definition of functional, applied to open space, is vacant land that performs some "useful" public purpose.

Quantifying urban sprawl

The economist's method of recognizing urban sprawl is theoretically sound, but extremely demanding to implement. It is very difficult to measure all of the benefits and costs that occur when further suburbanization occurs in a metropolitan area. Thus, it is no surprise that policy activists instead prefer depictions of types of suburban development where they believe the total costs likely are likely greater than total benefits.

The problems that arise when declaring that a type suburbanization is urban sprawl is not unlike the problem a court encounters when declaring something pornographic. We all know there are certain forms of metropolitan decentralization in which the private and social

costs of it occurring are greater than the private and social benefits it generates. The difficulty, as with pornography, is in the creation of a specific canon that identifies a type of suburbanization that fails such a benefit/cost test. Though, as described above, planners and other urban activists have stepped into this void and offered characteristics of metropolitan suburbanization in which they believe the total costs to all in the metropolitan area are greater than the total benefits. If we accept these characteristics, and Ewing's insight that defining sprawl is always a matter of degree, a declaration of the degree of sprawl in an urban area may be possible, though still not simple.

Much of how planners define sprawl consists of descriptions of specific types of development. Using existing data sources, there are no easy ways to directly measure the occurrences of many of these types of development in a metropolitan area. Nonetheless, there are measurable characteristics that do appear in these descriptions. These include low density, scattered, and/or dispersed development; the separation of where people live from where they work; and a lack of functional open space. These characteristics, along with the concept of excessive decentralization that occurs over time and measured in a relative sense, are what are relied on in this paper to begin to define ways of determining the degree of sprawl in urban areas in California and other states in western United States. The first step in doing this is specifying what is considered an urban area.

The Census defines U.S. metropolitan areas by a central city and the surrounding county or counties that are economically integrated – in regards to commuting and shopping patterns – with the central city. This is one of the definitions used here to define an area to examine for its degree of sprawl. The second definition is what the Census calls an "urbanized area." An urbanized area consists of the densely settled central place and places

in the metropolitan area, plus the less densely settled territory (urban fringe) that surrounds these places. An urbanized area must have a minimum population of 50,000 and the area's fringe must consist of contiguous territory that has a density of least 1,000 persons per square mile. The urban fringe can also consist of outlying territory of such density if a road no longer than 1.5 miles in distance connects it to the central place(s), or a road 5 miles long if water or other undeveloped territory separates it from the central place(s). The Census considers central places to be the dominant employment and residential centers in each urbanized area.

An empirical comparison of the degree of urban sprawl in different metropolitan areas across the West must begin with a unit of analysis. For this study, it is the 61 metropolitan areas in what the U.S. Census Bureau defines in 1990 as the continental western United States, less the seven metropolitan areas in Idaho, Montana, and Wyoming. Metropolitan areas in California and the other included western United States grew up in an era of rising populations, rising real incomes, and declining transportation costs. Unlike metropolitan areas in other parts of the United States, this resulted in lower densities at the urban core. It is therefore reasonable to compare only western metropolitan areas, and to exclude other U.S areas whose metropolitan structures at a point in time are products of their quite different historical development. In addition, metropolitan areas in Idaho, Montana, and Wyoming are excluded because these three states are best considered outliers in terms of the majority of metropolitan development patterns in the West.[1]

Table 1 contains a description of all the included metropolitan areas in California and the western United States. The first column of this table provides the metropolitan area's

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

name and whether the U.S. Census Bureau considers it a Metropolitan Statistical Area (MSA) or a Primary Metropolitan Statistical Area (PMSA).[2] Column 2 in Table 1 lists the square miles of each metropolitan area, while column 3 contains the names of the 1990 component counties for each MSA or PMSA. Column 4 in Table 1 offers the names of the 1990 Census defined "urbanized areas" that are included in each metropolitan area, and column 5 provides the 1990 Census defined "central places" that are in each of the urbanized areas. For this study, the Census defined central places in 1990 are considered the central places for that urbanized area for all years under consideration. There are two urbanized areas (Logan, UT, and Longview, WA) that are not part of any Census defined metropolitan area.

insert Table 1 approximately here

Since excessive suburbanization is a relative term, a metropolitan area's level of decentralization at one point in time needs to be compared with both its level at earlier points in time and the degree of decentralization in similar metropolitan areas at the same time. In the next section, this is done for metropolitan areas in California and other western states.

I. C. Urban Decentralization in California and the Western United States

Based upon the previous discussion, Tables 2 through 5 offers various ways of measuring the amount of decentralization and open space loss that has occurred in the last three decades in the Western United States. All of these tables are organized with the state average, for all metropolitan areas in a state, listed in the top rows. Tables 2 and 3 are based upon information drawn from a state's urbanized areas. The downside of using this unit of observation is it being only available for decennial census years and the data for 2000 has not

[2] 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

Table 1: Urban Area Definitions in the Western United States

1990 Metropolitan Area Name	1990 Metropolitan Area Square Miles	1990 Counties in Metropolitan Area	1990 Urbanized Areas in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Phoenix-Mesa AZ, MSA	14,574	Maricopa AZ, Pinal AZ	Phoenix AZ	Mesa AZ, Phoenix AZ, Scottsdale AZ, Tempe AZ
Tuscon AZ, MSA	9187	Pima AZ	Tucson AZ	Tucson AZ
Yuma AZ, MSA	5514	Yuma AZ	Yuma AZ	Yuma AZ
Bakersfield CA, MSA	8142	Kern CA	Bakersfield CA	Bakersfield CA
Chico-Paradise CA, MSA	1640	Butte CA	Chico CA	Chico CA
Fresno CA, MSA	8102	Fresno CA, Madera CA	Fresno CA	Fresno CA
Los Angeles-Long Beach CA, PMSA	4060	Los Angeles CA	Lancaster-Palmdale CA, Los Angeles-Long-Beach CA, Oxnard-Ventura CA	Lancaster CA, Long Beach CA, Los Angeles CA, Pasadena CA
Orange CA, PMSA	790	Orange CA	Los Angeles-Long Beach CA	Anaheim CA, Irvine CA, Santa Ana CA
Riverside-San Bernardino CA, PMSA	27,270	Riverside CA, San Bernardino CA	Henet-San Jacinto CA, Hesperito-Apple Valley-Victorville CA, Indio-Coachella CA, Los Angeles-Long Beach CA, Palm Springs CA, Riverside-San Bernardino CA	Hemet CA, Palm Dessert CA, Palm Springs CA, Riverside CA, San Bernardino CA, Temecula CA
Ventura CA, PMSA	1846	Ventura CA	Los Angeles-Long Beach CA, Oxnard-Ventura CA, Simi Valley CA	San Buenaventura (Ventura) CA
Merced CA, MSA	1929	Merced CA	Merced CA	Merced CA
Modesta CA, MSA	1495	Stanislaus CA	Modesto CA	Modesto CA, Turlock CA
Redding CA, MSA	3786	Shasta CA	Redding CA	Redding CA
Sacramento CA, PMSA	5094	El Dorado CA, Placer CA, Sacramento CA	Sacramento CA	Sacramento CA

1990 Metropolitan Area Name	1990 Metropolitan Area Square Miles	1990 Counties in Metropolitan Area	1990 Urbanized Areas in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Yolo CA, PMSA	1012	Yolo CA	Davis CA, Sacramento CA	Davis CA, Woodland CA
Salinas CA, MSA	3322	Monterey CA	Salinas CA, Seaside-Monterey CA, Watsonville CA	Monterey CA, Salinas CA
San Diego CA, MSA	4205	San Diego CA	San Diego CA	Coronado CA, Escondido CA, San Diego CA
Oakland CA, PMSA	1458	Alameda CA, Contra Costa CA	Antioch-Pittsburgh CA, San Francisco-Oakland CA	Alameda CA, Berkeley CA, Oakland CA
San Francisco CA, PMSA	1016	Marin CA, San Francisco CA, San Mateo CA	San Francisco-Oakland CA	San Francisco CA
San Jose CA, PMSA	1291	Santa Clara CA	San Jose CA	Gilroy CA, Palo Alto CA, San Jose CA, Santa Clara CA, Sunnyvale CA
Santa Cruz-Watsonville CA, PMSA	446	Santa Cruz CA	Santa Cruz CA	Santa Cruz CA, Watsonville CA
Santa Rosa CA, PMSA	1576	Sonoma CA	Santa Rosa CA	Petaluma CA, Santa Rosa CA
Vallejo-Fairfield-Napa CA, PMSA	1582	Napa CA, Solano CA	Fairfield CA, Napa, Vacaville CA	Fairfield CA, Napa CA, Vacaville CA, Vallejo CA
Visalia-Tulare-Porterville CA, MSA	4824	Tulare CA	Visalia CA	Porterville CA, Tulare CA
San Luis Obispo-Atascadero-Paso Robles CA, MSA	3305	San Luis Obispo CA	San Luis Obispo CA	Atascadero CA, Paso Robles CA, San Luis Obispo CA
Santa Barbara-Santa Maria-Lompoc CA, MSA	2739	Santa Barbara CA	Lompoc CA, Santa Barbara CA, Santa Maria CA	Lompoc CA, Santa Barbara CA, Santa Maria CA
Stockton-Lodi CA, MSA	1399	San Joaquin CA	Lodi CA, Stockton CA	Lodi CA, Stockton CA
Yuba City CA, MSA	1233	Sutter CA, Yuba CA	Yuba CA	Yuba CA
Boulder-Longmount CO, PMSA	743	Boulder CO	Boulder CO, Longmount CO	Boulder CO, Longmount CO
Colorado Springs CO, MSA	2127	El Paso CO	Colorado Springs, CO	Colorado Springs, CO
Denver CO, PMSA	3761	Adams CO, Arapahoe CO, Denver CO, Douglas CO, Jefferson CO	Denver CO	Denver CO

1990 Metropolitan Area Name	1990 Metropolitan Area Square Miles	1990 Counties in Metropolitan Area	1990 Urbanized Areas in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Fort-Collins-Loveland CO, MSA	2601	Larimer CO	Fort Collins CO	Fort Collins CO
Grand Junction CO, MSA	3328	Mesa CO	Grand Junction CO	Grand Junction CO
Greeley CO, MSA	3993	Weld CO	Greeley CO	Greeley CO
Pueblo CO, MSA	2389	Pueblo CO	Pueblo CO	Pueblo CO
Las Vegas NV & AZ, MSA	39,370	Clark NV, Mohave AZ, Nye NV	Las Vegas NV	Las Vegas NV
Reno NV, MSA	6343	Washoe NV	Reno NV	Reno NV
Albuquerque NM, MSA	5944	Bernalillo NM, Sandoval NM, Valencia NM	Albuquerque NM	Albuquerque NM
Las Cruces NM, MSA	3807	Dona Ana NM	Las Cruces NM	Las Cruces NM
Santa Fe NM, MSA	2019	Los Alamos NM, Santa Fe NM	Santa Fe NM	Santa Fe NM
Eugene-Springfield OR, MSA	4554	Lane OR	Eugene-Springfield OR	Eugene OR, Springfield OR
Medford-Ashland OR, MSA	2785	Jackson OR	Medford OR	Medford OR
Portland-Vancouver OR, PMSA	5028	Clackamas OR, Columbia OR, Multnomah OR, Washington OR, Yamhill OR, Clark WA	Portland-Vancouver OR-WA	Portland OR, Vancouver WA
Salem OR, PMSA	1926	Marion OR, Polk OR	Salem OR	Salem OR
Provo-Orem UT, MSA	1998	Utah UT	Provo-Orem UT	Provo UT, Orem UT
Salt Lake City-Ogden UT, MSA	1618	Davis UT, Salt Lake UT, Weber UT	Salt Lake City UT, Ogden UT	Salt Lake City UT, Ogden UT
Bellingham WA, MSA	2120	Whatcom WA	Bellingham WA	Bellingham WA
Bremerton WA, PMSA	396	Kitsap WA	Bremerton WA	Bremerton WA

1990 Metropolitan Area Name	1990 Metropolitan Area Square Miles	1990 Counties in Metropolitan Area	1990 Urbanized Areas in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Olympia WA, PMSA	727	Thurston WA	Olympia WA	Olympia WA
Richland-Kennewick-Pasco WA, MSA	2945	Benton WA, Franklin WA	Richland-Kennewick-Pasco WA	Kennewick WA, Pasco WA, Richland WA
Seattle-Bellevue-Everett WA, PMSA	4925	Island WA, King WA, Snohomish WA	Seattle WA	Auburn WA, Everett WA, Seattle WA
Spokane WA, MSA	1764	Spokane WA	Spokane WA	Spokane WA
Tacoma WA, PMSA	1678	Pierce WA	Tacoma WA	Tacoma WA
Yakima WA, MSA	4296	Yakima WA	Yakima WA	Yakima WA

been released yet. Tables 4 and 5 rely on the metropolitan area (or counties) as the unit of observation and subsequently report information drawn from as late as 1998.

A comparison among urbanized areas

Central places are the dominant employment and residential centers in an urbanized area. Measures of the percentage of an urbanized area's population and land area that are contained in its central places offer a comparable indication of how centralized an urban area is. Measured in this manner, less centralized urban areas are also more likely to fit many of the characteristics of sprawl previously discussed: dispersed development outside of compact urban villages, low density development in new growth areas, residential inaccessibility to shopping and employment, and greater strip commercial development. In one of the only statistically based examination of causes of urban sprawl, Jan Brueckner and David Fansler (1983) have also used values drawn from Census designated urban areas. Wassmer (2001) has also used the 1990 Census definition of central places in urbanized areas to look at factors important to the generation of retail urban sprawl in the American West.

