Should Suburbs Care About Cities? The Relationship between Urban Distress and Suburban and Metropolitan Growth during the 1980s

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Part of the debate over regionalism in recent years has focused on the dynamic of the relationship between cities and suburbs. Research has examined several questions in particular: Is metropolitan growth driven by the cities or by the suburbs? Are cities and suburbs independent of each other or mutually interdependent in terms of economic development and social welfare? Can a metropolitan area thrive with a declining central city at its core?

These questions carry significant weight both politically and in policy terms. If research suggests that a region needs a healthy central city to thrive, political leaders and their constituents may be more persuaded that it is in their own interest to ensure the well-being of their region's central city and may be more likely to embrace the policy ideas generally associated with the regionalist agenda. That could translate into support for changes in the structure and functioning of regional governance through such policies as:

- annexation or merger of political subdivisions to achieve more efficient regional administration, as in Jacksonville, Indianapolis, and Nashville;
- regionwide land-use strategies such as growth boundaries, as in Portland, Oregon;
- fiscal redistribution measures such as tax base sharing, as in Minneapolis-St. Paul.

If research finds no or inconclusive correlation between a central city's health and that of its suburbs, individual jurisdictions may adhere to more parochial agendas.

This study builds on existing research to test one of the primary arguments advanced in favor of increased regional governance. It examines the question of whether metropolitan regions, and suburbs in particular, do better when cities do better, or whether their success is unrelated to the economic success and social welfare of the central city.

Regression analysis is employed to examine the impact of various indicators of urban decline on indicators of suburban and metropolitan growth. Control variables are included in the model in order to screen out the impact of confounding factors that may distract from the effects of urban decline. This research adds to the debate both by reproducing aspects of earlier research and through introduction of new analysis of the relationship between urban, suburban, and metropolitan performance.

117 Metro Areas

The study looks at 117 of the largest metropolitan areas, with city populations over 100,000 and Metropolitan Statistical Areas (MSA) populations over 200,000. It examines the ability of such key indicators of urban health as city income growth, the city-suburban income gap, and city poverty to predict two key indicators of suburban and regional

health during the 1980s: suburban income growth and MSA employment growth.

In addition to the indicators mentioned above, the multivariate regressions include control variables to account for the possible confounding influence of three particular factors:

- variation in the percent of the MSA population that resides in the central city;
- variation in the ability of cities to expand by annexing their suburbs; and
- variation by region due to unobserved factors.

The bivariate regression results largely confirm some earlier research findings that purported to show that the suburbs were better off in general when the city was better off. For example, suburban income was found to grow faster when there was faster city income growth and falling city poverty; and faster regional job growth was found to be correlated with rising city income, a smaller city-suburban income gap, and lower city poverty rates.

The two multivariate regressions that were performed were found to be far more successful in predicting the outcomes in question than the bivariate regressions. The first multivariate regression predicts 99 percent of the variation in suburban income growth and the second predicts 40 percent of the variation in MSA job growth, based on the adjusted R^2 measure of regression success.

On the whole and excepting these two regression successes, the story told by the multivariate regressions is a far more ambiguous one than that told by the bivariate regressions.

The first multivariate regression model (Model #1) links faster suburban income growth to faster city income growth, but it finds only a very weak link to increases in urban poverty (much weaker than that found in the bivariate regression). It also finds suburban income growth completely unrelated to David Rusk's elasticity measure or the proportion of MSA population residing in the central city. The control variables for region of the country also are found to have no impact.

The second multivariate model (Model #2) finds that faster MSA job growth is predicted by faster city income growth and a greater ability of cities to annex their suburbs, consistent with the theory that suburbs are better off when cities are better off. But this model also finds that faster regional job growth is linked to a growing city-suburban income gap and a smaller city size relative to the MSA population.

Moreover, it finds that growing city poverty had no dampening effect on regional job growth rates. In addition, unspecified regional factors were found to have a strong impact on job growth rates.

These findings are by no means uniformly consistent with either side of the argument over whether faster job growth is a function of healthier central cities. Overall, this study's inconclusive mix of findings muddies the water considerably on the question of whether suburbs suffer from, benefit from, or are unaffected by city decline.

This article is organized as follows: The second section reviews the academic literature relating to this issue. The third section describes the data and study methodology. The fourth section discusses the empirical findings. The fifth section proposes avenues for further research. An appendix contains details on the empirical findings.

Review of Analytic Literature and Policy Research

Theoretical Foundations

The argument that suburbs can develop and prosper independent of the health and success of the central city is based in part on the theory that cities and suburbs compete for growth within a metropolitan region. Proponents of the city-suburban independence side of the debate argue that suburbs benefit when cities decline because that decline prompts businesses as well as residents to locate in the suburbs rather than in the central city.

