

SPRAWL, SMART GROWTH AND ECONOMIC OPPORTUNITY

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Prepared by:



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Sprawl, Smart Growth and Economic Opportunity

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INTRODUCTION

The rapid growth of suburbs in almost all-metropolitan areas has transformed the Nation's urban landscape. More US residents now live in suburbs than in central cities or rural areas. This redistribution of the Nation's population has given rise to a concern that metropolitan areas are growing so rapidly and in such a haphazard manner that they are creating unanticipated and undesirable impacts on metropolitan residents and communities.¹ These impacts include the destruction of open space and farmland, increased automobile congestion and pollution, the geographic isolation of low-income and minority residents, and mismatch between the location of jobs and the residences of workers—especially low-skilled, low-income workers. Those opposed to rapid suburb development often call this whole process sprawl. While sprawl is a somewhat imprecise and difficult to measure phenomenon, it is often characterized by low-density urban development that consumes land faster than the growth of population.²

In response to sprawl, a variety of growth-management and environmental initiatives have converged with regionalism advocates to form an approach called smart growth. Smart growth advocates seek to limit the growth on the fringes of metropolitan areas, while promoting reinvestment in the central cities and inner-ring suburbs. Proponents of smart growth believe that this type of development approach will resolve the problems associated with urban sprawl.³

Proponents believe that in order to implement smart growth that a metropolitan area needs to embrace some form of metropolitan or regional planning. One planning tool embraced by smart growth advocates is the urban growth boundary. Urban growth boundaries essentially limit new development at the fringes of a metropolitan area in an attempt to limit the loss of open space by forcing reinvestment in the core of metropolitan areas. While several states have implemented growth boundaries, the most well known example of urban growth boundaries has been in Portland, Oregon. Another tool promoted by smart growth advocates is metropolitan governance. Metropolitan governance can take a variety of forms from elected metropolitan government, such as the Portland, OR Metro, or regional land use planning, such as the Minneapolis-St. Paul Metropolitan Council.⁴

¹ See Downs, 1994.

² See Downs, 1994 and Stoel, 1999.

³ See Downs, 1994 and Stoel, 1999.

⁴ See Downs, 1994 and Stoel, 1999.

While smart growth promises to address environmental and growth management concerns⁵, it is less clear about its impact on existing patterns of social inequity. For example, it appears that growth boundaries in Portland and other Oregon cities may be contributing to substantial increases in housing costs for low-income families as well as the gentrification of existing low-income communities.⁶ It's also unclear whether smart growth will reduce existing racial and class isolation or improve low-income residents' access to employment.

This working paper focuses on the relationship between urban sprawl and social equity in large metropolitan areas. Advocates of smart growth argue that sprawl exacerbates inequality in two ways. First, sprawl isolates low-income people and concentrates poverty in the center of metropolitan regions by encouraging middle-class residents to move to the suburban fringes to acquire desirable housing and other resources, such as good schools. This population shift away from the center also reduces the fiscal resources available to central city (and inner-ring suburban) governments; reducing their capacity to provide basic services—such as, schools, police and sanitation. The decline in basic services often accelerates the population movement to the suburbs. Unfortunately, because of the high cost of housing in the suburbs low-income residents are unable to follow the middle-class and therefore remain isolated in fiscally and physically declining central city and inner-ring suburban communities. This whole process tends to concentrate poverty and disadvantage within the core of many metropolitan regions.⁷

Second, sprawl moves employment and economic activity from the center of the metropolitan region to the periphery. This coupled with the residential concentration of minorities and low-income individuals in the central cities and core suburbs result in the phenomenon of spatial mismatch.⁸ This spatial de-concentration of employment lowers opportunities for gainful employment for low-income residents of central cities and inner-ring suburbs.

The objective of the paper is to determine empirically whether high levels of urban sprawl are associated with high levels of social inequity. The starting hypothesis is that high levels of sprawl are associated with low levels of social equity. That is, as sprawl increases, social equity declines. The paper examines 34 of the nation's 50 largest metropolitan areas. These areas were selected because data was readily available to match measure of sprawl to the social equity measures used in this paper.

⁵ There are those who question the notion of sprawl and smart growth, See Staley, 1999, and Franciosi, 1998.

⁶ See The Dark Side of Growth Controls: Some Lessons from Oregon, by John A. Charles, May 1998, <http://goldwaterinstitute.org/azia/150.htm>

⁷ See Jargowsky, 1997 and Wilson, 1987.

⁸ The spatial mismatch hypothesis posits that disproportionate unemployment rates among low-income African-Americans are the result of the movement of jobs away from the central city and to the suburbs coupled with the residential concentration of low-income blacks in the central city. See Kain 1968 and Wilson 1996.

MEASURING SPRAWL

For the purposes of this paper, sprawl will be defined as a development continuum. At one end of the continuum, is low-density development that uses land faster than the growth of population.⁹ At this end of the continuum all new residential and business development occurs by expanding the metropolitan areas urbanized land area. At the other end of the continuum, is highly dense, compact development. All new residential and business development occurs within the current urbanized land area. The development process in a given metropolitan area can fall anywhere on this continuum. For the most part, there are few metropolitan areas that fall entirely on one or the other end of the continuum.