An examination of the percentage of an urbanized area's population and land area contained in its central places at one point in time, and how they have changed over time, offer information on the degree that an urban area is and has sprawled. For instance, the first data row of Table 2 indicates that 54 percent of the U.S. population living in urbanized areas chose to live in their central places in 1970. By 1990, this percentage had fallen to 50 percent. Similarly, in 1970, 41 percent of the land in U.S. urban areas was located in its central places; by 1990, this percentage had fallen to 39 percent. Only the metropolitan averages calculated for California and Oregon bucked this U.S. trend. On average,

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units.

metropolitan areas in these two states had a greater percentage of urbanized population living in central places, and land area in central places, in 1990 than in 1970.

insert Table 2 approximately here

Table 2 also shows that state averages mask metropolitan-area specific changes within a state. For instance, 13 of California's 25 metropolitan areas (Antioch, Los Angeles, Oxnard, Palm Springs, Riverside, Sacramento, Salinas, San Diego, Santa Barbara, Santa Cruz, Santa Rosa, Seaside, and Simi Valley) actually experienced a decline in both the percentages of population and land area in central places, or greater sprawl. While as noted before, California's metropolitan areas on average experienced a decrease. The obvious lesson for policymakers in a large and diverse state like California is that blanket statements on the degree of sprawl in the state's metropolitan areas are not valid.

Table 3 offers the percentage change in urban population, and the percentage change in urban fringe land, that occurred in California and other urbanized areas in the western United States between 1980 and 1990. As Landis (2000), and other planners have used, an index of the degree of sprawl is calculated by dividing the percentage change in urban fringe (or non-central place) land by the percentage change in urban population. A value greater than one indicates that between 1980 and 1990 the fringe area of an urbanized area grew at a faster rate than the population in the entire urbanized area. If this has occurred, more and more people are living at lower density levels outside of the urbanized area's central places. This index offers another way of quantifying the relative degree of sprawl across different areas.

insert Table 3 approximately here

Table 2: Population and Land Information for Central Places and Urbanized Areas in California and the Western United States

1990 Urbanized Area Name	1970 Central Place Population / Urban Population	1980 Central Place Population / Urban Population	1990 Central Place Population / Urban Population		1970 Central Place Land / Urban Land	1980 Central Place Land / Urban Land	1990 Central Place Land / Urban Land
United States average for urbanized areas	0.54	0.48	0.50		0.41	0.36	0.39
California average for urbanized areas	0.59	0.61	0.67		0.53	0.55	0.59
Arizona average for urbanized areas	0.78	0.69	0.62		0.70	0.62	0.66
Colorado average for urbanized areas	0.77	0.74	0.74		0.66	0.60	0.65
Nevada average for urbanized areas	0.63	0.50	0.50		0.62	0.36	0.44
New Mexico average for urbanized areas	0.82	0.85	0.81		0.72	0.73	0.71
Oregon average for urbanized areas	0.58	0.59	0.77		0.49	0.56	0.62
Utah average for urbanized areas	0.53	0.43	0.45		0.41	0.32	0.31
Washington average for urbanized areas	0.59	0.56	0.54		0.48	0.46	0.37
Antioch-Pittsburg	0.82	0.88	0.71		0.71	0.81	0.50
Bakersfield	0.39	0.47	0.58		0.45	0.47	0.63
Chico	na	0.51	0.56		na	0.56	0.69
Davis	na	na	0.88		na	na	0.80
Fairfield	na	0.84	0.77		na	0.84	0.88
Fresno	0.63	0.66	0.78		0.53	0.65	0.75
Hemet-San Jacinto	na	0.41	0.58		na	0.39	0.65
Hesperito-Apple Valley-Victorville	na	na	0.89		na	na	0.89
Indio-Coachella	na	na	0.95		na	na	0.99
Lancaster-Palmdale	na	0.85	0.88		na	0.82	0.91
Lodi	na	na	0.93		na	na	0.69
Lompoc	na	na	0.67		na	na	0.27
Los Angeles-Long Beach	0.43	0.35	0.42		0.38	0.28	0.33
Merced	na	na	0.87		na	na	0.81
Modesto	0.58	0.67	0.71		0.28	0.54	0.58
Napa	na	0.86	0.91		na	0.84	0.83
Oxnard-Ventura	0.67	0.69	0.49		0.63	0.63	0.29
Palm Springs	na	0.49	0.31		na	0.41	0.29
Redding	na	0.79	0.85		na	0.64	0.83
Riverside-San Bernardino	0.42	0.41	0.33		0.37	0.35	0.29
Sacramento	0.40	0.35	0.38		0.37	0.35	0.38
Salinas	0.94	0.97	0.89		0.89	0.88	0.54
San Diego	0.58	0.50	0.52		0.56	0.44	0.46
San Francisco-Oakland	0.38	0.32	0.38		0.17	0.13	0.19
San Jose	0.43	0.51	0.58		0.42	0.48	0.54
San Luis Obispo	na	na	0.83		na	na	0.81
Santa Barbara	0.54	0.50	0.47		0.57	0.42	0.39
Santa Cruz	0.43	0.34	0.32		0.35	0.16	0.13
Santa Maria	na	0.69	0.69		na	0.74	0.68
Santa Rosa	0.67	0.61	0.58		0.52	0.52	0.50
Seaside-Monterey	0.67	0.56	0.53		0.70	0.46	0.36
Simi Valley	0.99	0.97	0.78		0.93	0.96	0.70
Stockton	0.67	0.76	0.80		0.64	0.67	0.71
Vacaville	na	na	1.00		na	na	0.99
Visalia	na	0.84	0.90		na	0.84	0.85
Watsonville	na	na	0.61		na	na	0.29
Yuba City	na	0.31	0.36		na	0.19	0.25
Phoenix-Mesa, AZ	0.67	0.56	0.77		0.64	0.51	0.64
Tucson, AZ	0.88	0.73	0.32		0.76	0.57	0.50
Yuma, AZ	na	0.78	0.77		na	0.78	0.83
Boulder, CO	0.97	0.94	0.84		0.92	0.83	0.70
Colorado Springs, CO	0.66	0.78	0.80		0.68	0.73	0.72
Denver, CO	0.49	0.36	0.31		0.33	0.25	0.24
Fort Collins, CO	na	0.83	0.83		na	0.63	0.76
Grand Junction, CO	na	0.50	0.40		na	0.31	0.27
Greeley, CO	na	0.85	0.84		na	0.70	0.75
Longmount, CO	na	na	0.98		na	na	0.95
Pueblo, CO	0.94	0.93	0.93		0.71	0.75	0.78
Las Vegas, NV & AZ	0.53	0.38	0.37		0.43	0.30	0.27
Reno, NV	0.73	0.62	0.63		0.81	0.43	0.62
Albuquerque, NM	0.82	0.79	0.77		0.72	0.56	0.59
Las Cruces, NM	na	0.82	0.76		na	0.71	0.66
Santa Fe, NM	na	0.94	0.89		na	0.91	0.90
Eugene-Springfield, OR	0.55	0.58	0.83		0.47	0.53	0.79
Medford, OR	na	0.75	0.70		na	0.71	0.62
Portland-Vancouver, OR & WA	0.46	0.36	0.86		0.33	0.30	0.36
Salem, OR	0.73	0.66	0.69		0.67	0.71	0.73
Logan , UT	na	na	0.65		na	na	0.46
Ogden, UT	0.46	0.31	0.25		0.34	0.20	0.17
Provo-Orem, UT	0.76	0.74	0.70		0.56	0.50	0.44
Salt Lake City, UT	0.37	0.24	0.20		0.32	0.25	0.15
Bellingham, WA	na	0.90	0.88		na	0.88	0.73
Bremerton, WA	na	0.56	0.34		na	0.54	0.15
Longview, WA & OR	na	0.56	0.55		na	0.36	0.34
Olympia, WA	na	0.40	0.35		na	0.40	0.29
Richland-Kennewick-Pasco, WA	0.58	0.61	0.81		0.57	0.51	0.53
Seattle, WA	0.47	0.39	0.36		0.27	0.35	0.23
Spokane, WA	0.74	0.64	0.64		0.65	0.49	0.49
Tacoma, WA	0.46	0.39	0.36		0.37	0.26	0.21
Yakima, WA	0.70	0.61	0.62		0.51	0.36	0.40

Table 3: 1980 to 1990 Change in Urbanized Area Population, Urban Fringe Land Area, and a Sprawl Index for California and the Western United States

1990 Urbanized Area Name	1980 to 1990 % Change in Urban Population	1980 to 1990 % Change in Urban Fringe Land		1980 to 1990 Measure of Sprawl Index
United States average for urbanized areas	13.7	12.5		0.91
California average for urbanized areas	47.04	103.44		2.01
Arizona average for urbanized areas	33.63	13.25		0.52
Colorado average for urbanized areas	19.30	36.88		2.17
Nevada average for urbanized areas	46.40	8.58		0.04
New Mexico average for urbanized areas	29.30	59.57		1.84
Oregon average for urbanized areas	15.31	3.14		-2.91
Utah average for urbanized areas	24.34	19.87		0.65
Washington average for urbanized areas	22.21	61.40		3.59
Antioch-Pittsburg	77.9	520.0		6.68
Bakersfield	36.2	0.8		0.02
Chico	38.4	-8.2		-0.21
Davis	na	na		na
Fairfield	44.3	-4.0		-0.09
Fresno	36.7	-6.7		-0.18
Hemet-San Jacinto	64.2	-9.4		-0.15
Hesperito-Apple Valley-Victorville	na	na		na
Indio-Coachella	na	na		na
Lancaster-Palmdale	232.3	-10.0		-0.04
Lodi	na	na		na
Lompoc	na	na		na
Los Angeles-Long Beach	20.3	-0.1		0.00
Merced	na	na		na
Modesto	44.5	4.3		0.10
Napa	14.8	20.0		1.35
Oxnard-Ventura	27.2	120.0		4.41
Palm Springs	94.2	73.0		0.77
Redding	48.2	-35.6		-0.74
Riverside-San Bernardino	65.9	39.9		0.60
Sacramento	37.8	14.1		0.37
Salinas	48.0	705.0		14.70
San Diego	37.8	8.5		0.23
San Francisco-Oakland	13.8	2.2		0.16
San Jose	15.4	-8.2		-0.53
San Luis Obispo	na	na		na
Santa Barbara	21.3	15.0		0.70
Santa Cruz	23.6	37.7		1.60
Santa Maria	55.5	35.0		0.63
Santa Rosa	42.0	34.0		0.81
Seaside-Monterey	15.4	51.5		3.34
Simi Valley	60.2	1290.0		21.42
Stockton	33.0	6.0		0.18
Vacaville	na	na		na
Visalia	41.8	2.5		0.06
Watsonville	na	na		na
Yuba City	26.3	-1.0		-0.04
Phoenix-Mesa, AZ	42.4	-15.1		-0.36
Tucson, AZ	28.7	66.9		2.33
Yuma, AZ	29.8	-12.0		-0.40
Boulder, CO	21.8	140.0		6.44
Colorado Springs, CO	27.5	24.9		0.90
Denver, CO	12.3	6.0		0.49
Fort Collins, CO	35.2	0.8		0.02
Grand Junction, CO	26.5	83.2		3.14
Greeley, CO	14.9	13.3		0.89
Longmount, CO	na	na		na
Pueblo, CO	-3.0	-10.0		3.33
Las Vegas, NV & AZ	61.1	30.1		0.49
Reno, NV	31.7	-12.9		-0.41
Albuquerque, NM	18.9	23.2		1.23
Las Cruces, NM	47.9	115.6		2.41
Santa Fe, NM	21.1	40.0		1.90
Eugene-Springfield, OR	3.7	-51.7		-14.09
Medford, OR	27.6	60.0		2.17
Portland-Vancouver, OR & WA	14.2	1.6		0.11
Salem, OR	15.7	2.7		0.17
Logan , UT	na	na		na
Ogden, UT	26.0	21.9		0.84
Provo-Orem, UT	30.0	43.3		1.45
Salt Lake City, UT	17.1	-5.7		-0.33
Bellingham, WA	16.3	166.7		10.26
Bremerton, WA	75.1	194.4		2.59
Longview, WA & OR	3.7	12.4		3.33
Olympia, WA	39.1	57.2		1.46
Richland-Kennewick-Pasco, WA	3.5	34.1		9.70
Seattle, WA	25.3	43.3		1.71
Spokane, WA	4.6	4.9		1.06
Tacoma, WA	23.7	32.9		1.39
Yakima, WA	8.6	6.7		0.78

The top of Table 3 indicates that the 1980 to 1990 sprawl index for all of the United States was less than one. Population in all U.S. urbanized areas grew at a slower rate than land outside of central places in these urbanized areas. On the contrary, four of the eight states in this western sample exhibited a 1980 to 1990 sprawl index greater than one. In California, average metropolitan growth in urban fringe land between 1980 and 1990 was twice as great as growth in urbanized population. Though again, this statewide metropolitan average masks significant variation among California's metropolitan areas. At one extreme is a ratio of fringe lands to population growth of 21.4 and 14.7 respectively for Simi Valley and Salinas – representing a large increase in sprawl. At the other extreme, the –0.7 and –0.5 respective sprawl indexes for Riverside and San Bernardino – representing an actual decrease in sprawl. This is again further evidence that the degree of sprawl occurring across California's metropolitan areas differs greatly.