Hartshorn and Muller (1986) discuss how this process has contributed to the evolution of the suburbs from "bedroom communities" to "outer cities:"

> With surprising speed in the 1970s and 1980s, suburbs have evolved from a loosely-organized 'bedroom community' into a full fledged 'outer city,' characterized by metropolitan-level employment and activity concentrations and functional shifts that amount to nothing less than the achievement of suburban eco-

nomic, social, and geographic independence from the nearby central city that spawned these satellite settlements several decades ago.

Hicks (1987) adds:

> ...suburbs are increasingly successful in attracting the full range of advanced services away from central cities. Everything from corporate headquarters and urban universities to centers of high culture and sports and entertainment complexes gravitate easily to new suburban locations. Viewed as an economic landscape, we find a restructuring of the economies within many central cities that has left them simply one among several nodal points in a dispersed metropolitan economy. As central cities now compete with their suburbs for the full range of advanced services, modern suburbs can no longer be regarded as derivative and dependent.

Sources of Interdependence

The other side of the question responds with evidence of city-suburb interdependence and with the argument that the principal form of competition in today's economy is not *within* metropolitan areas but rather *among* them. Proponents of the city-suburb interdependence argument believe that regional cooperation offers the prospect of not only reversing the decline of central cities but also of bolstering the position of entire regions vis-a-vis their competitors in the global economy. As Neal Peirce, et al. write in their book *Citistates* (which is also their term for metropolitan regions), "Across America and across the globe, citistates are emerging as a critical focus of economic activity, of governance, of social organization for the 1990s and the century to come."

Ihlanfeldt (1995) discusses five possible sources of city-suburban interdependence.

- ***Image.*** Outsiders' perceptions of the region, which influence decisions on tourism and business and personal relocation, are frequently shaped by the image of the central city.
- ***Amenities.*** Central cities often contain amenities such as cultural institutions and tourist attractions that are valued by the entire region.
- ***Sense of place.*** Some central cities provide a "sense of place" valued by those who do not live in the central city.
- ***Fiscal and social burden.*** Central city fiscal and social problems often raise the tax burden on an entire region and retard economic development.
- ***Agglomeration economies.*** "Central cities may offer unique agglomeration economies that define an important and specialized role for the central city in the regional and national economy." (P. 126)

Central City and Suburban Growth Rates

A great deal of evidence has been assembled on the question of correlations between cities and suburbs in population growth, income growth, employment growth, and growth in housing values.

Savitch, et al. (1992, 1993) find through correlation analysis that suburban population growth is greater when the income disparity between city and suburbs is smaller. They also find a correlation between higher suburban per capita income and higher central city per capita income. However, it is possible that the correlations they demonstrate can be explained by something other than a causal relationship between city and suburban income levels. For example, MSA income levels could be highly correlated due to historical patterns shaping costs and standards of living in city and suburb alike rather than due to a causal link running from one to the other.[1]

In a 1993 study, Ledebur and Barnes look at the change in median household income in central cities and suburbs between 1979 and 1989 and find that the two are positively correlated. Ledebur and Barnes (1992) also examine the relationship between city-suburban income disparity and economic growth.

They find that metropolitan area employment growth is positively correlated with city per capita income as a percentage of suburban per capita income. However, they measure employment growth during a relatively brief period (only two and a half years, from January 1988 to August 1991) when the national economy was moving into recession, and it may be more instructive to look at a longer period of time, such as the period between growth peaks in the economic cycle.

Voith (1992, 1994) also documents the correlation between urban and suburban economic growth (as measured in terms of population, income, employment, and housing prices) and finds an increasing correlation over time.

As with Ledebur and Barnes and Savitch, et al., it is possible that this correlation is more reflective of factors affecting regions as a whole rather than of a causative relationship between city and suburban economic health in each individual region. Or, as Voith himself puts it, "Of course, the raw correlations could be the result of at least two alternative hypotheses: suburban growth could cause city growth, or the correlation could be the result of unobserved common factors (1994, p. 20)."

Mills (1990) presents similar evidence of interdependence, but he only looks at population growth and not at economic indicators.

In his own survey of the research into correlations between central city and suburban growth, Ihlanfeldt concludes that correlation analysis is incapable of providing satisfactory answers to researchers' questions:

> [T]hese results...should be interpreted as only weakly suggestive of interdependence and not very informative. First, positive correlations may arise if central cities and their suburbs are subject to common external factors. For example, a city and its suburbs are undoubtedly influenced by regional factors, such as climate, input costs, and product demands. Second, even if the positive correlations are not a statistical artifact and are the result of some type of causality, neither the direction nor the magnitude of the effect can be determined. Hence, correlative evidence cannot be used to address the fundamental issue of the importance of the central city to the regional economy. (1995, page 36-37)

Structural Models

Voith (1994) estimates a theoretically-grounded structural model relating city income growth to suburban growth in income, population, and residential real estate values using nonlinear two-stage least squares regression. This statistical model is intended to give a better indication about the direction of causality than the potentially spurious information from the raw correlations.