This definition assumes that the starting land use patterns for metropolitan areas vary based on a variety of historical, demographic, and geographic considerations. Some metropolitan areas such as Boston, where land is expensive and scarce are likely to start-off being denser than metropolitan areas in the Southwest, where land seems more plentiful. Metropolitan areas that start off being highly dispersed with multiple centers—multi-nodal—might become more compact and dense over time. Similarly, dense, compact metropolitan areas can develop in ways that make them more dispersed.

This paper will look at the degree of dispersion versus compactness of metropolitan areas starting in 1980, and how these same metropolitan areas have developed during the 1980s. The paper will use a composite index to measure dispersed land use in 1980, and the change from 1980 to 1990. The dispersion index measures two factors relative density and the relative size of the urbanized area. The higher the value on the index the greater the dispersion.¹⁰

MEASURING SOCIAL EQUITY

While many have expressed concerns about the impact of sprawl on existing patterns of social inequity¹¹, quantifying social equity is often imprecise and challenging. For example, social inequity is sometimes expressed as declining social capital or the loss of community for low-income individuals. It is also talked about in terms of poor people's isolation from non-low-income or non-minority residents. Finally, it is discussed as a lack of access to critical economic and social resources, such as employment.

⁹ This generally concept of a continuum is expressed by several observers. See Downs, 1994 and Gordon and Richardson, 1997.

¹⁰ See Appendix for description of variables and methodology.

¹¹ See Downs, 1994 and Gordon and Richardson, 1997.

This paper will measure social equity by analyzing five indicators related to economic opportunity for low-income individuals. When economic opportunity declines for low-income individuals and communities their capacity to improve their standard of living and reduce inequality is severely constrained.

The first indicator measures the general metropolitan poverty level. High poverty levels usually indicate limited labor market opportunities for low-income individuals.¹² This usually suggests high unemployment in low-income communities. However, because one of the key arguments against sprawl is that it exacerbates the concentration of poverty in the central areas of metropolitan regions, it is also useful to measure the spatial concentration of poverty. Research tends to show that areas with high levels of spatially concentrated poverty suffer economically and socially.¹³ Given this, spatial poverty is included as a second indicator of social equity.

However, while high poverty rates may be the results of high unemployment, it may also be the result of low-income individuals working at low-wage employment. Therefore, it is also useful to examine whether available employment earns enough to keep a family out of poverty. In order to capture this, a living wage employment measure is also added a third indicator of social equity. The living wage employment measure indicates the proportion of less educated males employed and earning enough to keep a family of four out of poverty.¹⁴

Finally, this country has an unfortunate history of racial inequality across a wide range of fields. Therefore, the social equity indicators will include two measures of racial equity. First, if less educated Black males are unable to find family-supporting employment than their families will be poor or they will not form stable families. Given this, the social equity indicator includes the proportion of less educated African American males employed and earning a wage high enough to keep a family out of poverty. Second, the history of racial inequality suggests that it would be useful to directly measure the gap in living wage employment between white and black less educated males.¹⁵

These five measures are used to produce the economic opportunity index (EOI). The EOI measures economic opportunity by race and for low-income and less educated individuals at the metropolitan level for 1980 and the change in economic opportunity from 1980 to 1990.¹⁶

¹² See Foster-Bey with Hays, 2001.

¹³ See Jargowsky 1997.

¹⁴ See Foster-Bey, Rubin, and Temkin, 2001.

¹⁵ See Foster-Bey, Rubin and Temkin, 2001.

¹⁶ See Appendix for description of indexes and variables.

RANKING METROPOLITAN AREAS BY SPRAWL AND SOCIAL EQUITY

Between 1980 and 1990, population density in the 34 metropolitan areas reviewed in this study increased only slightly, while the average urbanized land area increased by 13%. However, there was considerable variation across these thirty-four areas. Changes in density ranged from an increase of 2.6 percent per year in Riverside-San Bernardino to a decline of 1.9 percent per year in New Orleans. Changes in the growth in the urbanized land area ranged from a total 10-year increase of 1.1 percent in Cleveland to 59 percent in Norfolk, Virginia. Table 1 shows the distribution of metropolitan areas by changes in density and the growth in urbanized land area.

Number of Metro Areas with:	Annual Growth in Population Density (1980-1990)	Annual Growth in Urbanized Area (1980-1990)
Greater than 1 Standard Deviation Above Average	6	5
Greater than 1 Standard Deviation Below Average	7	1

The dispersion index¹⁷ indicates the relative population density and urbanized land area in each metropolitan area in the study. A high score on the dispersion index indicates low density and a large urbanized land area. Table 2 presents the 34 metro areas ranked by their score on the dispersion index. Column 1 shows the index scores ranked from highest to lowest for 1980, and column 2 presents the rankings for the change in the index from 1980 to 1990. The five areas with the highest dispersion score in 1980 were Dallas-Fort Worth, Minneapolis-St. Paul, Atlanta, New York, and Houston. The five areas with the lowest dispersion index scores in 1980 were New Orleans, Miami, Buffalo, San Francisco-Oakland, and Fort Lauderdale.

A simple correlation analysis indicates that there is a positive association between the 1980-dispersion index and the change in the dispersion index between 1980 and 1990. However, while the relationship is statistically significant it is relatively modest.¹⁸ Table 2 illustrates that metro areas with high dispersion scores in 1980 did not necessarily increase their

¹⁷ See Appendix for discussion of methodology.