A comparison among metropolitan areas

Data from the Census designated urbanized area, and the central places they contain, represents perhaps the best widely collected information for assessing the degree of decentralization or sprawl that has occurred in an area. Unfortunately, the most recent data from U.S. urbanized areas comes from only 1990. Since many claim that sprawl has escalated in the last decade, it is important to look at some measures drawn from the 1990s. For these we turn in Tables 4 and 5 to the county-based definition of a metropolitan area that the Census uses. In other studies, David Rusk (1995), Peter Gordon and Harry Richardson (1996), John Brennan and Edward Hill (1999), and Bruce Katz (2000) have also suggested that metropolitan areas are an appropriate designation to study the occurrence of decentralization in U.S. urban areas.

In calculating the information contained in Tables 4 and 5, we continue to use the 1990 central place definitions given in Table 1.

Since many lament the loss of open space in metropolitan areas as a clear symptom of urban sprawl, Table 4 offers a comparable measure of farmland loss in metropolitan areas in the western United States between 1987 and 1997. Metropolitan land devoted to farming is the only widely available measure of how much open space exists in a metropolitan area. The first two data columns of Table 4 list the fraction of total metropolitan land devoted to farming in 1987 and in 1997. The third data column offers the percentage change in this fraction between 1987 and 1997. As the first rows of Table 4 show, only metropolitan areas in New Mexico and Washington State saw average increases in the percentage of metropolitan area land devoted to farming. Washington's average increase is only due to the large percentage increase observed in one metropolitan area (Bremerton). Over this 10-year period, the average percentage of a California metropolitan area's land devoted to farming in California fell about 9.4 percent. But specific metropolitan areas varied from respective 53 and 46 percent farmland losses in Los Angeles and Orange, to respective 29 and 12 percent farmland gains in Santa Cruz and Salinas.[3]

insert Table 4 approximately here

Table 4 also continues the practice from Table 2 of looking at how central place population, relative to total area population, has changed over time. Here, the difference is that all counties in the Census defined metropolitan area account for the total urban area and data is available from 1998. As shown in the top row, in both 1990 and 1998, on average nearly the same percentages of the state of California's metropolitan populations were living

[3] Farmland gains should not be considered an increase in a metropolitan area's open space. They are likely to occur as open space is converted to farm activity.

Table 4: Farm Activity and Distribution of Population Changes for Metroplitan Areas in California and the Western United States

1990 Metropolitan Area Name	1987 Farm Land / Metropolitan Land	1997 Farm Land / Metropolitan Land	1987 to 1997 % Change in Farm Land / Metropolitan Land		1990 Central Place Population / Metropolitan Pop	1998 Central Place Population / Metropolitan Pop	1990 to 1998 % Change in Central Place Pop / Metro Pop
California average for (P)MSAs	0.470	0.443	-9.41		0.402	0.402	0.21
Arizona average for MSAs	0.327	0.260	-20.49		0.604	0.615	1.64
Colorado average for (P)MSAs	0.417	0.389	-4.97		0.520	0.515	-0.47
Nevada average for MSAs	0.155	0.118	-31.58		0.414	0.413	0.04
New Mexico average for MSAs	0.343	0.390	12.13		0.531	0.516	-2.55
Oregon average for (P)MSAs	0.218	0.203	-10.52		0.396	0.400	0.96
Utah average for MSAs	0.395	0.274	-30.57		0.407	0.387	-5.85
Washington average for (P)MSAs	0.273	0.265	4.46		0.358	0.340	-6.12
Bakersfield, MSA	0.583	0.547	-6.11		0.322	0.333	3.53
Chico-Paradise MSA	0.471	0.385	-18.27		0.220	0.241	9.55
Fresno, MSA	0.527	0.487	-7.67		0.469	0.457	-2.43
LA-Long Beach, PMSA	0.108	0.050	-53.30		0.468	0.465	-0.60
Orange, PMSA	0.215	0.115	-46.63		0.278	0.271	-2.57
Riverside-San Bernardino, PMSA	0.125	0.082	-34.07		0.200	0.199	-0.53
Ventura, PMSA	0.278	0.293	5.26		0.138	0.134	-2.88
Merced, MSA	0.850	0.714	-15.97		0.315	0.300	-4.70
Modesta, MSA	0.753	0.766	1.79		0.558	0.543	-2.86
Redding, MSA	0.156	0.131	-16.06		0.452	0.474	4.92
Sacramento, PMSA	0.217	0.169	-22.33		0.276	0.264	-4.29
Yolo, PMSA	0.780	0.828	6.13		0.610	0.637	4.50
Salinas, MSA	0.651	0.726	11.51		0.396	0.417	5.50
San Diego, MSA	0.197	0.176	-10.39		0.499	0.492	-1.40
Oakland, PMSA	0.473	0.435	-8.06		0.265	0.238	-9.96
San Francisco, PMSA	0.356	0.299	-15.94		0.451	0.443	-1.86
San Jose, PMSA	0.421	0.386	-8.30		0.721	0.723	0.15
Santa Cruz-Watsonville, PMSA	0.194	0.249	28.82		0.349	0.355	1.70
Santa Rosa, PMSA	0.545	0.566	3.87		0.403	0.410	1.79
Vallejo-Fairfield-Napa, PMSA	0.572	0.567	-0.86		0.550	0.539	-1.96
Visalia-Tulare-Porterville, MSA	0.457	0.424	-7.14		0.444	0.467	5.18
SLO-Atasc-Paso Robles, MSA	0.683	0.616	-9.87		0.385	0.376	-2.31
San Barb-Santa Maria-Lom, MSA	0.496	0.466	-6.08		0.499	0.503	0.77
Stockton-Lodi, MSA	0.920	0.903	-1.81		0.547	0.538	-1.55
Yuba City, MSA	0.733	0.705	-3.79		0.224	0.241	7.62
Phoenix-Mesa MSA, AZ	0.359	0.216	-39.94		0.689	0.655	-4.94
Tucson MSA, AZ	0.543	0.496	-8.80		0.608	0.717	18.00
Yuma MSA, AZ	0.077	0.067	-12.72		0.514	0.472	-8.13
Boulder-Longmount PMSA, CO	0.327	0.270	-17.58		0.599	0.571	-4.59
Colorado Springs MSA, CO	0.674	0.637	-5.54		0.708	0.704	-0.65
Denver PMSA, CO	0.545	0.544	-0.21		0.288	0.257	-10.65
Fort Collins-Loveland MSA, CO	0.345	0.326	-5.66		0.471	0.471	-0.10
Grand Junction MSA, CO	0.205	0.196	-4.63		0.312	0.366	17.27
Greeley MSA, CO	0.824	0.749	-9.10		0.459	0.442	-3.80
Pueblo MSA, CO	0.000	0.000	7.97		0.802	0.796	-0.75
Las Vegas NV & AZ, MSA	0.093	0.046	-50.81		0.303	0.306	1.00
Reno NV, MSA	0.217	0.190	-12.34		0.526	0.521	-0.92
Albuquerque MSA, NM	0.400	0.428	6.96		0.658	0.618	-6.12
Las Cruces MSA, NM	0.235	0.239	1.52		0.458	0.450	-1.87
Santa Fe MSA, NM	0.395	0.505	27.91		0.477	0.479	0.35
Eugene-Springfield MSA, OR	0.095	0.077	-19.11		0.556	0.570	2.43
Medford-Ashland MSA, OR	0.167	0.138	-17.55		0.321	0.330	2.94
Portland-Vancouver PMSA, OR	0.217	0.208	-4.30		0.319	0.317	-0.54
Salem PMSA, OR	0.392	0.387	-1.12		0.388	0.384	-1.00
Provo-Orem MSA, UT	0.386	0.293	-24.09		0.586	0.564	-3.68
Salt Lake City-Ogden MSA, UT	0.404	0.254	-37.06		0.229	0.210	-8.03
Bellingham MSA, WA	0.092	0.076	-16.90		0.408	0.395	-3.35
Bremerton PMSA, WA	0.038	0.075	99.76		0.201	0.170	-15.45
Olympia PMSA, WA	0.122	0.121	-0.88		0.210	0.194	-7.68
Richland-Kennewick-Pasco MSA, WA	0.692	0.624	-9.89		0.632	0.629	-0.42
Seattle-Bellevue-Everett PMSA, WA	0.055	0.042	-23.60		0.331	0.315	-4.71
Spokane MSA, WA	0.543	0.523	-3.79		0.490	0.450	-8.15
Tacoma PMSA, WA	0.055	0.047	-13.42		0.301	0.266	-11.80
Yakima MSA, WA	0.586	0.612	4.38		0.290	0.298	2.61

in central places. While, for the states of Colorado, Oregon, Utah, and Washington, the average across all of these states' metropolitan areas indicate that relatively fewer were living in central places.

However, as with earlier tables, Table 4 also shows that averages calculated from a state's metropolitan areas hide great differences in losses in central-place populations. For California, between 1990 and 1998, the Oakland metropolitan area led in central-place population loss with nearly a 10 percent decline in the percentage of metropolitan residents living in the cities of Alameda, Oakland, or Berkeley. In fact, 13 out of California's 25 metropolitan areas exhibited a decline in central population relative to total metropolitan population. At the same time, the Chico metropolitan area experienced a 10 percent increase in its metropolitan residents living in its central place of the City of Chico.

Finally, Table 5 offers a different perspective on decentralization in the West's metropolitan areas. It looks at what percentage of a metropolitan area's retail activity (measured in real dollar value of sales) occurred in its central places, and how that changed between 1977, 1987, and 1997. Percentage of total metropolitan retail activity in central places is used here as an inverse measure of the degree of sprawl in an urban area. Retail sales activity, and the "big-box" and "strip-mall" ways in which it generally occurs in the suburbs, represents much of what planners and the public perceive as sprawl.

insert Table 5 approximately here

On average, for all of California's metropolitan areas, retail activity in central places over the 20-year period between 1977 and 1997 declined by 4.7 percent. Average declines for this period, calculated for all metropolitan areas in a state, were also observed for Arizona, Colorado, Utah, and Washington. Metropolitan areas in Nevada, New Mexico, and

Table 5: Distribution of Retail Sales Changes for Metroplitan Areas in California and the Western United States