Voith argues that his regression model "allows the identification of the effects of city growth on suburban growth independent of the effects of suburban growth on city growth and independent of unobserved common factors (p. 20)." He concludes that his findings "strongly suggest that city income growth positively affects suburban growth in income, house value, and population... The estimations imply that the slow rate of income growth in our central cities has a significant negative impact on the aggregate wealth of metropolitan areas (p. 19-20)."

Ihlanfeldt sees shortcomings in Voith's methodology[2] but concludes that his findings are "the strongest evidence to date in favor of the interdependence hypothesis (1995, p. 138)."

City Earnings of Suburban Residents

Persky, et al. (1991) and Savitch, et al. (1993) find that a high proportion of suburban income is derived from center city employment. However, these findings fail to examine the changes in these figures over time and make no attempt to examine whether city job loss is related to suburban job gain.

City Employment Growth and Suburban Housing Values

Voith (1993) studied suburban Philadelphia housing and found that proximity to center-city-bound train services had a powerful effect on suburban home prices. However, as Ihlanfeldt (1995) observes, properties in close proximity to such rapid transit may constitute only a small share of all suburban housing, so the effect of a decline in the health of the central city on suburban real estate values may not be great.

Research Challenging Suburban Dependence Hypothesis

Hill, Wolman, and Ford (1995) argue that the direction of causality is the opposite of that hypothesized by Voith, Ledebur and Barnes, and Savitch, et al. They accept the finding of positive bivariate correlations between a larger income gap and slower suburban employment growth. However, they argue that the short-run causal relationship is best seen as

one in which faster metropolitan economic growth causes narrower disparities between central cities and their suburbs while slow growth causes wider disparities, due to residential segregation by income and skill level between city and suburb (p. 151). They also contend that the bivariate analyses employed to demonstrate suburban dependence suffer fail to control for regional effects and the effects of variation in the proportion of metropolitan residents contained in the central city. They further argue that "the largest problem...is the lack of an explicit theory that links the economic destinies of the central city to other parts of the metropolitan region and the lack of models based on theory (p. 163)."

Hill, et al. address this last issue by developing what they understand to be the implicit model linking city and suburban economic performance in the works they critique. This implicit model links city and suburban performance through city-suburban production complementarities that ensure eventual, indirect sharing of the economic costs of social polarization and urban decline. For example, they hypothesize that the suburbs suffer in the long run (in terms of income and job growth) when an entire region's competitive position is undermined by a failing urban educational system and the image problems generated by urban deterioration.

Hill, et al. think that this implicit model helps explain the results of city-suburb correlation studies, but they contend that the explanation is not complete without a second model to account for the causal link that they believe runs from variations in metro area economic growth to variations in city-suburban income disparities. They argue that faster economic growth reduces income disparities by disproportionately drawing poorer, lower-skilled city residents into the labor force, whereas economic contraction drives those people from the labor force disproportionately, increasing city-suburban income disparities.

Hill, et al. propose that future empirical work attempt to specify and estimate a model linking city and suburban economic performance based on these two theories of causation.

Rusk's Elasticity Hypothesis

A related body of work has been developed by former Albuquerque mayor David Rusk, who argues in *Cities Without Suburbs* that 24 cities have passed what he terms "the point of no return," characterized by population loss, disproportionate minority population, and a high city-suburban income gap (Rusk 1995, p. 44-45). All but one of these cities are located in the Northeast and Midwest, where Rusk points out that cities are more likely than their Western and Southern counterparts to have static jurisdictional boundaries.

Rusk argues that the most successful and dynamic cities have been those with "elastic" boundaries, meaning that they enjoy the power to annex their suburbs, helping them avoid the downward spiral in which the region's central city becomes an island of poverty in a sea of suburban wealth. Although Rusk developed his elasticity analysis to examine central city health more than metropolitan, there is merit in extending his concept to determine what light it sheds on regional trends. Rusk goes on to argue for "reversing the fragmentation of urban areas" by "reunify[ing] city and suburb...through metropolitan government (Rusk 1995, p. 85)."

This has been done by Blair, Staley, and Zhang (1996), who employ regression analysis to test the impact of elasticity and conclude that the results, while showing that higher elasticity has a positive impact on regional growth, show that the effect is not strong enough to justify widespread consolidation of metropolitan governments. They argue that other forms of inter-jurisdictional cooperation short of outright merger may have equally beneficial effects.