¹⁸ The correlation is .33 and explains about 11 percent of the variation between the 1980 dispersion and the change in the dispersion index between 1980 and 1990.

level of dispersion over time. For example, while Dallas-Fort Worth and Minneapolis-St. Paul had the highest dispersion index scores in 1980, they were 17th and 24th on the change in the dispersion index between 1980 to 1990.¹⁹ On the other hand, San Jose was 25th on the dispersion index, but ranked 2nd on its increase in dispersion (sprawl). The metro area that increased its dispersion the greatest between 1980 and 1990 was Norfolk, VA; the metro area with the smallest increase in dispersion was Cleveland, followed by Miami, FL.

Finally, there also appears to be some association between the dispersion index and the region of the country. Simple correlation analysis reveals that metro areas in the Southwest and the Central regions of the country tended to have higher dispersion index scores in 1980, while metro areas in the Far West and Northeast tended to have lower scores.²⁰ There was also a statistically significant positive relationship between the 1980-1990 dispersion index and metro areas located in the South. That is, metro areas in the South tended to have above average increases in dispersion (sprawl).

MSA	1980 DISPERSION INDEX SCORE	1980-1990 DISPERSION INDEX RANKING
Dallas-Fort Worth	1.96	17
Minneapolis-St. Paul	1.73	24
Atlanta	1.69	5
Houston	1.29	18
Kansas City	1.24	3
Norfolk	1.08	1
Riverside-San Bernardino	0.88	4
Phoenix	0.73	10
Pittsburgh	0.65	21
Milwaukee	0.52	31
Tampa-St. Petersburg	0.41	7
Cleveland	0.28	34

¹⁹ See Appendix for discussion of methodology for constructing the sprawl index.

²⁰ The correlation between the dispersion index and metros in the Southwest, Central, Northeast and Far West were .39, .24, -.21, and -.22 respectively.

TABLE 2. METRO AREAS RANKED BY HIGHEST TO LOWEST SCORE ON 1980 DISPERSION INDEX COMPARED THE RANKINGS FOR THE 1980-1990 CHANGE IN DISPERSION INDEX		
MSA	1980 DISPERSION INDEX SCORE	1980-1990 DISPERSION INDEX RANKING
San Antonio	0.26	19
Cincinnati	0.17	9
Boston	0.17	30
St. Louis	0.10	6
Seattle	-0.09	8
Detroit	-0.19	25
Sacramento	-0.19	11
Portland	-0.20	20
Washington	-0.21	13
Denver	-0.25	29
New York	-0.29	28
Baltimore	-0.46	15
San Jose	-0.49	2
Chicago	-0.64	27
Philadelphia	-0.66	14
San Diego	-0.86	22
Fort Lauderdale	-0.86	16
Los Angeles	-0.99	26
San Francisco-Oakland	-1.18	32
Buffalo	-1.19	23
Miami	-2.16	33
New Orleans	-2.24	12

Social equity is examined by ranking the 34 metro areas in the study by their standardized scores on the 1980 Economic Opportunity Index (EOI) and the change in the Economic Opportunity Index for 1980-1990. The EOI provides an indication of the relative social equity position of low-income residents across the 34 metro areas in 1980. The change in the EOI indicates how economic opportunity changed over time.

TABLE 3. METROPOLITAN AREAS RANKED BY 1980 ECONOMIC OPPORTUNITY INDEX COMPARED TO 1980-1990 CHANGE IN THE ECONOMIC OPPORTUNITY INDEX		
METROPOLITAN AREAS	ECONOMIC OPPORTUNITY INDEX 1980	ECONOMIC OPPORTUNITY INDEX 1980-1990
Kansas City	1.69	-0.90
Riverside-San Bernardino	1.41	-0.37
Houston	1.25	-2.83
Seattle	1.24	0.57
Baltimore	1.05	0.88
Boston	0.96	0.65
Portland	0.89	-0.84
Milwaukee	0.86	-1.06
Pittsburgh	0.55	-1.81
Dallas-Fort Worth	0.50	-0.74
Washington	0.42	2.07
Cleveland	0.42	-0.31
Chicago	0.40	0.47
Tampa-St. Petersburg	0.39	0.07
San Jose	0.31	-0.11
Fort Lauderdale	0.18	-0.97
Norfolk	0.01	1.65
Cincinnati	-0.04	0.04
Atlanta	-0.11	1.45
Los Angeles	-0.13	-0.34
New Orleans	-0.18	-0.96
Denver	-0.20	-0.19
New York	-0.27	1.26
Philadelphia	-0.29	1.22
St. Louis	-0.32	0.79
San Francisco-Oakland	-0.43	0.53
Detroit	-0.44	-0.33
Buffalo	-0.67	0.39

TABLE 3. METROPOLITAN AREAS RANKED BY 1980 ECONOMIC OPPORTUNITY INDEX COMPARED TO 1980-1990 CHANGE IN THE ECONOMIC OPPORTUNITY INDEX		
METROPOLITAN AREAS	ECONOMIC OPPORTUNITY INDEX 1980	ECONOMIC OPPORTUNITY INDEX 1980-1990
Minneapolis-St. Paul	-0.88	0.11
San Antonio	-0.95	0.22
Sacramento	-1.08	-0.56
Miami	-1.24	-0.60
San Diego	-2.13	0.68
Phoenix	-3.17	-0.12

Table 3 compares metropolitan areas by their 1980 EOI and the change in the EOI from 1980-1990. The table indicates that Kansas City, Riverside-San Bernardino, Houston, Seattle, and Baltimore had the highest scores on the EOI for 1980, while Phoenix, Miami, Sacramento, San Antonio, and Minneapolis-St. Paul had the lowest. A review of table 4 indicates that there is very little systemic relationship between the 1980 EOI and the change in this social equity measure over time. Metro areas with high EOI scores did not necessarily have high scores on the EOI change from 1980-1990. This is confirmed by a simple correlation analysis which indicates that while the 1980 EOI and the 1980-1990 EOI have a negative association, the relationship explains only about 3 percent of the variation between the two indexes.