1990 Metropolitan Area Name	1977 Central Place / Metro Retail Sales	1987 Central Place / Metro Retail Sales	1997 Central Place / Metro Retail Sales	1977 to 1987 % Change in Central Place / Metro Sales	1987 to 1997 % Change in Central Place / Metro Sales	1977 to 1997 % Change in Central Place / Metro Sales
California average for (P)MSAs	0.539	0.539	0.523	-0.580	-3.515	-4.733
Arizona average for MSAs	0.810	0.820	0.740	1.364	-9.754	-8.671
Colorado average for (P)MSAs	0.743	0.742	0.718	-1.303	-4.127	-5.380
Nevada average for MSAs	0.577	0.561	0.594	-2.844	7.178	4.136
New Mexico average for MSAs	0.860	0.877	0.883	1.947	0.772	2.687
Oregon average for (P)MSAs	0.588	0.578	0.603	-2.813	6.572	2.182
Utah average for MSAs	0.597	0.530	0.508	-11.063	-8.668	-18.927
Washington average for (P)MSAs	0.594	0.580	0.537	-3.209	-9.573	-10.989
Bakersfield, MSA	0.555	0.569	0.564	2.44	-0.83	1.59
Chico-Paradise MSA	0.419	0.445	0.657	6.17	47.87	56.99
Fresno, MSA	0.583	0.636	0.588	9.11	-7.57	0.86
LA-Long Beach, PMSA	0.476	0.443	0.390	-7.06	-11.81	-18.03
Orange, PMSA	0.243	0.227	0.246	-6.73	8.66	1.34
Riverside-San Bernardino, PMSA	0.402	0.309	0.298	-23.16	-3.56	-25.90
Ventura, PMSA	0.240	0.239	0.193	-0.45	-19.19	-19.56
Merced, MSA	0.590	0.617	0.612	4.68	-0.85	3.80
Modesta, MSA	0.750	0.750	0.645	0.04	-13.93	-13.89
Redding, MSA	0.728	0.773	0.833	6.18	7.75	14.41
Sacramento, PMSA	0.306	0.278	0.232	-9.18	-16.61	-24.26
Yolo, PMSA	0.720	0.752	0.712	4.40	-5.32	-1.15
Salinas, MSA	0.606	0.605	0.564	-0.17	-6.65	-6.81
San Diego, MSA	0.550	0.523	0.533	-4.92	1.99	-3.03
Oakland, PMSA	0.280	0.252	0.192	-10.01	-23.92	-31.53
San Francisco, PMSA	0.468	0.445	0.402	-4.78	-9.71	-14.03
San Jose, PMSA	0.674	0.701	0.739	3.99	5.39	9.60
Santa Cruz-Watsonville, PMSA	0.645	0.548	0.447	-15.04	-18.40	-30.67
Santa Rosa, PMSA	0.554	0.688	0.660	24.16	-4.07	19.11
Vallejo-Fairfield-Napa, PMSA	0.867	0.807	0.824	-6.88	2.06	-4.96
Visalia-Tulare-Porterville, MSA	0.309	0.311	0.307	0.60	-1.29	-0.70
SLO-Atasc-Paso Robles, MSA	0.564	0.647	0.467	14.72	-27.77	-17.14
San Barb-Santa Maria-Lom, MSA	0.737	0.677	0.715	-8.13	5.64	-2.95
Stockton-Lodi, MSA	0.670	0.711	0.625	6.07	-12.03	-6.69
Yuba City, MSA	na	0.534	0.621	na	16.26	na
Phoenix-Mesa MSA, AZ	0.798	0.810	0.762	1.48	-5.94	-4.55
Tucson MSA, AZ	0.840	0.823	0.784	-1.97	-4.81	-6.69
Yuma MSA, AZ	0.791	0.827	0.674	4.59	-18.51	-14.77
Boulder-Longmount PMSA, CO	0.775	0.789	0.796	1.77	0.97	2.76
Colorado Springs MSA, CO	0.903	0.920	0.931	1.84	1.23	3.09
Denver PMSA, CO	0.368	0.289	0.265	-21.32	-8.48	-27.99
Fort Collins-Loveland MSA, CO	0.599	0.639	0.589	6.80	-7.90	-1.63
Grand Junction MSA, CO	0.895	0.844	0.838	-5.75	-0.71	-6.42
Greeley MSA, CO	0.729	0.778	0.662	6.79	-14.93	-9.15
Pueblo MSA, CO	0.931	0.937	0.946	0.75	0.93	1.69
Las Vegas MSA, NV & AZ	0.393	0.383	0.424	-2.65	10.90	7.96
Reno MSA, NV	0.762	0.739	0.764	-3.04	3.45	0.31
Albuquerque MSA, NM	0.846	0.883	0.832	4.38	-5.79	-1.67
Las Cruces MSA, NM	0.902	0.896	0.902	-0.74	0.73	-0.02
Santa Fe MSA, NM	0.833	0.851	0.914	2.20	7.38	9.75
Eugene-Springfield MSA, OR	0.638	0.788	0.765	23.52	-2.92	19.91
Medford-Ashland MSA, OR	0.692	0.562	0.630	-18.84	12.13	-8.99
Portland-Vancouver PMSA, OR	0.407	0.330	0.388	-18.89	17.58	-4.63
Salem PMSA, OR	0.614	0.632	0.629	2.95	-0.50	2.43
Provo-Orem MSA, UT	0.751	0.662	0.727	-11.90	9.87	-3.20
Salt Lake City-Ogden MSA, UT	0.443	0.397	0.289	-10.23	-27.21	-34.65
Bellingham MSA, WA	0.691	0.675	0.673	-2.37	-0.16	-2.53
Bremerton PMSA, WA	0.600	0.403	0.269	-32.80	-33.18	-55.09
Olympia PMSA, WA	0.550	0.593	0.528	7.95	-11.06	-3.99
Richland-Kennewick-Pasco MSA, WA	0.656	0.861	0.903	31.14	4.94	37.62
Seattle-Beelevue-Everett PMSA, WA	0.459	0.374	0.337	-18.51	-9.95	-26.62
Spokane MSA, WA	0.661	0.674	0.580	1.90	-13.99	-12.35
Tacoma PMSA, WA	0.510	0.465	0.399	-8.89	-14.18	-21.81
Yakima MSA, WA	0.625	0.599	0.605	-4.09	0.99	-3.15

Oregon, on average saw an increase in the percentage of retail sales occurring in central places. As with the information contained in previous tables, these statewide metropolitan averages mask broadly varying changes across Western States metropolitan areas. Even though the metropolitan average loss in retail activity in central places in California was negative, eight of the state's 24 metropolitan areas exhibited a positive increase in central place retail activity. The Chico metropolitan area experienced the greatest increase in the degree of retail activity occurring at its core (57 percent), while Santa Cruz experienced the greatest decrease (-31 percent).

Lessons from California Sprawl Data

This section drew upon the previously described economic way of thinking about urban sprawl, and the planning and other urbanist's literature on what type of urban growth patterns are best characterized as sprawl, to create data tables that contain information relevant to determining the degree of urban decentralization that has occurred in California and the American West. The data in these tables capture the degree of dispersion, low-density development, separation from where people live, shop, and work; and loss of open space across these metropolitan areas. It should be made clear that the information contained in these tables are by no means meant to be perfect measures of the degree of sprawl in a specific area at one point in time, or how it has changed over time. As has been done, they are best considered in the context of comparison with the same metropolitan area over time, or similar areas in the Western United States.[4] Before getting to one final way of comparing

[4] The statistical method of regression analysis can be used to determine if the degree of suburban activity in a metropolitan area is in some measure excessive. Wassmer (2001) has done this for retail activity in metropolitan areas in the Western United States and has found that, holding other relevant causal factors constant, greater statewide reliance on local sales taxes is related to greater retail activity in suburban places, i.e. more than the population, income, demographics, and land prices justify.

the multiple measures of sprawl contained in Tables 2 through 5, some general points about urban sprawl in California can be made.

In comparing the statewide metropolitan averages that are at the top of each of these tables, California's average nearly always falls in the middle of the other states. On average, California is never an outlier in terms of an excessive amount of sprawl, or lack of sprawl. Perhaps this is due to the sheer size of California and the fact that it contains nearly half of the total metropolitan areas in the West. That said, there are clear indicators in these tables that some of California's metropolitan areas are more sprawled.

One way of scoring differences in recent changes in the degree of sprawl across California's 25 metropolitan areas is contained in Table 6. Here, three different measures of increases in urban sprawl over the last decade, that were in the previous tables, are brought together and listed side-by-side. For all of these measures, a negative value indicates a greater likelihood of increased sprawl throughout the 1990s than a positive value. The greater the negative magnitude, the greater this increased likelihood. All negative values have been placed in bold, and the number of negative values out of three possible is listed in the final column. By this accounting, Fresno, Los Angeles, Riverside, Merced, Sacramento, Oakland, San Francisco, San Luis Obispo, and Stockton have experienced the greatest increases in urban sprawl during the 1990s. A relative comparison among these areas is possible by looking at the separate magnitudes of all the measures. Only the Los Angeles and Sacramento metropolitan areas exhibit two of three measures than are both greater than 10 percent losses.

insert Table 6 approximately here

Table 6: Sprawl Scorecard for California Metropolitan Areas in the 1990s

1990 Metropolitan Area Name	1987 to 1997 % Change in Farm Land / Metropolitan Land	1990 to 1998 % Change in Central Place Pop / Metro Pop	1987 to 1997 % Change in Central Place / Metro Sales	Degree of Sprawl Indicators
Bakersfield, MSA	**-6.11**	3.53	**-0.83**	2/3
Chico-Paradise MSA	**-18.27**	9.55	47.87	1/3
Fresno, MSA	**-7.67**	**-2.43**	**-7.57**	3/3
LA-Long Beach, PMSA	**-53.30**	**-0.60**	**-11.81**	3/3
Orange, PMSA	**-46.63**	**-2.57**	8.66	2/3
Riverside-San Bernardino, PMSA	**-34.07**	**-0.53**	**-3.56**	3/3
Ventura, PMSA	5.26	**-2.88**	**-19.19**	2/3
Merced, MSA	**-15.97**	**-4.70**	**-0.85**	3/3
Modesta, MSA	1.79	**-2.86**	**-13.93**	2/3
Redding, MSA	**-16.06**	4.92	7.75	1/3
Sacramento, PMSA	**-22.33**	**-4.29**	**-16.61**	3/3
Yolo, PMSA	6.13	4.50	**-5.32**	1/3
Salinas, MSA	11.51	5.50	**-6.65**	1/3
San Diego, MSA	**-10.39**	**-1.40**	1.99	2/3
Oakland, PMSA	**-8.06**	**-9.96**	**-23.92**	3/3
San Francisco, PMSA	**-15.94**	**-1.86**	**-9.71**	3/3
San Jose, PMSA	**-8.30**	0.15	5.39	1/3
Santa Cruz-Watsonville, PMSA	28.82	1.70	**-18.40**	1/3
Santa Rosa, PMSA	3.87	1.79	**-4.07**	1/3
Vallejo-Fairfield-Napa, PMSA	**-0.86**	**-1.96**	2.06	2/3
Visalia-Tulare-Porterville, MSA	**-7.14**	5.18	**-1.29**	2/3
SLO-Atasc-Paso Robles, MSA	**-9.87**	**-2.31**	**-27.77**	3/3
San Barb-Santa Maria-Lom, MSA	**-6.08**	0.77	5.64	1/3
Stockton-Lodi, MSA	**-1.81**	**-1.55**	**-12.03**	3/3
Yuba City, MSA	**-3.79**	7.62	16.26	1/3

I. D. Conclusions and Policy Options

> *While economists may have the theoretical high ground, they can't always follow Through and operationalize their ideas.*

This quote appears in an article by Paul Gottlieb (1999, p. 54) that he titled "Do Economists Have Anything to Contribute to the Debate on Urban Sprawl? (And Would Anybody Listen to Them if They Did?)." In this article, he covers some of the same ground covered in the first half of this report and laments the shortage of quality work by economists on urban sprawl. This shortage is in part due to the difficulty in measuring the metropolitan area land use patterns that urban activists have labeled as urban sprawl: decentralized, low density, non-clustered housing, leapfrog, too much strip, and separation of uses. In this paper, the measurement of at least the degree of decentralized, low-density, and possibly leapfrog development in a metropolitan area has been "operationalized." Over time, these measures are calculated for California urbanized areas and metropolitan regions, and like regions in the western United States. In doing so, the goal was to reduce the shortage of work by economists on urban sprawl.

The picture that emerged concerning the degree of urban sprawl in the Western United States is somewhat mixed, but definitely points to a comparably high degree of decentralization, and continuing decentralization in some of California's urban regions. Whatever the form of data used to identify urban sprawl, analysts can learn from the economist's method of defining excessive suburbanization. If a type of suburbanization generates more private and social costs, than it does private and social benefits, then it is excessive. This is also a reasonable way to characterize the way that the public defines the pejorative use of the term "sprawl" when it is applied to new suburban developments. People and policymakers know that a certain form of suburbanization fails such a benefit/cost test,

they should be appropriately trying to do something to reduce it. At the same time, this does not imply that all forms of suburbanization should be slowed.

Though in reality, the exact measurement of all the costs and benefits associated with a type of suburbanization is difficult, if not impossible. No matter, if policymakers keep in mind the fact that all forms of suburbanization yields benefits and costs, they can eliminate from consideration many of the purely value-laden and one-sided discussions that this issue has been relegated to for so long. Economists do have something important to contribute to the escalating debate on urban land use in U.S. metropolitan areas and policymakers in California can benefit from listening.

Policy options for California

The U.S. Census Bureau anticipates that California's population will grow from around 32.5 million in 2000, to about 34.4 million in 2005, to 41.4 million in 2015, and to 49.3 million in 2025. The nearly 17 million additional people expected to arrive in California in the next 25 years will no doubt offer benefits to the state and its economy. Benefits include the creation of new jobs, new incomes, new tax revenues, and higher property values. More people also mean that existing metropolitan areas will grow more populated.

Population growth in California appears inevitable, but in many respects, we should not fear it. What we do need to fear is growth that is allowed to proceed in a manner that fails to maximize the benefits to be derived from it, and fails to minimize the costs that can arise from it. Call it the opposite of Smart Growth, such dumb growth is what needs to be avoided in California. Public policymakers can advocate and institute approaches designed to steer California's growth in a manner that maximizes the benefits to be derived from it,

while minimizing the costs. The question arises about whether there is a role for state government, or collaborations of county governments, in influencing the process of where people and businesses locate. The reasons for a government role in this process, beyond just local city planning, are the external effects that are largely ignored in private decisions on where to locate and the lack of an appropriate regional level of government to deal with issues that flow over the boundaries of lower levels of government.

Getting people or businesses to consider the social consequences of their location choices offers a reason for government to incentivize the intra-metropolitan location decisions of individuals and firms. This economic solution by no means calls for a complete ban on where people and businesses locate, only that they take into consideration the social costs imposed upon others when choosing urban fringe locations. Since the social benefits and costs of intra-metropolitan location decisions extend beyond city and county borders, a regional strategy is the ideal.

Metropolitan areas in California, like most throughout the United States, lack a binding regional governance structure. With little prospect of such being established in the near future, California state government or coalitions of California county governments in a region, are the arenas in which a discussion can appropriately be convened to consider directing reinvestment into more centralized locations. Perhaps the optimal role for state government would be to provide incentives for the creation of metropolitan-wide collaborative bodies (where they do not already exist) throughout the state that could approach this issue with appropriate solutions tailored to region-specific needs. Though, for these collaborative bodies to be effective at reducing excessive suburbanization, they will

need the legal and institutional ability to employ both "carrots and sticks" to influence local land use decisions.

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II.

Retail Sprawl, Urban Containment, and the "Fiscalization" of Land Use in the Western United States

II. A. Introduction

> ***Perhaps diffusion is too kind of 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 quote made in a 1937 speech to a national conference of planners. Urban planners have retained this term as part of their lexicon, but beyond a label that applies to what they view as undesirable land use patterns, they have not been entirely clear on its meaning. 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 a development agenda based on the now common term "Smart Growth."