Blair, et al. perform regression analysis and find that higher elasticity did indeed contribute to MSA population and employment growth during the 1980s. However, they also find that there was no statistically significant link between elasticity and either MSA per capita income growth or MSA poverty growth during the same period. They conclude that elasticity has a greater impact on aggregate metropolitan growth than on indicators of economic welfare. Also noteworthy in Blair, Staley, and Zhang's study is their effort to control for state and regional economic influences by including in each regression

Table 1a: Literature Survey Summary

Authors	Measures of City-Suburban Interdependence
Rusk	• Higher elasticity contributes to lower city-suburb income disparities and hence to faster metropolitan job growth
Blair, Staley, and Zhang	• Higher elasticity contributes to metropolitan growth (in terms of population and jobs) but not to economic welfare (in terms of income and poverty)
Savitch, Collins, Sanders, and Markham	• Suburban population growth is greater when the income disparity between city and suburbs is smaller • Correlation between higher suburban per capita income and higher central city per capita income
Voith	• Finds an increasing correlation over time between urban and suburban economic growth from the 1960s to the 1980s (as measured in terms of population, income, employment, and housing prices)
Ledebur and Barnes	• Finds positive correlation between city and suburban absolute and relative change in median household income, 1979-1989. • Metro area employment growth is positively correlated with city per capita income as a percentage of suburban per capita income, 1988-91
Mills	• Finds city and suburban population growth are correlated from 1960-1980
Persky, Sclar, and Wiewel	• Measures the percent of suburban residents income derived from work in the city for seven cities

a variable to account for the state contribution to the dependent variable.

Areas Needing Further Research

Ihlanfeldt concludes that while there are significant linkages between cities and suburbs:

> it is obvious that much more work needs to be done. The most promising subject for future inquiry would be an explicit focus on the relationship(s) between central-city decline and metropolitan or suburban growth. Voith has already demonstrated that structural models which test for causality can be constructed and estimated. Much can be learned by refining these models to capture causal flows in both directions between cities and suburbs, changes in the relationships over time, and differences among metropolitan areas. (p. 39).

While the present study will not estimate a full structural model such as Voith's, it will build on earlier research, and help lay the groundwork for future research, by attempting to reproduce some of the results of earlier work while controlling for such factors as regional variation, elasticity, and the proportion of population residing in the central city.

Tables 1a and 1b summarize some of the most important findings of recent research into the question of city-suburban interdependence.

Research Design

Data and Sample

This study examines the same 117 MSAs with central city population greater than 100,000 used by David Rusk in his study of the effects of elasticity,[3] and covers the time period 1980-1990.

The Census Bureau is the source of most of the data in this study, including population, income, and poverty figures, which are drawn from the findings of the 1980 and 1990 decennial censuses. Job growth figures are from the Current Economic Statistics (CES) time series published by the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor. CES

Table 1b: Literature Survey Summary

Correlation/Regression Analyses of City-Suburban Interdependence

Authors	Independent Variables	Dependent Variables	Findings
Blair, Staley, and Zhang	• central city elasticity	• MSA population growth	• positive correlation
	• elasticity	• MSA employment growth	• positive correlation
	• elasticity	• MSA per capita income growth	• no significant correlation
	• elasticity	• MSA poverty growth	• no significant correlation
Savitch, Collins, Sanders, and Markham	• city population growth 1980-1990	• suburban population growth 80-90	• positive correlation
	• city per capita income 1987	• suburban per capita income 1987	• positive correlation
	• ratio of suburban to central city per capita income	• suburban population growth 1980-1990	• negative correlation
	• price of city office space	• price of suburban office space	• positive correlation
Voith	• city population growth 1960-1990	• suburban population growth 60-90	• increasing positive correlation
	• city income growth 1960-1990	• suburban income growth 1960-90	• increasing positive correlation
	• city employment growth 1960-90	• suburban employmnt growth 60-90	• positive correlation
	• city home price growth 60-90	• suburban home price growth 60-90	• positive correlation
Ledebur and Barnes	• city per capita income as a % of suburban per capita income, 1989	• metropolitan area employment growth, Jan. 1988 - Aug. 1991	• positive correlation
	• change in city median household income, 1979-89	• change in suburban median household income, 1979-89	• positive correlation
Mills	• nat'l city/suburb pop. growth rate for, regional dummies, SMSA dummies	• city or suburban population growth rate	• positive correlation between city and suburban growth

yields MSA-level employment data based on a survey of nonfarm establishments conducted monthly by BLS in cooperation with state employment security agencies.

Methodology

In this study, ordinary least squares regression analysis is employed to analyze the relationship between indicators of urban distress and indicators of suburban and regional growth. Regression analysis reveals the presence or absence of systematic relationships among key variables of interest while holding other factors constant. Bivariate regressions are performed to test the validity of earlier research findings. Multivariate regressions are conducted so as to factor out the impact of other test variables and other possible confounding influences.