There also appears to be some relationship between the EOI and the region of the country. In 1980 metro areas in the Southwest had statistically lower than average levels of economic opportunity. Metro areas in the Southwest and Central regions found that economic opportunity actually declined between 1980 and 1990, while metropolitan areas in the Northeast tended to have increases in economic opportunity.

SOCIAL EQUITY AND SPRAWL

The central question of this paper is whether there is a systemic association between sprawl (as measured by the dispersion index) and social equity (as measured by the economic opportunity index). The starting hypothesis is that social equity declines with rising levels of sprawl.

The results presented in this paper suggest that indeed there is an association between sprawl and social equity. However, the relationship is in the opposite direction than expected.

Social equity seems to increase with rising sprawl. Indeed while several metropolitan areas, such as Portland and Minneapolis-St. Paul, considered examples of progressive planning, had among the smallest increases in dispersion (sprawl) between 1980 and 1990; they also had among the smallest increases in economic opportunity (social equity).

METROPOLITAN AREAS	DISPERSION INDEX 1980	ECONOMIC OPPORTUNITY INDEX 1980
Dallas-Fort Worth	1.96	0.50
Minneapolis-St. Paul	1.73	-0.88
Atlanta	1.69	-0.11
Houston	1.29	1.25
Kansas City	1.24	1.69
Norfolk	1.08	0.01
Riverside-San Bernardino	0.88	1.41
Phoenix	0.73	-3.17
Pittsburgh	0.65	0.55
Milwaukee	0.52	0.86
Tampa-St. Petersburg	0.41	0.39
Cleveland	0.28	0.42
San Antonio	0.26	-0.95
Cincinnati	0.17	-0.04
Boston	0.17	0.96
St. Louis	0.10	-0.32
Seattle	-0.09	1.24
Detroit	-0.19	-0.44
Sacramento	-0.19	-1.08
Portland	-0.20	0.89
Washington	-0.21	0.42
Denver	-0.25	-0.20
New York	-0.29	-0.27
Baltimore	-0.46	1.05

METROPOLITAN AREAS	DISPERSION INDEX 1980	ECONOMIC OPPORTUNITY INDEX 1980
San Jose	-0.49	0.31
Chicago	-0.64	0.40
Philadelphia	-0.66	-0.29
San Diego	-0.86	-2.13
Fort Lauderdale	-0.86	0.18
Los Angeles	-0.99	-0.13
San Francisco-Oakland	-1.18	-0.43
Buffalo	-1.19	-0.67
Miami	-2.16	-1.24
New Orleans	-2.24	-0.18

Table 4 and 5 present the relationship between sprawl and social equity. Table 4 ranks metropolitan areas by their score on the dispersion index for 1980 and compares them to the economic opportunity index for 1980. Of the top five metro areas with a high level of urban sprawl, three also had high scores on the economic opportunity index. Surprisingly, the five metropolitan areas with the lowest level of relative sprawl also had low levels of economic opportunity. The results were very similar for table 5 where metropolitan areas are ranked by the change in the dispersion index from 1980-1990 and compared to their change in economic opportunity from 1980-1990. Growing sprawl (dispersion) was not necessarily associated with declining social equity (at least as measured by the economic opportunity index). Metro areas with the most compact growth often had the greatest declines in economic opportunity.

METROPOLITAN AREAS	DISPERSION INDEX 1980-1990	ECONOMIC OPPORTUNITY INDEX 1980-1990
Norfolk	3.64	1.65
San Jose	2.03	-0.11
Kansas City	1.25	-0.90
Riverside-San Bernardino	0.94	-0.37
Atlanta	0.84	1.45

TABLE 5. METROPOLITAN AREAS RANKED BY SPRAWL COMPARED TO SOCIAL EQUITY FOR 1980-1990		
METROPOLITAN AREAS	DISPERSION INDEX 1980-1990	ECONOMIC OPPORTUNITY INDEX 1980-1990
St. Louis	0.73	0.79
Tampa-St. Petersburg	0.67	0.07
Seattle	0.64	0.57
Cincinnati	0.63	0.04
Phoenix	0.62	-0.12
Sacramento	0.34	-0.56
New Orleans	0.29	-0.96
Washington	0.13	2.07
Philadelphia	0.01	1.22
Baltimore	-0.13	0.88
Fort Lauderdale	-0.22	-0.97
Dallas-Fort Worth	-0.29	-0.74
Houston	-0.30	-2.83
San Antonio	-0.31	0.22
Portland	-0.36	-0.84
Pittsburgh	-0.43	-1.81
San Diego	-0.48	0.68
Buffalo	-0.59	0.39
Minneapolis-St. Paul	-0.61	0.11
Detroit	-0.63	-0.33
Los Angeles	-0.71	-0.34
Chicago	-0.77	0.47
New York	-0.80	1.26
Denver	-0.94	-0.19
Boston	-0.95	0.65
Milwaukee	-1.01	-1.06
San Francisco-Oakland	-1.04	0.53
Miami	-1.04	-0.60
Cleveland	-1.17	-0.31

These observations are also confirmed by examining a correlation matrix that compares the dispersion index to the economic opportunity index. Table 6 indicates that there is a statistically significant positive correlation between increasing sprawl and rising levels of social

equity. However, the relationship explains at best only a modest amount of the variation between the two indexes. The results indicate that while growing sprawl may be correlated with improving economic opportunity, other factors may be much more important.