Given the recent renewed national interest in the manner in which spatial growth occurs in U.S. urban areas, prominent urban economists, such as Gordon and Richardson (1997), Mills (1999) and Brueckner (2000), have weighed in on the issue with articles that summarize an economic view of urban sprawl and what constitutes smart urban growth. Economists underscore that the metropolitan decentralization of people and economic activity that has been occurring in the United States for well over 50 years has been driven by population increases, real income increases, and decreases in the cost of automobile transportation. To most economists, metropolitan decentralization only represents an "undesirable land use pattern" if the total costs it imposes upon a metropolitan region are greater than the total benefits it generates. Such violations occur when economic actors in a

metropolitan area ignore the social costs (benefits) that their actions impose (bestow) upon others. As a solution, economists suggest that government impose (distribute) the appropriate fees (subsidies) to internalize the social costs (benefits) imposed (bestowed) upon others in a metropolitan area by the private land use choices of individuals and business. Once suitably set these fees and subsidies guide a metropolitan area's smart growth and the debate over the desirability of compact verses non-compact growth ends through externality free markets.

Conversely, analysts such as Ewing (1997), Downs (1999), and Myers and Kitsuse (1999) point out that a purely market-based approach to defining and correcting urban sprawl – or excessive spatial growth that violates a benefit verses cost test – ignores the institutional environment in which economic actors in a metropolitan area make land use decisions. These analysts highlight that state and federal regulations, including state imposed ways of raising local revenue, also influence local land use decisions in the United States, and can generate urban sprawl. Mieszkowski and Mills (1993) also recognize the possibility that local fiscal choices influence the degree of suburbanization in a metropolitan area. In this paper, I take this recognition a step further by performing an empirical test of the relevance of a state's system of local government finance to the generation of a retail urban sprawl in the state's metropolitan areas.

As discussed in Nelson and Duncan (1995) and Nelson (2001), urban growth boundaries and other forms of metropolitan-wide containment have been used in some metropolitan areas in the western United States as a way to slow the spread of activity into non-central places. The statistical analysis within this paper accounts for the possible influence that the presence of these policies can have on reducing retail urban sprawl. As a

complete reading of this paper demonstrates, I find that statewide reliance by municipalities on some forms of own-source revenue exert a significant influence on the degree of retail decentralization in metropolitan areas in the western United States over the period 1977 to 1997. I also find that the continuing presence of certain forms of urban containment policies reduce the degree of retail decentralization.

By means of the way that planners and economists think about sprawl, I develop in the next section the concept of urban retail sprawl used in this paper. Section III contains a brief review of the previous literature on the location of retail activity in a metropolitan area. I also discuss why the way that municipal governments raise revenue in a state can influence the intra-metropolitan location of retail activity in that state. Section IV of the paper offers a description of differences in the degree of retail decentralization in 54 metropolitan areas in the western portion of the United States for the years 1977, 1987, and 1997. In Section V, I describe the empirical test used to determine if statewide averages for municipal revenue reliance exert an influence on the location of retail activity in a metropolitan area. Section VI contains a simulation of the average effect on urban retail sprawl of the average western state reducing or increasing its average local reliance on a revenue instrument. The policy implications of this research are also in the concluding section.

II. B. Urban Retail Sprawl

The inherent difficulty in performing an empirical examination of urban sprawl is that it is not easily quantifiable. As discussed above, the concept of sprawl began as a term used by urban planners to portray what they viewed as undesirable forms of urban land use. Planning experts may know sprawl when they see it, but such a normative identification does not easily lend itself to an objective measure of the degree of sprawl in an urban area.

Fortunately, a few researchers have recognized this shortcoming and developed a list of land use characteristics that are most often associated with what planners and the public regards as urban sprawl.

Ewing (1994, 1997) surveyed academic articles written between 1957 and 1992 and found that low-density, strip, scattered, and leapfrog are the forms of urban development most often labeled urban sprawl. Ewing consolidates these characteristics under his preferred term of "non-compact" development. Similarly, 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. In an interpretive review, Myers and Kitsuse (1999) frame the issue of sprawl in terms of undesirable patterns of density in urban development.

In his surveys of the literature, Ewing (1994, 1997) also stresses that urban sprawl must always be considered a matter of degree. There is a fine distinction between what may be undesirable non-compact development in a metropolitan area, and what can be desirable polycentric development. 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 compact centralized pattern. This is precisely the line of reasoning presented by economists who have written on this issue.

Given this background on what the literature in planning and economics deems as ways of quantifying sprawl, and my desire to test whether the statewide structure of raising municipal revenue influences the degree of sprawl observed in a metropolitan area, I use the

amount of retail activity in non-central places as a surrogate for the degree of sprawl in a metropolitan area. This is a reasonable choice because retail sales activity, and the "big-box" and "strip-mall" ways in which it generally occurs in the suburbs, represents much of what planners and the public perceive as sprawl. However, more non-central retail activity in a metropolitan area does necessarily mean greater sprawl. As economists have highlighted, greater retail activity should naturally occur in the suburbs as suburban population and income levels rise. Accepting this, I consider non-central retail activity to be retail urban sprawl only if it is greater than justified by these economic factors. 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, greater auto reliance for retail shopping, and greater congestion 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).

II. C. Retail Activity in a Metropolitan Area

If urban retail sprawl is defined as non-central activity that is greater than non-central, economic factors warrant, then knowing the relevant economic factors that determine the intra-metropolitan location of retail activity is important. As summarized in DiPasqual and Wheaton (1996), and O'Sullivan (2000), economic theory predicts that a retail firm chooses a location in a metropolitan area based upon the location of its customers, transportation costs, agglomeration economies, and the degree of scale economies in retail production. In a metropolitan area with a dominant 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 intra-metropolitan location on where their customers reside and a division of the region into profitable market areas.

In the last quarter of the 20th Century, most large metropolitan areas in the United States contain more than one dominant central city. Between 1950 and 1990, the percentage of the U.S. metropolitan population living in its central cities fell from 64 to 38 percent. A reflection of this decline in central city population dominance is the fraction of metropolitan retail employment in U.S. central cities falling from about two-thirds in 1950, to a little less than one-half in 1990. Retail suburbanization occurred due to 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.[5]

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 suburbanization as partially the result of citizen 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. The fiscal/social approach may be particularly relevant when considering factors that cause retail

suburbanization. Own-source municipal revenue derived 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 can generate a local fiscal surplus through greater local retail activity, may be a factor in the generation of further retail decentralization. The idea being that local fiscal structure does not induce more retail activity in a metropolitan area, but may induce changes in where it locates. Non-central places draw retail activity from the central places where it has been historically located.[6]

Other researchers have alluded to the possibility that local fiscal factors contribute to the generation of urban decentralization. Harvey and Clark (1965) assert that local reliance on property taxation discourages the platting of land for non-agricultural uses because once done, the land is subject to higher taxation. The hesitancy of jurisdictions to designate agricultural land for non-agricultural uses may encourage leapfrog development. Misczynski (1996) coined the term "the fiscalization of land use" 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) continue with Misczynki's theme and 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.

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[5] 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 office space was in central cities, by 1999 the central city share of office space dropped to 58 percent.

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

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 how much municipalities benefit from them. In a monograph-length study of sales taxation in California, Lewis and Barbour (1999, p. 126) conclude that local sales tax reliance motives local land use decisions in the state, "…although [such reliance is] unlikely to systematically alter broad patterns of retail development." They argue that retailers primarily base location on economic factors that are not subject to much control by local government.

From the perspective of capital investment, 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 property taxation reduces the intensity of land development, lowers population density, and encourages urban sprawl. Their simulation, using reasonable real world values, suggests that the influence of greater local property taxation in generating urban sprawl through an influence on capital use is slightly positive.

Brueckner and Fansler (1983) conducted one of the only regression studies of the determinants of the size of a United State's urban area. Relying on traditional urban theory, and using 1970 data, they regressed the Census defined size in square miles of 40 urbanized areas against the urbanized area's population, median income, rent paid on agricultural land, and proxies for commuting costs. The signs of their regression coefficients were as expected and their model's predictive power equivalent to an R-squared statistic of nearly 0.80. They

interpret these results as empirical support for metropolitan decentralization generated through an ordinary market process.

In the empirical analysis that follows, I expand upon Brueckner and Fansler's study by including statewide measures of municipal revenue reliance in a regression that explains retail activity in non-central places in U.S. metropolitan areas in the West. Before I describe the method to do this, I offer in the next section a description of metropolitan areas included in the study and differences over time in their non-central place retail activity.

II. D. Metropolitan Retail Decentralization in the Western United States

An empirical study of the degree and causes of retail decentralization must begin with a unit of analysis. For this study, it is the 61 metropolitan areas in what the U.S. Census Bureau defines in 1990 as the continental western United States, less the seven metropolitan areas in Idaho, Montana, and Wyoming. I limit the analysis to metropolitan areas in the West for a few reasons. The first is the fact that six of the eight states defined as the West 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); voters in California, Oregon, and Colorado voters used the initiative to limit local property taxation throughout their state. In Arizona, Nevada, and Utah, the state legislature took similar steps.[7] 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. Unlike metropolitan areas in other parts of the United States, this resulted in lower densities at the urban core. It is therefore reasonable to compare only western metropolitan areas, and to exclude other U.S areas whose metropolitan structures at a point in time are products of their quite different historical development. In addition, I exclude metropolitan areas in Idaho, Montana and Wyoming because I believe these three states to be outliers in terms of the majority western United States' metropolitan development patterns.[8]

Table 1 contains a description of the 54 metropolitan areas used in the analysis. The first column of this table provides the metropolitan area's name and whether the U.S. Census Bureau considers it a Metropolitan Statistical Area (MSA) or a Primary Metropolitan Statistical Area (PMSA).[9] Column 2 in Table 1 lists the square miles of each metropolitan area, while column 3 contains the names of the component counties for each MSA or PMSA. Column 4 in Table 1 offers the names of the 1990 Census defined "urbanized areas" that are included in each metropolitan area, and column 5 provides the 1990 Census defined "central places" that are in each of the urbanized areas. The U.S. Census Bureau defines an urbanized area as having a population of at least 50,000 and including at least one central place and a surrounding area with a population density exceeding 1,000 per square mile. The Census considers central places to be the dominant employment and residential centers in each urbanized area.

insert Table 1 approximately here

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[7] 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.

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

[9] 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.

Table 1: Urban Area Definitions in the Western United States

1990 Metropolitan Area Name	1990 Metropolitan Area Square Miles	1990 Counties in Metropolitan Area	1990 Urbanized Areas in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Phoenix-Mesa AZ, MSA	14,574	Maricopa AZ, Pinal AZ	Phoenix AZ	Mesa AZ, Phoenix AZ, Scottsdale AZ, Tempe AZ
Tuscon AZ, MSA	9187	Pima AZ	Tucson AZ	Tucson AZ
Yuma AZ, MSA	5514	Yuma AZ	Yuma AZ	Yuma AZ
Bakersfield CA, MSA	8142	Kern CA	Bakersfield CA	Bakersfield CA
Chico-Paradise CA, MSA	1640	Butte CA	Chico CA	Chico CA
Fresno CA, MSA	8102	Fresno CA, Madera CA	Fresno CA	Fresno CA
Los Angeles-Long Beach CA, PMSA	4060	Los Angeles CA	Lancaster-Palmdale CA, Los Angeles-Long-Beach CA, Oxnard-Ventura CA	Lancaster CA, Long Beach CA, Los Angeles CA, Pasadena CA
Orange CA, PMSA	790	Orange CA	Los Angeles-Long Beach CA	Anaheim CA, Irvine CA, Santa Ana CA
Riverside-San Bernardino CA, PMSA	27,270	Riverside CA, San Bernardino CA	Henet-San Jacinto CA, Hesperito-Apple Valley-Victorville CA, Indio-Coachella CA, Los Angeles-Long Beach CA, Palm Springs CA, Riverside-San Bernardino CA	Hemet CA, Palm Dessert CA, Palm Springs CA, Riverside CA, San Bernardino CA, Temecula CA
Ventura CA, PMSA	1846	Ventura CA	Los Angeles-Long Beach CA, Oxnard-Ventura CA, Simi Valley CA	San Buenaventura (Ventura) CA
Merced CA, MSA	1929	Merced CA	Merced CA	Merced CA
Modesta CA, MSA	1495	Stanislaus CA	Modesto CA	Modesto CA, Turlock CA
Redding CA, MSA	3786	Shasta CA	Redding CA	Redding CA
Sacramento CA, PMSA	5094	El Dorado CA, Placer CA, Sacramento CA	Sacramento CA	Sacramento CA