Hypothesis

This study tests the hypothesis that a systematic relationship exists between indicators of suburban and metropolitan growth and indicators of urban decline. It employs several innovations designed to build on the research outlined in the previous section so as to advance general understanding of the functioning of these interrelationships. It looks at the nation as a whole instead of just one or two regions but incorporates dummy variables to control for region-specific effects. It also controls for variations in the percent of the MSA population that resides in a region's central city. In addition, it tests David Rusk's elasticity hypothesis through the inclusion of his elasticity scale as an independent variable.

To avoid the possibly confusing effects of cyclical fluctuations, the study covers an entire decade instead of just a few years. While this study does not propose a comprehensive model of city-suburban economic interaction, which would address the question of direction of causality, it is hoped that the findings will contribute to efforts to construct such a model.

Table 2a: Variable Descriptive Statistics

Dependent Variables

Variable	Valid	Missing	Minimum	Maximum	Range	Mean	Standard Error of the Mean	Median	Standard Deviation	Variance	Skewness
Suburban per capita income (PCI) growth 1979-1989	117	0	-0.066	0.511	0.577	0.173	0.011	0.155	0.117	0.014	0.522
MSA job growth 1980-1990	113	4[1]	-0.049	1.120	1.170	0.290	0.019	0.256	0.204	0.042	1.140

1. Missing data for four MSAs: Patterson, N.J.; Seattle, Wash.; Colorado Springs, Colo.; and Anchorage, Alaska

Models and Variables

This study employs two models, testing the relationship between urban distress and suburban growth in the first and between urban distress and regionwide growth in the second. Tables 2a and 2b provide the variables' descriptive statistics.

Dependent Variables. Suburban growth is the dependent variable in Model #1, as represented by growth in real per capita income in the areas of each MSA outside the central city from 1979 to 1989.

In Model #2, the dependent variable is regionwide growth, as represented by the increase in jobs in the entire MSA from 1980 to 1990. This can also be taken as a measure of suburban prosperity in the sense that the suburbs benefit directly from job growth anywhere in the region, given modern commuting patterns.

Key Independent Variables. The key test variables of interest are six indicators of urban distress, represented by city income growth, the gap between city and suburban incomes (and changes in that gap), and three measures of poverty. City income growth is the overall increase in inflation-adjusted per capita income in each city during the period in question, the decade of the 1980s. The gap between city and suburban incomes is measured by the ratio of city to suburban per capita income during the same period. The relative change in the income gap during the 1980s is also employed as a test variable.

In addition, three measures of urban poverty supplement income measures as indicators of city decline. The first is the average of the 1979 and 1989 city poverty rates as measured by the 1980 and 1990 censuses. The second is the relative change in the city poverty rate over that period. The third is a measure of the concentration of each region's poverty in its central city derived by dividing the city poverty rate by the metro poverty rate. (Another way to calculate this concentration ratio is to divide the proportion of regional poverty found in the city by the proportion of regional population that resides there.)

Other Independent Variables. Control variables are included in order to test arguments made in earlier research that region, city population size, and elasticity are significant influences on the dependent variables whose impacts must be taken into account in an accurate model. The most important control variable is region of the country. This is included in order to take into account the regional effects discussed earlier by Ihlanfeldt (such as climate and costs), as well as such factors as the rustbelt-sunbelt dichotomy in metropolitan development patterns in the 1980s. Regional dummy variables are employed in both Model #1 and Model #2 to prevent region of the country from interfering with the effect of the test variables (indicators of urban decline) on the

Table 2b: Variable Descriptive Statistics

Independent and Control Variables (Continuous Only)

Variable	Valid	Missing	Minimum	Maximum	Range	Mean	Standard Error of the Mean	Median	Standard Deviation	Variance	Skewness
City PCI growth 1979-1989	117	0	-0.147	0.392	0.538	0.10	0.01	0.091	0.103	0.011	0.283
City/suburb PCI ratio, average of 1979 & 1989	117	0	0.450	1.330	0.880	0.908	0.017	0.890	0.182	0.033	0.098
City/suburb PCI ratio change 79-89 (as a % of 79)	117	0	-0.214	0.340	0.554	-0.058	0.007	-0.056	0.075	0.006	1.106
City poverty, average of 79 & 89	117	0	0.07225	0.2954	0.22315	0.171	0.00451	0.1684	0.04877	0.002378	0.296
City poverty change 79-89 (as a % of 79)	117	0	-0.37631	0.81065	1.18696	0.15391	0.01933	0.1295	0.20914	0.043738	0.368
City poverty concentration ratio, avg. of 79 & 89	117	0	0.893	3.573	2.680	1.512	0.046	1.390	0.503	0.253	1.540
Proportion of MSA population in the city, 1990	117	0	0.09	1	0.91	0.383	0.018	0.34	0.191	0.036	0.729
Rusk's elasticity scale	117	0	4	39	35	20.393	0.970	22	10.493	110.103	-0.157

dependent variables (indicators of suburban and metropolitan growth).[4]

Another important control variable accounts for variation in the size of each city as a proportion of its MSA. The fact that some central cities make up most of their metro area while others account for only a small proportion of their region's population is a potentially important source of variation in the dependent variables whose effect might overlap with that of a test variable if it is not accounted for separately. It should be noted that this study takes this variable from 1990 only, on the assumption that variation for this variable did not change very much over the course of the decade.