Sprawl Measures	Social Equity Measures		Percent of Variance Explained
	Economic Opportunity Index 1980	Economic Opportunity Index 1980-1990	
Dispersion Index 1980	.28		8.0%
Dispersion Index 1980-1990		.26	7.0%

OBSERVATIONS AND IMPLICATIONS

This paper investigated the connection between urban sprawl in metropolitan areas and changes in social equity. Most advocates of smart growth believe that rapid low-density metropolitan development not only poses environmental and quality of life problems, but also exacerbates existing patterns of social inequity. The findings in this paper do not seem to support this assertion. In fact, it appears that sprawl as defined in this paper is actually associated with improvements in social equity. Moreover, the sprawl index suggests that many of the metropolitan areas normally thought to have high levels of sprawl actually have been increasing their population density and only modestly expanding their urbanized land area.²¹

What might explain these results? One possible explanation for sprawl is that it is related to rapid economic growth. Economic growth is also related to reductions in poverty and improvements in employment. Reductions in poverty and increases in living wage employment for less educated males heavily influence the social equity index. Areas with fast employment growth may have higher sprawl and higher social equity. Indeed, a simple correlation reveals that employment growth has a modest positive correlation with both the composite social equity index and the sprawl index.²² However, employment growth explains less than 5 percent of the variation in either the sprawl index or the social equity index.

²¹ Similar results were found by William Fulton, Rolf Pendall, Mai Nguyen, and Alicia Harrison in, "*Who Sprawls the Most? How Growth Patterns Differ Across the U.S.*".

²² The correlation between employment growth and the social equity index is .22 and is statistically significant. The correlation between employment growth and the sprawl index is .11 but not statistically significant.

While sprawl may impose some undesirable consequences, reduction in economic opportunity (social equity) may not be one of the costs. Indeed, sprawl, because of its positive relationship to economic growth may actually reflect improvements in economic opportunities

The major implication of this paper is that smart growth strategies aimed at limiting metropolitan growth may not necessarily improve social equity. For example, Portland, OR and Minneapolis-St. Paul have been leaders in promoting rational metropolitan land use planning. The effectiveness of these efforts seems to be illustrated in their low scores on the 1980–1990 changes in the dispersion index. However, both of these metro areas had among the lowest scores on the 1980-1990 change in the economic opportunity index. This suggests that even if smart growth is successful in creating more rational development processes, it may not improve economic opportunity (social equity) per se. Indeed, the empirical results presented in this paper imply that sprawl may be related to other factors—such as, economic growth—which are positively correlated to economic opportunity. As such, the issue is can smart growth limit sprawl without limiting the underlying factors, which also improve economic opportunity? A tentative answer to this question is that anti-sprawl efforts may have to strike a balance between limiting sprawl development while not diminishing the economic dynamics, which may be related to improvements in economic opportunity.

ADDITIONAL RESEARCH

This working paper attempted to examine the relationship between sprawl and social equity. While the paper found an unexpectedly positive relationship between increasing sprawl and improving social equity, the data used in this paper represented a small, rather limited sample. First, the study is descriptive and not causal. There is no attempt to imply that sprawl causes either improvements or declines in economic opportunities for low-income individuals and communities. What is being investigated is whether sprawl and economic opportunity move in the same or opposite direction.

Second, the small size of the sample did not allow for the development of a multivariate model that could be used to test empirically the relationship between sprawl and social equity. As such, the study does not attempt to control for multiple factors that might influence the outcomes. For example, how might population size, or the size of the minority population or the level of racial and class segregation affect the relationship between sprawl as a predictor and economic opportunity as the dependent variable? This more complex set of relationships might be investigated through the use of such multivariate techniques, as multiple regression. Understanding more thoroughly whether, for instance, regions with low levels of geographic racial and class concentration are more or less likely to benefit when sprawl is occurring is an important policy and intervention question. Where racial and class concentration is minimal,

smart growth efforts which force economic growth and development into the core may actually limit economic opportunity for sizable numbers of low-income people.

Third, the sample was also limited to 1980 and 1990 data. It would be useful to examine more recent data given the historic growth in the economy, the substantial declines in poverty, and the visible efforts made over the 1990s to implement smart growth policies by both local and state governments. The outcomes presented in this paper may also be sensitive to variations in the sprawl and social equity indices.

Despite these limitations, this study seems to be a good starting point for investigating the sprawl and social equity connection. The findings in this paper suggest that smart growth policies may not be a panacea for improving existing undesirable patterns of social inequity in most metropolitan areas. Further research might help to sharpen the relationship between sprawl and social equity, and provide necessary insight into how to devise smart growth policies that not only limit and shape land use but also improve social equity.

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APPENDIX

The sprawl and social equity indices were constructed using the following approach:

THE SAMPLE OF METROPOLITAN AREAS

This paper examines thirty-four large metropolitan areas that represent all regions of the country. Table 1 presents the selected areas.