1990 Metropolitan Area Name	1990 Metropolitan Area Square Miles	1990 Counties in Metropolitan Area	1990 Urbanized Areas in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Yolo CA, PMSA	1012	Yolo CA	Davis CA, Sacramento CA	Davis CA, Woodland CA
Salinas CA, MSA	3322	Monterey CA	Salinas CA, Seaside-Monterey CA, Watsonville CA	Monterey CA, Salinas CA
San Diego CA, MSA	4205	San Diego CA	San Diego CA	Coronado CA, Escondido CA, San Diego CA
Oakland CA, PMSA	1458	Alameda CA, Contra Costa CA	Antioch-Pittsburgh CA, San Francisco-Oakland CA	Alameda CA, Berkeley CA, Oakland CA
San Francisco CA, PMSA	1016	Marin CA, San Francisco CA, San Mateo CA	San Francisco-Oakland CA	San Francisco CA
San Jose CA, PMSA	1291	Santa Clara CA	San Jose CA	Gilroy CA, Palo Alto CA, San Jose CA, Santa Clara CA, Sunnyvale CA
Santa Cruz-Watsonville CA, PMSA	446	Santa Cruz CA	Santa Cruz CA	Santa Cruz CA, Watsonville CA
Santa Rosa CA, PMSA	1576	Sonoma CA	Santa Rosa CA	Petaluma CA, Santa Rosa CA
Vallejo-Fairfield-Napa CA, PMSA	1582	Napa CA, Solano CA	Fairfield CA, Napa, Vacaville CA	Fairfield CA, Napa CA, Vacaville CA, Vallejo CA
Visalia-Tulare-Porterville CA, MSA	4824	Tulare CA	Visalia CA	Porterville CA, Tulare CA
San Luis Obispo-Atascadero-Paso Robles CA, MSA	3305	San Luis Obispo CA	San Luis Obispo CA	Atascadero CA, Paso Robles CA, San Luis Obispo CA
Santa Barbara-Santa Maria-Lompoc CA, MSA	2739	Santa Barbara CA	Lompoc CA, Santa Barbara CA, Santa Maria CA	Lompoc CA, Santa Barbara CA, Santa Maria CA
Stockton-Lodi CA, MSA	1399	San Joaquin CA	Lodi CA, Stockton CA	Lodi CA, Stockton CA
Yuba City CA, MSA	1233	Sutter CA, Yuba CA	Yuba CA	Yuba CA
Boulder-Longmount CO, PMSA	743	Boulder CO	Boulder CO, Longmount CO	Boulder CO, Longmount CO
Colorado Springs CO, MSA	2127	El Paso CO	Colorado Springs, CO	Colorado Springs, CO
Denver CO, PMSA	3761	Adams CO, Arapahoe CO, Denver CO, Douglas CO, Jefferson CO	Denver CO	Denver CO

1990 Metropolitan Area Name	1990 Metropolitan Area Square Miles	1990 Counties in Metropolitan Area	1990 Urbanized Areas in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Fort-Collins-Loveland CO, MSA	2601	Larimer CO	Fort Collins CO	Fort Collins CO
Grand Junction CO, MSA	3328	Mesa CO	Grand Junction CO	Grand Junction CO
Greeley CO, MSA	3993	Weld CO	Greeley CO	Greeley CO
Pueblo CO, MSA	2389	Pueblo CO	Pueblo CO	Pueblo CO
Las Vegas NV & AZ, MSA	39,370	Clark NV, Mohave AZ, Nye NV	Las Vegas NV	Las Vegas NV
Reno NV, MSA	6343	Washoe NV	Reno NV	Reno NV
Albuquerque NM, MSA	5944	Bernalillo NM, Sandoval NM, Valencia NM	Albuquerque NM	Albuquerque NM
Las Cruces NM, MSA	3807	Dona Ana NM	Las Cruces NM	Las Cruces NM
Santa Fe NM, MSA	2019	Los Alamos NM, Santa Fe NM	Santa Fe NM	Santa Fe NM
Eugene-Springfield OR, MSA	4554	Lane OR	Eugene-Springfield OR	Eugene OR, Springfield OR
Medford-Ashland OR, MSA	2785	Jackson OR	Medford OR	Medford OR
Portland-Vancouver OR, PMSA	5028	Clackamas OR, Columbia OR, Multnomah OR, Washington OR, Yamhill OR, Clark WA	Portland-Vancouver OR-WA	Portland OR, Vancouver WA
Salem OR, PMSA	1926	Marion OR, Polk OR	Salem OR	Salem OR
Provo-Orem UT, MSA	1998	Utah UT	Provo-Orem UT	Provo UT, Orem UT
Salt Lake City-Ogden UT, MSA	1618	Davis UT, Salt Lake UT, Weber UT	Salt Lake City UT, Ogden UT	Salt Lake City UT, Ogden UT
Bellingham WA, MSA	2120	Whatcom WA	Bellingham WA	Bellingham WA
Bremerton WA, PMSA	396	Kitsap WA	Bremerton WA	Bremerton WA

1990 Metropolitan Area Name	1990 Metropolitan Area Square Miles	1990 Counties in Metropolitan Area	1990 Urbanized Areas in Metropolitan Area	1990 Central Places (Cities) in Metropolitan Area
Olympia WA, PMSA	727	Thurston WA	Olympia WA	Olympia WA
Richland-Kennewick-Pasco WA, MSA	2945	Benton WA, Franklin WA	Richland-Kennewick-Pasco WA	Kennewick WA, Pasco WA, Richland WA
Seattle-Bellevue-Everett WA, PMSA	4925	Island WA, King WA, Snohomish WA	Seattle WA	Auburn WA, Everett WA, Seattle WA
Spokane WA, MSA	1764	Spokane WA	Spokane WA	Spokane WA
Tacoma WA, PMSA	1678	Pierce WA	Tacoma WA	Tacoma WA
Yakima WA, MSA	4296	Yakima WA	Yakima WA	Yakima WA

Since the focus of this paper is retail activity in suburban locations, I define the suburban area within a metropolitan area as the component counties in a MSA or PMSA, less the central places included in 1990 in the urbanized areas in a metropolitan 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. With existing data sources, this definition of suburbia is an attempt to account for the polycentric nature of most U.S. metropolitan areas.

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 states of California, Arizona, Colorado, Nevada, New Mexico, Oregon, Utah, and Washington. Information on the dollar amount of retail activity in the relevant metropolitan areas comes from the 1977, 1987, and 1997 U.S. *Census of Retail Trade*. The corresponding value for a non-central place equals the metropolitan-wide value less the values for 1990-defined central places contained in the metropolitan area. The first three data columns in Table 2 illustrate the variation in the degree of retail sales decentralization across metropolitan areas and within a metropolitan area over time. The last two data columns in Table 2 indicate the percentage change in retail decentralization for each area, for the periods 1977 to 1987, and 1987 to 1997. The top eight data rows in this table report the averages for each state using metropolitan area as the unit of observation.

insert Table 2 approximately here

Metropolitan areas in Arizona, between 1977 and 1987, on average experienced a slight 4.3 percent decrease in the degree of metropolitan retail sales in non-central places, while this measure rose by 45.4 percent between 1987 and 1997. Alternatively, metropolitan areas in Utah on average experienced a 22.0 percent increase in the decentralization of retail

Table 2: Distribution of Retail Sales and Changes in Retail Sales for Non-Central Places and Metroplitan Areas in the Western United States

1990 Metropolitan Area Name	1977 Non-Central Place / Metro Retail Sales	1987 Non-Central Place / Metro Retail Sales	1997 Non-Central Place / Metro Retail Sales		1977 to 1987 % Change in Non-Central Place / Metro Sales	1987 to 1997 % Change in Non-Central Place / Metro Sales
Arizona average for MSAs	0.190	0.180	0.260		-4.28	45.39
California average for (P)MSAa	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
Orange CA, PMSA	0.757	0.773	0.754		2.16	-2.54
Riverside-San Bernardino CA, PMSA	0.598	0.691	0.702		15.58	1.59
Ventura CA, PMSA	0.760	0.761	0.807		0.14	6.02
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
Redding CA, MSA	0.272	0.227	0.167		-16.54	-26.41
Sacramento CA, PMSA	0.694	0.722	0.768		4.05	6.41
Yolo CA, PMSA	0.280	0.248	0.288		-11.35	16.13
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
Oakland CA, PMSA	0.720	0.748	0.808		3.89	8.06
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
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
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
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
Stockton-Lodi CA, MSA	0.330	0.289	0.375		-12.34	29.57
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
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-Beelevue-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

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 western metropolitan areas between 1977 and 1997, it is hard to draw any specific conclusions from the information in Table 2. To comprehend the observed variation, a regression analysis of the determinants of suburban retail activity is obviously necessary.

II. E. Statewide Local Revenue Choices and Retail Decentralization

The dependent variable for this empirical study 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. This pooling of cross section and time series data allows for variation in non-central retail sales to occur across metropolitan areas and within an area over time. I use this data to carry out a regression test of whether statewide averages for relevant forms of own-source municipal revenue reliance exert a significant influence on the amount of non-central retail sales in a state's metropolitan areas. To do this, an overall model of what determines non-central retail sales in a metropolitan area is necessary. The model that follows builds upon the earlier work of Brueckner and Fansler (1983).

As described in Section II, economic theory indicates that the real dollar value of retail sales in the suburban portion of a metropolitan region increases as suburban real income and population increases. Suburban retail activity can also be slowed through 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 (income, population, price of agricultural land, and transportation options) are what Brueckner and Fansler expected to influence the size of an urbanized

area.[10] With the exception of a proxy for transportation options, the model used here to predict suburban retail sales relies on these same causal factors. The model excludes metropolitan transportation options for two reasons: (1) the likelihood that demographics, population, and income largely determine transportation options, and (2) the influence of transportation options on suburban retail activity is not the focus of this investigation. If included, such a measure would be a simultaneously determined variable and need to be appropriately modeled.[11]

In addition, to accurately assess the influence of statewide averages for local fiscal choices on suburban retail activity, further refinement of Brueckner and Fansler's model of urban size is necessary. This is in the form of controlling for demographic differences in the type of population located in non-central places, previous decade's growth in non-central population, and any forms of urban growth control that may be present. The model used to define the regression analysis is thus:

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

where,

$i = 1, 2, 3, \ldots 54$ (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 influences the amount of retail activity in non-central metropolitan places through the process

[10] 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's (1983) paper.

of local fiscal zoning and local economic development incentives.[12] As widely documented, municipalities in the United States regulate local land uses with an eye on the fiscal bottom-line.[13] As also widely documented, municipal governments in the United States use incentives to attract desirable land uses within their boundaries.[14] 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 produce different amounts of fiscal surplus generated by local land devoted to retail activity. Holding other factors that determine non-central retail sales constant, the greater the percentage statewide reliance on a municipal revenue source that generates greater local fiscal surplus for local retail activity, the more likely that local officials may zone for retail land uses and use local incentives to try and encourage it.

The U.S. *Census of Governments* divides municipal own-source revenue into two broad groups: taxes and current charges/miscellaneous revenue. The Census describes current charges as fees for specific local services delivered to a local citizen or business. If levied in this manner, they generate little fiscal surplus for a community and their average local use in a state should theoretically exert no influence on intra-metropolitan retail activity through suburban governments seeking retailers for the fiscal surplus they generate.

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[11] 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) were never statistically significant factors in explaining the size of an urbanized area.

[12] Municipal revenue reliance is calculated as a percentage of own-source revenue, as opposed to total revenue, because municipalities have little control over revenue received from the state and federal governments. Reliance on a local revenue source, that a municipality could conceivably alter the base upon which revenue is raised from it, should exert a greater influence on the municipality's desire to alter the base (i.e., increase the amount of retail activity within its boundaries).

[13] 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) also provides a recent summary of land use regulation as a local fiscal tool in the United States.

Nevertheless, if levied in a manner that more than covers the marginal cost of providing local services to a new retailer, they could generate a local fiscal surplus and stimulate local land use policies that favor greater retail activity. For the purpose of this study, relevant current charges equals the Census defined value, plus special assessments, less charges collected through the municipal operation of hospitals.[15]

The Census defines miscellaneous revenue as interest earnings, special assessments (that are like a fee for a service), sale of property, and other general revenue. With the exception of special assessments, these are unrelated to the potential generation of a local fiscal surplus through greater retail activity and excluded as causal factors in the above regression model. The U.S. *Census of Governments* classifies municipal taxes as property, sales, individual income, corporate income, motor vehicle license, and other taxes. In the eight western United States under consideration here, none allow local personal or corporate income taxes. I account for all other forms of local taxation because they offer the potential for a local suburban government to enjoy a fiscal surplus through the attraction of greater retail activity within its boundaries.[16]

Economic theory indicates that suburban income and population exerts 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 retail development specified by population and retail sales may be smaller, *ceteris paribus*, in an area that

[14] 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.
[15] Charges collected in the operation of municipal hospitals are not included because it is the one category of user charges totally unrelated to local retail activity.

previously experienced high population growth. In addition, suburban 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.[17]

The regression model used to explain non-central retail activity in a metropolitan area also contains three explanatory variables that control for the three different types of urban containment policies (UCPs) that could be used to control the path of urban development in the area. UCPs are designed to reduce urban sprawl and could thus reduce the amount of non-central retail activity in metropolitan areas were they are in place. I use the three broad types of UCPs designated by Nelson (2001) in his recent examination of these policies. The first type is closed-region containment that preserves land at the urban fringe and explicitly attempts to shift displaced development back to the center. The second type is open-region containment that does nothing to preserve open space at the fringe, but does attempt to shift development to the center of the urban area. The final type of UCP is isolated containment that preserves limited land at some jurisdictional boundaries within a metropolitan area, but again does nothing to shift development outside of these boundaries back to the urban core. A description of the metropolitan areas that had urban containment policies in place, the type they are, and when they began, are in Table 3. Since any type of UCP is more likely to be effective the longer that it has been in place – because desired development patterns are more likely to bump up against restrictions as time pass – the three variables that account for the

[16] The categories of municipal own-source revenue excluded from the analysis are revenue from hospitals, interest earnings, property sales, utilities and liquor stores, motor vehicle taxes, other general sources, and employee retirement.