Finally, David Rusk's elasticity scale is included so as to test whether the ability of a city to annex its suburbs contributes to a region's success, other things being equal. Several of Rusk's many factors hold that the elasticity of cities (their ability to annex their suburbs) influences the economic vitality of the region by promoting greater economic efficiency through the unification of policymaking, regulation, and tax base, helping attract new businesses and promoting the growth of existing concerns.

It is also argued that the social benefits of elasticity, purported to include greater racial and economic integration, help prevent the development of the isolated pockets of poverty and despair that con-

Table 3: Regression Variable "Effects"
(for the nine-region multivariate regressions)[1]

Variable	"Effect"
Faster city income growth associated with...	• **faster suburban income growth** • **faster MSA job growth**
Larger city-suburb income gap associated with...	• no effect on suburban income growth • no effect on MSA job growth (p=0.11)
Growing city-suburb income gap associated with...	• **faster suburban income growth** • **faster MSA job growth**
Higher city poverty rate associated with...	• no effect on suburban income growth • no effect on MSA job growth
Rising city poverty rate associated with...	• slightly slower suburban income growth • no effect on MSA job growth
Higher concentration of poor in city associated with...	• no effect on suburban income growth • no effect on MSA job growth
Higher percent of MSA residents in city associated with...	• no effect on suburban income growth • **slower MSA job growth**
Higher elasticity rating associated with...	• no effect on suburban income growth • **faster MSA job growth**

1. Coefficients that are significant at the 95% confidence level are noted in bold.

stitute an obstacle to economic development in many large cities, with the benefits accruing to the entire region. It should be noted that Rusk's scale is based on elasticity as measured from 1950-1990, while this study covers only the last quarter of that period, following Blair, Staley, and Zhang (1996).

Discussion of Results

The most important findings of this study are as follows:

- bivariate regression analysis confirms the findings of earlier research;
- multivariate regression analysis confirms some earlier findings but contradicts others; and
- overall, the results of the present study are ambiguous, providing support for both sides of the city-suburb independence-interdependence debate.

Table 3 summarizes the multivariate effect of each of the independent variables. Specific findings are discussed below.

Bivariate vs. Multivariate

Previous studies have been criticized for not taking into account possible confounding factors such as the level of urban distress, region of the country, and variation in the size of each city in proportion to its MSA. This study appears to justify those criticisms, demonstrating that bivariate and multivariate analyses can produce very different findings in terms of significance, magnitude, and direction of effect. For example, Ledebur and Barnes find a positive bivariate correlation between a lower city-suburb income gap and higher MSA job growth. This study finds a similar correlation.

Yet, when multivariate analysis is conducted, that correlation is no longer statistically significant

Table 4: Results Supporting the Independence and Interdependence Hypotheses

Results That Support the City-Suburb Interdependence Hypothesis	Results That Support the City-Suburb Independence Hypothesis
Model #1: Suburban Income Growth...	**Model #1: Suburban Income Growth...**
• is faster when city income growth is faster • is slightly slower when city poverty rates rise more quickly	• is faster when the city-suburb income gap grows • is unaffected by higher concentration of regional poverty in the central city • is unaffected by higher urban poverty rates
Model #2: MSA Job Growth...	**Model #2: MSA Job Growth...**
• is faster when city income growth is faster • is faster when the city has a higher elasticity rating on the Rusk scale	• is unaffected by a larger city-suburb income gap, and actually speeds up when the income gap grows faster • is unaffected by higher poverty, more quickly rising poverty, and higher concentration of regional poverty in the central city • is faster when more of the region's residents live outside the central city

at the 95 percent confidence level. Moreover, this study's finding that a *growing* city-suburb income gap (as opposed to a *higher* one in absolute terms) over the period in question was associated with faster job growth was only found through multivariate analysis. In the bivariate analysis that coefficient had a different sign and was not statistically significant.

At the same time, multivariate analysis confirms Ledebur and Barnes' finding (for the same time period but a different group of MSAs and definition of income) that city and suburban income growth are highly correlated in bivariate analysis. In this study, the bivariate coefficient was 0.77 (with R^2=0.46), while the multivariate coefficient was 1.02 (with adjusted R^2=0.99).

Independence vs. Interdependence

The empirical findings from the multiple-variable regression analysis can be grouped into two categories: findings that provide support for the city-suburb interdependence theory, and those that support the city-suburb independence theory. The two types of findings are categorized in Table 4. (Only multivariate regression results are presented.)