METRO	REGIONS
Atlanta	South
Baltimore	Northeast
Boston	Northeast
Buffalo	Northeast
Chicago	Central
Cincinnati	Central
Cleveland	Central
Dallas -Fort Worth	Southwest
Denver	Central
Detroit	Central
Fort Lauderdale	South
Houston	Southwest
Kansas City	Central
Los Angeles	Far West
Miami	South
Milwaukee	Central
Minneapolis-St. Paul	Central
New Orleans	South
New York	Northeast
Norfolk	South
Philadelphia	Northeast
Phoenix	Southwest

TABLE A-1. 34 LARGE METROPOLITAN AREAS	
METRO	REGIONS
Pittsburgh	Central
Portland	Far West
Riverside-San Bernardino	Far West
Sacramento	Far West
St. Louis	Central
San Antonio	Southwest
San Diego	Far West
San Francisco-Oakland	Far West
San Jose	Far West
Seattle	Far West
Tampa-St. Petersburg	South
Washington	Northeast

Key variables

The paper uses a composite index to measure sprawl. The index is derived by adding the standardized values of the following two indicators:

- ***Changes in metropolitan population density from 1980-1990*** measure whether population is growing faster than land use. Increases in density suggest more compact development. However, declines in density may imply either that land use is growing faster than population, or that the population is declining or stagnant.
- ***Changes in the urbanized area from 1980-1990*** indicate how much land is being consumed by development. While a metro area may be increasing its population density, it still may be consuming an inordinate amount of land to accommodate its population and economic growth. On the other hand, population loss may result in a metropolitan area experiencing declining density without its urbanized land area increasing.
- ***Changes in poverty from 1980-1990***. There is considerable variation in poverty rates across metropolitan areas. Some metros have high poverty rates while

others have relatively low poverty rates. However, a snapshot of poverty at one point in time may be less meaningful than how poverty changes over time. Areas with low poverty rates may for historical, policy, and institutional reasons, experience faster growth in poverty metro areas with relatively high poverty rates.

- ***Changes in spatial poverty from 1980-1990.*** Spatial poverty is the incidence of geographically concentrated poverty. In this paper it is defined as the number of poor people residing in census tracts where 20 percent or more of their neighbors are also poor. Much of the debate about poverty over the last two decades has been driven by concerns about spatial poverty and its relationship to the growth of the underclass.
- ***The change in Living wage employment for less educated adult males from 1980-1990.*** This indicator measures the change in the proportion of less educated adult males in the metro area that are hold full-time jobs that earn a wage high enough to keep a family of four out of poverty. Presumably, increases in the living wage proportion indicate growing opportunities for less educated and low-income workers and job seekers.
- ***The change in the proportion of less educated Black males holding living wage employment males from 1980-1990.*** Given the historical problems low skilled, Black males have faced in the labor market, and this indicator provides some insight into the economic opportunities available for low-skilled minority workers over time.
- Finally, ***the change in the racial gap in living wage employment between less educated White and Black adult males from 1980-1990.*** This indicator provides a direct measure of racial inequality in the labor market. Even in metropolitan areas where Black living wage employment has improved, the White-Black gap may be growing.

The paper also uses the level version of these same variables for 1980.

Sprawl and Social Equity Indexes

The paper constructs two basic indexes: The Dispersion index which measures relative urban sprawl; and the Economic Opportunity Index which provides one measure of social equity. The approach to constructing the indexes was a type of simplified factor analysis. Traditionally factor analysis attempts to combine variables that all represent a single dimension,

the resulting factors can be used to explain changes in a particular social phenomenon. One approach to finding factors is to take a large number of variables and to subject them to a factor analysis statistical process. The process is designed to discover the relationships between variables and to create suitable factors. However, it is also possible to construct factors by applying a theoretical structure to the variables. For example, it is possible to start with a hypothesis that certain variables such as per capita income, employment growth, and capital investment represent economic development. The factor analysis can then be used to indicate how these variables should be combined to provide the greatest explanatory power.

This paper uses a similar process to construct sprawl (dispersion index) and social equity (economic opportunity index) factors. The sprawl factor (dispersion index) is a weighted, linear, combination of metropolitan population density and the urbanized land area. The social equity factor (economic opportunity index) is a weighted, linear, combination of metropolitan poverty rates, spatial poverty rates, living wage employment for less educated males, living wage employment for less educated Black males, and the gap in living wage employment between white and Black less educated males.

- The dispersion index was constructed by multiplying the actual 1980 population density and the urbanized land area by the correlation coefficient between each variable and 1980 metropolitan population. Population was used because of the general sense that sprawl is highly related to population growth. The weighted-results for each variable were then standardized, by calculating the z-scores for each variable for all 34 metropolitan areas. In order to insure that declining density would represent increased sprawl the standardized value for the density was multiplied by -1 . The final standard values for both variables were then added together to construct the composite dispersion index.²³
- The 1980 to 1990 changes in the dispersion index was constructed by weighting the change in density and the change in land area by their correlation with the 1980-1990 change in population. The weighted values for each variable was standardizing, by calculating the z-scores for each weighted-variable for all 34 metropolitan areas. In order to insure that declining density would represent increased sprawl the standardized value for the change in density was multiplied by -1 . The final standard values for both variables were then added together to construct a composite economic opportunity index for 1980-1990.

²³ The same process was used to calculate 1990 indices. The 1990 indices were necessary to calculate the 1980-1990 change in the dispersion and economic opportunity indicators.