[17] I also tried to account for the spillover of retail customers between contiguous metropolitan areas by including a dummy variable representing such metropolitan areas. This dummy was never statistically significant in the OLS and random effects models, and could not be included in the fixed effects regression model due to perfect colinearity. A separate dummy for whether a metropolitan area is a PMSA, and not a MSA, yielded similar results. Thus, both of these dummies are not included in the final analysis.

three types of urban containment measure the number of years that the policy has been in place.

insert Table 3 approximately here

Concerning revenue choices, the effect of the statewide percentage of total municipal revenue from property taxes on suburban retail sales is uncertain. As Brueckner and Kim (2000) demonstrate, the expected overall theoretical influence of higher property taxation on urban sprawl through capital use is uncertain. Greater municipal reliance on property taxes may also encourage local land use decisions that favor activities 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 shopping centers do in generating a property tax fiscal surplus relative to alternative uses for a municipality's land (housing or manufacturing).

Greater statewide reliance on sales taxation as a source of own-source municipal revenue offers yet another reason for suburban governments to lure retailers, especially the "big-box" type that generate high sales per customer, away from traditional business districts in central place communities, and hence increase the amount of retail sales in the suburbs. In support of this possibility, Lewis and Barbour (1999) found that in 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, "new sales tax revenues" always finished first or second in terms of the ranking most often given. Interestingly, only the 36 central city officials in the sample systematically ranked retail and sales tax considerations lower. The lure of collecting other taxes, like a business license fee, from retailers should also offer an additional motivation for suburban governments to draw retail activity away

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

		Type of UCP	
Western Metropolitan Areas with an Urban Containment Policy (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	1975		
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			1980
Santa Barbara-Santa Mraia-Lompoc CA, MSA			1989
Yuba City CA, MSA			1989
Boulder-Longmount CO, PMSA			1978
Denver CO, PMSA		1998	
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		

from traditional central place locations. If fees and special assessments generate more local revenue from retailers than needed to cover the additional local services provided them, greater statewide reliance on them could also generate greater retail sprawl.

The top of Table 4 contains a full description of the dependent and explanatory variables used in this regression study. The values for median household income and population are from the U.S. Department of Housing and Urban Development's *State of the Cities Data System*.[18] Real income values were not available for 1997, and extrapolated from the available 1979 and 1989 values. Interpolation from the available decennial Census years is 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 values come from the U.S. *Census of Agriculture.*

insert Table 4 approximately here

The body of Table 4 provides the mean and standard deviation for each variable included in the regression analysis. The table contains the overall values for all 54 metropolitan regions and all three years (1977, 1987, and 1997), and the values for each of the different years and each of the different states. The descriptive statistics for a state are for all three years, but for only the metropolitan areas in the state. A quick scan of these yields some interesting differences between states in the West. Non-central metropolitan places in

Table 4: Descriptive Statistics for Variables Included in Regression Analysis

	Real Value Metropolitan Retail Sales in Non-Cenral Places ($1,000s)	Real Value Median Household Income in Non-Central Places	Population in Non-Central Places	Previous Ten Year Percentage Growth in Population in Non-Central Places	Years that Closed-Region Urban Containment in Place	Years that Open-Region Urban Containment in Place	Years that Isolated Urban Containment in Place	Real Value Agriculture Products in Metro Area Per Acre in Agriculture	Percentage Population Less Than Age 18	Percentage Population Greater Than Age 64	Fraction of Statewide Own Municipal Revenue from Property Taxes	Fraction of Statewide Own Municipal Revenue from Sales Taxes	Fraction of Statewide Own Municipal Revenue from Other Taxes	Fraction of Statewide Total Municipal Revenue from Relevant Charges
Overall Mean	$3,844,121	$41,733	450,783	28.92	0.919	0.185	1.339	$858.86	29.17	10.79	0.188	0.213	0.061	0.205
(Std. Dev.)	($7,017,489)	($8,562)	(729,214)	(18.97)	(3.343)	(1.513)	(4.260)	($889.35)	(6.41)	(3.09)	(0.099)	(0.077)	(0.027)	(0.057)
1977 Mean	$3,297,391	$39,706	357,442	36.71	0.037	0.000	0.148	$840.06	31.85	9.55	0.299	0.261	0.077	0.195
(Std. Dev.)	($6,312,034)	($6,966)	(628,081)	(24.42)	(0.272)	(0.000)	(0.787)	($875.07)	(4.67)	(2.70)	(0.074)	(0.088)	(0.029)	(0.066)
1987 Mean	$3,830,541	$42,540	445,021	26.12	0.666	0.130	1.070	$730.57	28.62	10.69	0.133	0.181	0.054	0.175
(Std. Dev.)	($7,357,004)	($8,824)	(714,680)	(14.87)	(2.257)	(0.953)	(3.179)	($793.75)	(6.32)	(2.71)	(0.052)	(0.049)	(0.026)	(0.024)
1997 Mean	$4,394,304	$42,952	549,887	23.95	2.056	0.241	2.791	$1,005.94	27.06	12.14	0.132	0.198	0.053	0.243
(Std. Dev.)	($7,405,506)	($9,483)	(831,357)	(13.42)	(5.159)	(0.432)	(6.382)	($983.72)	(7.13)	(3.30)	(0.052)	(0.067)	(0.020)	(0.050)
AZ Mean	$2,010,827	$35,591	326,870	53.27	0.000	0.000	0.333	$892.15	27.73	15.38	0.137	0.318	0.032	0.230
(Std. Dev.)	($2,342,804)	($7,249)	(319,447)	(26.98)	(0.000)	(0.000)	(1.000)	($1,097.86)	(3.57)	(2.27)	(0.054)	(0.078)	(0.001)	(0.009)
CA Mean	$5,698,746	$43,343	643,052	22.54	0.480	0.320	2.053	$1,103.37	26.83	11.16	0.205	0.208	0.071	0.189
(Std. Dev.)	($9,235,101)	($10,260)	(965,874)	(13.48)	(2.882)	(2.113)	(5.294)	($934.11)	(5.78)	(2.46)	(0.101)	(0.041)	(0.011)	(0.020)
CO Mean	$2,031,826	$413,779	220,660	28.48	0.000	0.000	2.619	$307.82	29.74	8.91	0.113	0.305	0.031	0.237
(Std. Dev.)	($4,373,394)	($6,569)	(389,743)	(17.97)	(0.000)	(0.000)	(5.678)	($307.94)	(3.44)	(3.62)	(0.060)	(0.050)	(0.007)	(0.083)
NV Mean	$3,005,335	$43,524	349,634	62.88	0.000	0.000	0.000	$29.15	37.50	9.86	0.205	0.082	0.143	0.259
(Std. Dev.)	($2,873,989)	($4,843)	(323,006)	(37.38)	(0.000)	(0.000)	(0.000)	($20.08)	(13.78)	(1.98)	(0.070)	(0.010)	(0.035)	(0.062)
NM Mean	$360,716	$35,710	111,060	37.08	0.000	0.666	0.000	$178.38	32.32	7.71	0.133	0.200	0.029	0.253
(Std. Dev.)	($401,752)	($9,154)	(78,236)	(9.30)	(0.000)	(2.000)	(0.000)	($227.15)	(2.89)	(1.54)	(0.086)	(0.079)	(0.025)	(0.066)
OR Mean	$3,021,582	$38,066	356,354	17.91	7.333	0.000	0.000	$491.29	27.68	14.13	0.267	0.065	0.061	0.239
(Std. Dev.)	($4,137,498)	($4519)	(415,131)	(9.85)	(6.971)	(0.000)	(0.000)	($284.12)	(1.88)	(2.93)	(0.025)	(0.003)	(0.018)	(0.044)
UT Mean	$3,514,708	$42,458	450,698	38.38	0.000	0.000	0.000	$308.06	44.02	7.51	0.175	0.243	0.035	0.227
(Std. Dev.)	($3,742,655)	($2879)	(394,820)	(12.12)	(0.000)	(0.000)	(0.000)	($61.35)	(6.27)	(1.47)	(0.046)	(0.053)	(0.010)	(0.022)
WA Mean	$2,408,530	$42,427	297,689	31.72	1.042	0.000	0.208	$1,348.53	30.32	10.09	0.163	0.214	0.069	0.159
(Std. Dev.)	($4,172,761)	($5,241)	(400,232)	(14.17)	(2.074)	(0.000)	(1.021)	($967.88)	(3.10)	(1.70)	(0.055)	(0.033)	(0.018)	(0.071)

California exhibit both the highest real median household income and population in the Western United States. The previous decade's rate of population growth in Arizona and Nevada was nearly twice as large as the overall average rate for all states in the sample. The real value of agricultural products per acre in California and Washington State metropolitan areas is greater than $1,100, while in Nevada it is only $29.

The last four columns of Table 4 illustrate long-term, cross-state variation in how municipal governments raise own-source revenue. Regarding property taxation, between 1977 and 1997, local governments in New Mexico drew only 13.3 percent of their own-source revenue from this source, while municipal governments in Oregon drew 26.7 percent. For sales taxes, municipal governments in Oregon relied on it for none of their revenue, while municipal governments in Colorado gained 30.5 percent of their total revenue from it. Statewide aggregates also hide some large within state variations that occurred throughout the years under consideration. For instance, in 1977, local governments in California drew 34.6 percent of own-source revenue from property taxation; but by 1997, this value had fallen to 13.1 percent. Sales taxation totaled 14.9 percent of New Mexico's own-source municipal revenue in 1977; by 1997, this rose to 30.5 percent. Washington municipalities relied on relevant retail charges for only 6.2 percent of their own-source revenue in 1977; by 1997, this figure rose to 23.2 percent. Full details on fractions of statewide own-source municipal revenue from the various sources, for all years and all states, are in Table 5.

insert Table 5 approximately here

An additional concern for the regression analysis is how to control for non-measurable factors fixed in a given year across all areas, or fixed in a given area for all years, that can influence the real value of retail activity observed in the non-central portion of an

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

Table 5: Fraction of Total Revenue from Various Sources for all Municipal Governments in Western States

Year and State	Fraction of Statewide Own Municipal Revenue from Property Taxes	Fraction of Statewide Own Municipal Revenue from Sales Taxes	Fraction of Statewide Own Municipal Revenue from Other Taxes	Fraction of Statewide Own Municipal Revenue from Relevant Charges
1997 Arizona	0.095	0.285	0.033	0.242
1997 California	0.131	0.179	0.060	0.207
1997 Colorado	0.068	0.289	0.026	0.349
1997 Nevada	0.172	0.070	0.104	0.327
1997 New Mexico	0.085	0.305	0.016	0.266
1997 Oregon	0.289	0.061	0.079	0.251
1997 Utah	0.142	0.217	0.033	0.237
1997 Washington	0.133	0.205	0.057	0.233
1987 Arizona	0.106	0.247	0.031	0.227
1987 California	0.137	0.180	0.067	0.162
1987 Colorado	0.077	0.256	0.026	0.162
1987 Nevada	0.149	0.085	0.141	0.261
1987 New Mexico	0.066	0.147	0.009	0.172
1987 Oregon	0.294	0.066	0.038	0.182
1987 Utah	0.150	0.201	0.025	0.198
1987 Washington	0.118	0.181	0.055	0.181
1977 Arizona	0.209	0.420	0.032	0.223
1977 California	0.346	0.266	0.085	0.200
1977 Colorado	0.196	0.372	0.042	0.201
1977 Nevada	0.295	0.092	0.183	0.189
1977 New Mexico	0.247	0.149	0.063	0.322
1977 Oregon	0.450	0.069	0.065	0.284
1977 Utah	0.234	0.311	0.047	0.245
1977 Washington	0.239	0.258	0.094	0.062

area. Since the factors in a given year are very likely related to position of the national economy in the business cycle, and such a fixed effect is best picked up in the regression's constant term, a dummy variable for observations from 1987, and another dummy variable for observations from 1997, are also 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.[19] The first is the "fixed effects" 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. In this "random effects" method, the regression's error is composed of the traditional component plus a second component that varies by area. A final option is to do nothing to account for specific area effects. The regression results recorded in Table 6 include two of these three possibilities, and the results of statistical tests that indicate which of three possibilities are preferred.

insert Table 6 approximately here

The first column of regression results in Table 6 is just the ordinary least squares results with no attempt to control for area effects. These results, and the fixed effect regression results in the second column of results, use White's method of adjusting the regression coefficient's standard errors for possible bias arising from heteroskedasticity from an unknown source.[20] All entries in Table 5 first contain, in bold, the respective mean

[19] See Kennedy (1992, pp. 222-23) for a further description of these possibilities.
[20] See Kennedy (1992, Chapter 8) for a description of what heteroskedasticity is and the problems it presents for regression analysis. The White method of correction is described on p. 130.