Before discussing the findings in more detail, it should be noted that, as a general rule, it should not be surprising to find evidence in support of both theories of city-suburban linkage, since it is not difficult to conceive that both theories enjoy at least some measure of validity in describing the dynamics of metropolitan interaction. It is certainly true that subdivisions within a metropolitan area compete with each other to retain and attract businesses and residents. At the same time it seems reasonable to suppose that, as David Rusk has said, "When the president of the Chamber of Commerce must alibi for the central city, the whole region is in trouble. (Rusk 1997)" Nonetheless, several of the findings of this study are surprising in light of earlier research.

The role of the city-suburb income gap. The finding that widening city-suburban polarization, as

evidenced by a growing income gap, is strongly associated with faster suburban income growth and faster metropolitan employment growth is of particular interest. It appears to contradict the general thrust (though not the exact findings) of earlier research by Ledebur and Barnes that linked job growth to smaller disparities and that has been widely cited in support of the city-suburban interdependence hypothesis. Therefore, it is a finding that is worthy of careful consideration.

The link in Model #1 in both the bivariate and multivariate regressions between a growing income gap and faster suburban income growth can probably be dismissed as a simple statistical artifact since the income gap automatically grows when suburban income grows faster on average than city income, as was the case during the 1980s. (Table 2 shows that, on average, suburban income grew 17 percent during the 1980s, while city income grew only 10 percent.)

However, the link in Model #2 between a growing income gap and faster metropolitan job growth cannot be similarly dismissed. With a coefficient of -0.774 ($p<.01$), the full range of variation in the growth of the income gap during the 1980s is associated with 43 points of variation in the job growth rate, out of a full range of 117 points of variation (see Table 5).

According to this coefficient, the actual rise of nearly 6 percent in the city-suburb income gap that took place in the 1980s was associated with 4.5 of the decade's 29 points of faster job growth in the average MSA. Or to put it another way, if we assumed a causal relationship, we could say that 15 percent of job growth in the 1980s was due to the growing city-suburb income gap.

What chain of causation could serve as the theoretical link between rising inequality and faster job growth? One possible explanation is that rising inequality fueled job growth. It is possible, for example, that rising inequality was due in part to the growing concentration of metropolitan poverty in the central cities, leaving the rest of the MSA freer to devote resources to investment and other job-producing activities, fueling faster job growth than in MSAs where poverty is more equally distributed and where the burdens of providing services to the poor are shared in greater measure by the suburbs.

If this were the case, we might also expect to find a correlation between higher concentration of poverty and faster job growth. In fact, in this study such correlations were not found to be statistically significant in the multivariate regression model (see Table 5).

It may make more intuitive sense to explain this phenomenon based on the opposite chain of cause and effect, that faster MSA job growth caused the growing inequality between cities and suburbs. If 1980s job growth was generally faster in suburbs than in cities, and if city residents were less likely than suburban residents to benefit from suburban job growth due to transportation difficulties and lower skill levels, then it makes sense that faster job growth in a region might benefit suburbanites more than city residents. If this is the case, then faster MSA job growth could fuel growth in the city-suburb income gap.

This explanation would also raise questions about the power of the effect hypothesized by Hill, et al. under which faster job growth disproportionately benefits the poorer, lower- skilled city residents (since, according to this story, they are more likely to be drawn into the labor market in a faster job growth situation). Hill, et al. were using this hypothesis to try to explain the link found by Ledebur and Barnes between lower inequality and faster job growth. This study's finding that that link does not exist in a statistically significant form should be considered in their efforts to construct a model explaining city-suburban interaction.

Role of city income growth. The finding of a strong correlation between city and suburban income growth reinforces the findings of earlier research and is consistent with the city-suburb interdependence hypothesis; however, the question of causation remains. Does one factor cause the other, or are they both caused by something else entirely? The present study is not designed to address this question.

Role of two independent factors. The study results are perhaps most confusing for these two independent variables, elasticity and the percent of

MSA population residing in the central city (ELAS4-39 and CITPCTPOP), which are so highly correlated that they have a bivariate R^2 of 0.30 and a Pearson's correlation coefficient of 0.51. It certainly makes intuitive sense that the high elasticity cities would generally have more of their MSA's population residing in the central city.

Yet, their multivariate regression coefficients indicate that these two variables offset each other almost completely in their "effect" on MSA job growth. The coefficients are of opposite sign, and carry similar impact on job growth over their entire range of variation (see Table 5).