- The same process used to construct the dispersion indexes was used to construct the 1980 and the 1980-1990 change in the economic opportunity index. For the 1980 economic opportunity index the weights for the variables were derived from the correlation coefficients between each of the five economic opportunity variables and employment to population ratio for 1980. For the 1980-1990 change in the economic opportunity index, the weights were derived from the correlation coefficients on the change in the economic opportunity variables and the change in employment between 1980 and 1990. Employment was used because of the hypothesized relationship between improving employment and rising economic opportunity. Adjustments were made to insure that improvements in all five standardized variables moved in the same direction.

TABLE A-2. CHANGES IN SPRAWL INDICATORS BETWEEN 1980-1990 FOR SELECTED METRO AREAS		
MSA	CHANGE IN POPULATION DENSITY	CHANGE IN URBANIZED LAND AREA
Atlanta	0.6%	25.6%
Baltimore	-0.5%	13.4%
Boston	0.0%	4.0%
Buffalo	-1.2%	7.5%
Chicago	-0.5%	5.8%
Cincinnati	-1.2%	21.9%
Cleveland	-0.5%	1.1%
Dallas -Fort Worth	1.5%	12.7%
Denver	0.7%	4.6%
Detroit	-1.0%	7.2%
Fort Lauderdale	0.8%	13.1%
Houston	0.7%	12.2%
Kansas City	-1.1%	29.4%
Los Angeles	1.1%	7.6%
Miami	1.4%	3.8%
Milwaukee	-0.2%	3.2%
Minneapolis-St. Paul	0.7%	8.5%
New Orleans	-1.9%	17.4%

TABLE A-2. CHANGES IN SPRAWL INDICATORS BETWEEN 1980-1990 FOR SELECTED METRO AREAS		
MSA	CHANGE IN POPULATION DENSITY	CHANGE IN URBANIZED LAND AREA
New York	-0.3%	5.7%
Norfolk	0.8%	58.9%
Philadelphia	-1.1%	14.7%
Phoenix	1.4%	23.5%
Pittsburgh	-1.6%	9.1%
Portland	0.3%	11.2%
Riverside-San Bernardino	2.6%	28.1%
Sacramento	1.4%	20.1%
St. Louis	-0.3%	23.7%
San Antonio	2.0%	12.9%
San Diego	0.4%	9.8%
San Francisco-Oakland	1.1%	3.7%
San Jose	-1.0%	38.7%
Seattle	-1.5%	21.9%
Tampa-St. Petersburg	0.2%	23.3%
Washington	0.4%	17.1%
Average	0.1%	13.0%
Standard Deviation	1.1%	11.8%

TABLE A-3. 1980 DISPERSION INDICATORS BY SELECTED METRO AREAS		
MSA	POPULATION DENSITY	URBANIZED LAND AREA
Atlanta	1,782	905
Baltimore	3,356	523
Boston	3,126	857
Buffalo	3,767	266
Chicago	4,526	1,498
Cincinnati	2,674	420

TABLE A-3. 1980 DISPERSION INDICATORS BY SELECTED METRO AREAS		
MSA	POPULATION DENSITY	URBANIZED LAND AREA
Cleveland	2,785	629
Dallas-Fort Worth	1,915	1,280
Denver	3,080	439
Detroit	3,648	1,044
Fort Lauderdale	3,488	289
Houston	2,299	1,049
Kansas City	1,864	589
Los Angeles	5,188	1,827
Miami	4,729	340
Milwaukee	2,433	496
Minneapolis-St. Paul	1,824	980
New Orleans	4,687	230
New York	5,552	2,808
Norfolk	1,842	418
Philadelphia	4,051	1,015
Phoenix	2,348	600
Pittsburgh	2,539	713
Portland	2,940	349
Riverside-San Bernardino	1,964	359
Sacramento	2,863	278
St. Louis	2,669	354
San Antonio	2,789	611
San Diego	4,009	796
San Francisco-Oakland	3,816	326
San Jose	3,283	424
Seattle	3,097	597
Tampa-St. Petersburg	2,567	527
Washington	3,424	807
Average	3,145	725
Standard Deviation	999	522

TABLE A-4. 1980 ECONOMIC OPPORTUNITY INDICATORS FOR 1980 BY SELECTED METRO AREAS					
MSA	1980 POVERTY	1980 SPATIAL POVERTY	1980 LIVING WAGE EMPLOYMENT	1980 BLACK LIVING WAGE EMPLOY	1980 WHITE- BLACK GAP IN LIVING WAGE EMPLOYMENT
Atlanta	10.9%	4.5%	0.45	0.50	1.07
Baltimore	10.4%	5.9%	0.60	0.53	1.12
Boston	8.0%	3.8%	0.56	0.52	1.04
Buffalo	9.3%	5.4%	0.52	0.44	1.32
Chicago	10.7%	6.1%	0.57	0.49	1.17
Cincinnati	8.9%	3.3%	0.55	0.43	1.22
Cleveland	8.6%	5.2%	0.57	0.47	1.17
Dallas -Fort Worth	8.5%	4.7%	0.55	0.48	1.10
Denver	6.8%	2.7%	0.48	0.48	1.18
Detroit	8.8%	5.4%	0.53	0.40	1.25
Fort Lauderdale	7.9%	2.2%	0.55	0.41	1.16
Houston	8.6%	4.3%	0.58	0.53	1.01
Kansas City	7.6%	3.9%	0.56	0.60	0.94
Los Angeles	11.8%	8.3%	0.53	0.43	1.14
Miami	13.6%	8.4%	0.58	0.34	1.49
Milwaukee	6.8%	4.0%	0.54	0.55	1.06
Minneapolis-St. Paul	5.6%	1.8%	0.43	0.47	1.28
New Orleans	16.2%	10.3%	0.56	0.41	1.18
New York	17.1%	9.5%	0.46	0.51	1.08
Norfolk	12.7%	6.8%	0.54	0.45	1.17
Philadelphia	10.6%	5.5%	0.52	0.46	1.25
Phoenix	9.2%	3.5%	0.52	0.26	1.91
Pittsburgh	8.0%	2.7%	0.60	0.49	1.26
Portland	7.5%	1.5%	0.56	0.52	1.09
Riverside-San Bernardino	9.9%	3.7%	0.50	0.56	0.81
Sacramento	9.9%	3.7%	0.47	0.42	1.33
St. Louis	9.0%	4.7%	0.54	0.45	1.30