Table 6: Regression Results Using Real Value Metropolitan Retail Sales ($1,000s) in Non-Central Places as Dependent Variable

				Fixed Effects
Explanatory Variables		**Ordinary Least Squares**		**Ordinary Least Squares**
Constant		-4001373.13**		*not reported*
		(1735679.40)		
1987 Year Dummy		-277343.27		821791.60**
		(708606.36)		(372271.21)
1997 Year Dummy		-1158323.58*		604322.93*
		(756466.54)		(386001.36)
Real Value Median Household		**0.602**		
Income in Non-Central Places		55.08***		15.78
		(13.14)		(21.13)
Population in Non-Central		**1.095**		**0.799**
Places		9.28***		6.77***
		(0.14)		(0.60)
Previous 10 Year Percentage		**-0.094**		
Growth in Non-Central Places		-12480.10**		4451.56
		(5570.05)		(3737.21)
Years that Closed-Region Urban				**-0.009**
Containment in Place		3735.39		-37537.27**
		(31948.01)		(21520.26)
				0.001
Years that Open-Region Urban		33663.10		30400.95*
Containment in Place		(60925.71)		(20934.07)
				-0.004
Years that Isolated Urban		96.21		-13089.99**
Containment in Place		(22972.61)		(8117.36)
Real Value Agriculture Products				**-0.086**
in Metro Area Per Acre in Agric.		120.94		-382.74**
		(109.97)		(198.11)
Percentage of Population in Non-				
Central Places Less than Age 18		7396.77		9663.56
		(16647.35)		(16517.98)
Percentage of Population in Non-				**0.262**
Central Places Greater than Age 64		36806.83		92808.37**
		(39835.16)		(39187.75)
Fraction of Statewide Own Municipal				
Revenue from Property Taxes		-535079.39		2572444.98
		(2803090.40)		(2079780.50)
Fraction of Statewide Own Municipal				**0.108**
Revenue from Sales Tax		1665232.74		1934688.77**
		(2310509.00)		(1134956.40)
Fraction of Statewide Own Municipal				**0.198**
Revenue from Other Taxes		4583778.11		12309902.10**
		(4966225.10)		(4930050.20)
Fraction of Statewide Own Municipal		**0.239**		**0.079**
Revenue from Relevant Charges		4459977.38**		1477895.22*
		(2103259.50)		(962869.14)
Obervations		161		161
R-Squared Statistic		0.977		0.995
Adjusted R-Squared Statistic		0.974		0.992
F-Test Statistic				6.753***
Lagrange Multipler Test Statistic				36.66***
Hausman Test Statistic				61.65***
White Heteroskedsaticity Corrected		yes		yes
*** = Statiscally significant in two-tailed test at greater than 99% confidence, ** = 91 to 99 % confidence,				
* = 85 to 90% confidence.		**Elasticities, calculated from means, in bold.**		

elasticities for the statistically significant regression coefficients.[21] Below these are the actual regression coefficients, and in parenthesis, below these, are the coefficient's standard errors.[22] 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 effects 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 effects model is preferred to simple ordinary least squares. The statistical significance of the Hausman statistic indicates that the fixed effects model is preferred to the random effects model due to correlation between the calculated random effects errors and the random effects regressors. Such correlation is likely to bias the regression coefficients in the random effects model.[23] Based upon these test statistics, the preferred results are from the fixed effects regression model. The ordinary least squares regression results are provided to show the difference in magnitude and statistical significance of regression coefficients after fixed effects are appropriately controlled for.

As expected, non-central place population exerts a significant influence on non-central place retail sales. In the fixed effects model, a one-percent increase in suburban population from its mean, results in about 0.8 percent 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 U.S. metro areas record a larger 1.1 percent increase in urbanized land area for a one percent increase in urbanized population.

[21] Statistical significance is defined at greater than 85 percent confidence in a two-tailed test.
[22] The regressions use only 161 of the possible 162 observation (54 areas over three areas), because the Yuba City CA, MSA was not in existence in 1977.
[23] The Hausman statistic could only be calculated after the year dummies were dropped from the regression.

In the fixed effects regression, household income exerted no statistically significant influence on real retail sales.[24]Other significant influences in the fixed effects regression, that were non-fiscal in nature, is that a one-percent increase in the proxy of price per acre of agriculture land resulted in about a 0.1 percent decrease in real retail sales. This is the expected effect of higher prices for suburban land slowing down the amount of suburban retail expansion and subsequent retail sales. Brueckner and Fansler (1983) record a twice-higher elasticity of –0.2 for a similar explanatory variable's effect on the size of urbanized land area, but this came from a single cross section where they did not control for any fixed effects. In addition, a one percent increase in the percentage of the non-central population over age 64 yields about 0.3 percent increase in non-central retail sales.

Particularly notable are the regression coefficients calculated for the number of years that the three different forms of urban containment policies were in place. For every year that a western metropolitan area used a policy of closed-region urban containment (a metropolitan-wide boundary which preserves open space outside it and consciously shifts demand for regional development to within it), the real value of retail activity in non-central places, *ceteris paribus,* fell by about $37.5 million. For the less restrictive use of isolated urban containment (open space preservation beyond jurisdictional boundaries not accompanied by efforts to redirect development demand back to central places), every year that it was in place saw a $13.1 million decrease in real retail activity in non-central places. Though these yearly decreases in what I have defined as retail urban sprawl are not large relative to the average real value on non-central retail activity of $3.8 billion, after 20 years

[24] This may be due to inaccuracies in actual 1997 real income generated by its value being extrapolated from 1979 and 1989 Census values.

of closed-region (isolated) urban containment, the resulting $750 ($262) million reduction must be considered significant amounts.

The regression coefficient of 30,401 on the variable representing the number of years that open-region urban containment in place also deserves explanation. Recall that this form of urban containment policy is the least restrictive in that it makes no attempt to preserve open space outside of drawn boundaries. The adoption of such policies in only the western metropolitan areas of Denver and Santa Fe is likely a response to increasing urban sprawl in these areas. But as the regression results indicate, without concentrated efforts to redirect activity back to central places, open-space urban containment policies does not reduce it. The positive coefficient on years of open-region urban containment is unlikely to be causal and only picking up the increasing urban sprawl in these areas that led to the adoption of this ineffective policy to reduce it.

Of greatest importance to the issue under consideration here, is how the statewide measures of reliance on various forms of own-source municipal revenue performed. For the fixed effects regression method, the fractions of statewide own-source municipal revenue from property taxes and relevant charges exerted no statistically significant influence on the value of real retail sales in the non-central portion of Western U.S. metropolitan areas. Though the Brueckner and Kim (2000) simulation, and the additional motivation of suburbs seeking fiscal surplus, indicated that the expected influence of statewide reliance on property taxes be positive, there is also the theoretical possibility that high property taxation discourages housing and business capital consumption, promotes greater density, and therefore reduces retail sprawl. This offsetting occurrence may be the reason for the insignificant influence that this variable exerts on non-central retail sales.

Alternatively, the fraction of statewide municipal revenue derived from sales taxation exerted a significant positive influence on non-central retail activity. Based upon the fixed effects results, for every one-percent increase in statewide sales tax reliance at the municipal level, real retail sales in non-central metropolitan places in the West rose by nearly 0.11 percent. Statewide municipal reliance on other taxes, such as a business license fee, also yielded a significant influence. The fixed effects regression indicates that for every one percent increase in reliance on other forms of local taxation, real retail sales in non-central places rose by nearly 0.20 percent. This is close to twice the elasticity recorded for local sales taxation. Finally, as indicated in the fixed effects regression, a one percent increase in the fraction of statewide own municipal revenue from relevant local charges is associated with a smaller 0.80 percent increase in non-central place retail activity.

These regression results have largely confirmed the *a priori* expectations of economic theory. Population, available land prices, and demographics drive the real dollar amount of retail sales in non-central places in the Western United States. Worthy of note is the finding that statewide measures of municipal reliance on sales taxation, other taxation, or relevant charges are more likely to exert a significant influence on non-central place real retail sales than the percentage of young people residing there. In the final section, I simulate the effect of the average state in the West increasing or decreasing its municipal sales tax reliance or relevant charges by the amount that it differs from the western state that used them the most or least. Also simulated is the effect of the average state in the West increasing or decreasing its other tax reliance by the amount that the average state's other tax reliance differs from the state that used it the most or least. The results of these simulations, and previous findings, are used to offer a few policy suggestions and opportunities for future research on this issue.

II. F. Simulation and Policy Implications

Table 4 offers the values for the average fraction of statewide own municipal revenue from sales taxes (0.213), other taxes (0.061), and relevant charges (0.205). These values are calculated from all western states over the three years observed. Consider the simulated effect for the hypothetical average western state that decides to undertake a state-imposed policy that results in the fraction of municipal own-source reliance on sales taxes (or other taxes or relevant fees) rising or falling by the amount that would put it at the maximum or minimum average reliance observed in any of the western states. For sales taxation, reliance would rise by 0.105 to match the 0.318 maximum average reliance observed in Arizona, and fall by 0.148 to match the 0.065 minimum average observed in Oregon. In the case of other taxes, reliance would rise by 0.082 to match the 0.143 maximum average reliance observed in Nevada, and fall by 0.032 to match the minimum average observed in New Mexico. For relevant charges, reliance would rise by 0.54 to match the 2.59 maximum observed in Nevada, and fall by 0.46 to equal the 0.159 average of Washington State. These are intended to be simulated balanced-budget changes in that an alternate municipal revenue source, that does not influence non-central retail sales, also falls or rises to maintain balanced budgets. The results of these simulations, based upon the fixed effects regression coefficients in Table 5, are described next.

To simulate the effect on non-central place retail sales of municipal sales tax reliance rising by 0.105, to match the difference between average reliance and Arizona's maximum reliance, the fixed effect regression coefficient for sales taxation (1,934,689) is multiplied by 0.105 to yield an increase of $203,142 thousand. To place this increase in perspective, it is about 5.3 percent of the average real value of non-central retail sales, or about a $451 per-

capita increase in these sales based upon average population in non-central places. The effect of municipal sales tax reliance falling by 0.148, to match the difference between average reliance and Oregon's minimum reliance, is a decrease in non-central place retail sales equivalent to about 7.4 percent of the average, or a loss of about $635 per person.

Similarly, to simulate the effect on non-central retail sales of municipal other tax reliance rising by 0.143, to match the difference between average reliance and Nevada's maximum reliance, I multiply the fixed effect regression coefficient for other taxation (12,309,902) by 0.143 to yield an increase of $1,760,316 thousand. To place this increase in perspective, it is about 45.8 percent of the average real value of non-central retail sales, or about a $3,905 per-capita increase in these sales based upon average population in non-central places. The effect of municipal other tax reliance falling by 0.030, to match the difference between average reliance and Colorado's minimum reliance, is a decrease in non-central place retail sales equivalent to about 10.2 percent of the average, or a loss of about $874 per person.

Also, the effect of fee reliance rising by 0.54, to match the difference between average reliance and the maximum observed in Nevada, is a decrease in non-central retail sales of $798,063 thousand. This represents about a 21 percent decrease from the West average or about $1,770 per person. If average western state fee reliance falls by 0.46 to match Washington State's low average reliance, the decrease in urban retail sprawl is 17.6 percent of the average or $1,508 per person.

These regression simulations confirm the hypothesis put forth earlier that retail sprawl, in the form of greater retail activity in non-central places than population, population growth, demographics, land prices, and income warrant; is advanced by some forms of local

government revenue reliance. A statewide movement towards greater reliance on sales taxation, other taxation, or relevant charges for municipal own source revenue has been shown to contribute to a further decentralization of retail activity in the state's metropolitan areas. Looking over the data in Table 4, New Mexico is the only state where municipal reliance on sales taxation or other taxes has increased. In 1977, New Mexico municipalities drew 14.9 percent of their own-source revenue from sales taxation; by 1997, this measure had nearly doubled to 30.5 percent. The regression findings indicate that this change has contributed to a greater amount of retail activity occurring in this state's non-central metropolitan places than warranted by population, income, land prices, and demographics. The other western states, having reduced their municipal own-source revenue reliance on sales taxation and other taxes, have likely experienced less non-central retail activity than would have occurred if these reductions had not happened. Alternatively, most of the western states have increased their reliance on relevant charges for municipal revenue and thus have experienced an increase in non-central retail activity that may not have occurred without it.

A policy implication that could follow from this analysis is that states consider reducing reliance on municipal sales taxation even further. However, the reality is that many voters prefer sales taxation to other forms of raising local revenue.[25] The real connection between retail sprawl and local sales taxation comes from the local retention of all, or even a significant portion, of the sales tax revenue generated in a jurisdiction. If this bond is broken, then it is unlikely that non-central places in metropolitan areas will continue to desire, and draw retail activity from central places, for just the fiscal surplus it provides. A workable alternative would be to collect at least a portion of local retail sales revenue on a regional

basis, and then distribute it back to communities in the region on a per-capita basis. California is currently considering such legislation.[26]

Avenues for future research on this topic include an expansion of the data set to include other metropolitan areas of 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 to break the level of retail activity observed in non-central metropolitan places into smaller standard industrial code categories. If retail decentralization is measured in terms of "big-box" items like automobiles, the effects of local fiscal choices on retail decentralization may even be greater. Finally, it would be interesting to use square miles in the urbanized area as the dependent variable in a regression study, as Brueckner and Fansler (1983) did, and check if statewide local fiscal structure exerts similar influences on the geographic size of a metropolitan area.

II. G. References

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

[26] See Johnson (2000). California State Senator Dede Alpert, in support of her spring 2000 bill that would distribute new local sales tax revenue in a county on a per-capita basis instead of the current *situs basis,* believes 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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