MSA	1980 POVERTY	1980 SPATIAL POVERTY	1980 LIVING WAGE EMPLOYMENT	1980 BLACK LIVING WAGE EMPLOY	1980 WHITE-BLACK GAP IN LIVING WAGE EMPLOYMENT
San Antonio	17.2%	12.0%	0.47	0.43	1.19
San Diego	10.0%	3.8%	0.44	0.33	1.48
San Francisco-Oakland	8.1%	3.5%	0.46	0.47	1.18
San Jose	5.8%	0.9%	0.47	0.53	1.07
Seattle	6.3%	1.6%	0.52	0.58	0.97
Tampa-St. Petersburg	10.6%	3.6%	0.48	0.46	0.94
Washington	6.8%	3.2%	0.46	0.54	1.00
Average	9.7%	4.7%	0.52	0.47	1.17
Standard Deviation	2.9%	2.5%	0.05	0.07	0.19

MSA	POVERTY	SPATIAL POVERTY	LIVING WAGE EMPLOYMENT	BLACK LIVING WAGE EMPLOY	WHITE-BLACK GAP IN LIVING WAGE EMPLOYMENT
Atlanta	-7.8%	-6.5%	-20.7%	-30.8%	22.4%
Baltimore	-3.5%	-28.0%	-22.2%	-34.5%	29.6%
Boston	3.5%	-3.0%	-19.3%	-34.6%	28.7%
Buffalo	30.9%	9.5%	-16.6%	-34.8%	34.2%
Chicago	15.3%	2.9%	-18.2%	-27.6%	20.6%
Cincinnati	27.9%	23.2%	-9.7%	-33.6%	42.5%
Cleveland	37.6%	32.1%	-18.2%	-25.1%	13.2%
Dallas-Fort Worth	41.0%	21.2%	-28.5%	-42.1%	34.0%
Denver	42.9%	67.8%	-24.8%	-18.8%	-5.4%
Detroit	45.7%	-1.6%	-21.2%	-27.7%	13.0%
Fort Lauderdale	29.3%	73.6%	-26.0%	-34.6%	18.6%

MSA	POVERTY	SPATIAL POVERTY	LIVING WAGE EMPLOYMENT	BLACK LIVING WAGE EMPLOY	WHITE-BLACK GAP IN LIVING WAGE EMPLOYMENT
Houston	76.5%	121.3%	-32.5%	-50.6%	59.1%
Kansas City	28.5%	12.4%	-22.4%	-63.9%	136.9%
Los Angeles	27.5%	22.4%	-24.3%	-28.1%	17.8%
Miami	31.8%	21.7%	-31.5%	-4.3%	-21.6%
Milwaukee	70.1%	-2.7%	-17.7%	-56.4%	108.0%
Minneapolis-St. Paul	45.4%	38.0%	-16.3%	-57.6%	101.1%
New Orleans	31.0%	16.4%	-27.1%	-46.1%	56.4%
New York	1.9%	-3.1%	-19.7%	-26.9%	18.6%
Norfolk	-10.1%	-47.0%	-14.3%	-13.4%	-0.1%
Philadelphia	-1.7%	-11.3%	-16.0%	-28.1%	23.6%
Phoenix	34.7%	61.7%	-20.3%	48.8%	-45.6%
Pittsburgh	51.8%	90.0%	-34.7%	-55.2%	49.6%
Portland	32.2%	72.9%	-24.3%	-48.0%	48.4%
Riverside-San Bernardino	22.4%	38.7%	-15.6%	-43.1%	54.7%
Sacramento	20.2%	53.0%	-16.3%	-49.5%	89.5%
St. Louis	19.2%	-0.8%	-13.1%	-25.6%	20.6%
San Antonio	13.0%	-4.2%	-36.2%	-31.8%	5.0%
San Diego	13.5%	27.0%	-21.6%	-9.1%	-13.0%
San Francisco-Oakland	11.3%	-0.7%	-25.6%	-48.9%	59.1%
San Jose	29.0%	70.1%	-22.7%	-33.5%	26.8%
Seattle	20.9%	7.4%	-14.1%	-37.6%	39.9%
Tampa-St. Petersburg	7.3%	31.8%	-21.2%	-34.5%	25.0%
Washington	-5.8%	-36.3%	-14.1%	-17.7%	12.4%
Average	24.5%	22.6%	-21.8%	-30.5%	33.1%
Standard Deviation	20.6%	36.9%	4.6%	9.3%	36.7%