However, when one measures the combined, or net, effect on the entire sample set, the effect is not quite so even. The net effect of the two variables is negative for 29 MSAs (meaning that the negative effect of the population variable on job growth predominates) and positive for the other 88, meaning that the positive effect of elasticity on job growth is considerably stronger overall. The average combined effect is to add 5.5 percentage points to an MSA's job growth figure. Thus, greater elasticity is associated with enhanced economic growth, even when the apparently offsetting effect of higher city population is considered[5]

A query. From the theoretical perspective, however, an important question remains: Why would having a higher percent of the metro population in the city be associated with lower job growth? Clearly, with an R^2 of only 0.40, Model #2 leaves out many factors influencing regional job growth. The model does not include any variables for local tax policy, wages, workforce characteristics, or transportation infrastructure, for example. In addition, this model does not include a variable to control for the size of the MSA. It may well be that the variable that is the percent of MSA population residing in the central city (CITPCTPOP) is acting as a proxy for some other variable that has been excluded from the model.

In addition, Model #2 does not attempt to account for differences between long term and short term effects. It seems reasonable to suppose that some of the mechanisms by which urban decline might slow regional growth would be gradual enough to escape perception in a year by year analysis. It might make sense to add variables to account for lagged effects.[6]

A regression run excluding the variable of the percent of MSA population residing in the central city (CITPCTPOP) found that elasticity retained almost exactly the same positive impact on job growth. However, a variable that had not previously been significant, the city poverty concentration ratio, which measures whether the city houses a disproportionate share of the region's poverty (POVCONAV), now became significant, with surprising effect.

As the city's share of the region's poverty population rises from the lowest to the highest score, job growth increases by 48 percentage points (out of a full range of 117 points). In other words, MSAs whose central cities are more burdened by the region's poverty have faster job growth, all other things being equal. (The full regression results for this model are available from the author as Appendix 5.)

Taken at face value, this finding supports the city-suburban independence theory. One can imagine various possible explanations of how this causal relationship might work. Perhaps, as with the income disparity discussion, isolating more of the region's social problems within one jurisdiction frees up the rest of the MSA to compete more effectively for job growth. However, it seems more likely that these seemingly contradictory findings result from specification error or missing variable bias. Indeed, econometric models predicting job growth often achieve much higher adjusted R^2s. Further refinement of this model—in both its variables and its specifications—might yield results that make more intuitive sense.

Summary and Conclusions

This study began with two goals: It set out to reproduce the bivariate regression results of earlier research and perform new, multivariate regressions to examine the relationship between urban, suburban, and metropolitan performance according to several important indicators of social and economic health. It was hoped that such an exercise might achieve two objectives:

Table 5: Regression Results Summary
(for the nine-region regressions)[1]

Independent Variables	Bivariate coefficients		Multivariate coefficients		Multivariate effect of full-range variation (B*range)[2]		Multivariate effect of 1980s changes (for change variables only)[3]	
	Suburban Income Growth	MSA Job Growth	Suburban income growth	MSA Job Growth	Suburban Income growth	MSA Job Growth	Suburban Income Growth	MSA Job Growth
City PCI growth 79-89 [PCICitGr]	**0.769**	**0.755**	**1.017**	**1.037**	**+.55**	**+.56**		
Sig t	.000	.000	0.000	0.001				
City/suburb PCI ratio, average of 1979, 1989 [PCIRatAv]	**-0.223**	**0.220**	-0.012	0.258				
Sig t	.000	.040	0.277	0.110				
City/ suburb PCI ratio change 79-89 [PCIRatCh]	**-0.7**	0.248	**-1.194**	**-0.774**	**-.66**	**-.43**	**+.07**	**+.045**
Sig t	.000	.332	0.000	0.009				
Avg of city poverty 1979, 89 [PovAvg]	0.252	**-1.060**	0.026	-0.213				
Sig t	.260	.008	0.499	0.700				
City poverty change 79-89 (as % of 79) [PovChng]	**-0.321**	**-0.353**	**-0.018**	-0.163	**-.02**		**-.003**	
Sig t	.000	.000	0.044	0.209				
Avg of city poverty concentration ratio 79, 89 [PovConAv]	**0.090**	0.0395	0.000	0.093				
Sig t	.000	.329	0.994	0.207				
% of MSA pop in city 1990 [CitPctPop]	**-0.165**	-0.139	0.01449	**-0.28**		**-.255**		
Sig t	.003	.195	0.115	0.038				
Rusk's Elasticity Scale [Elas4-39]	**-0.003**	**0.006**	-0.0003	**0.008**		**+.28**		
Sig t	.002	.001	0.143	0.005				
Midwest	**-0.215**	-0.008	**-0.01**	**0.212**				
Sig t	.000	.884	0.053	0.004				
West	**-1.168**	0.111	-0.002	**0.196**				
Sig t	.000	.094	0.661	0.015				
South	**-0.107**	0.123	0.002	0.103				
Sig t	.000	.060	0.748	0.206				
Florida	**-0.137**	**0.327**	0.012	**0.261**				
Sig t	.001	.000	0.094	0.011				
East southwest	**-0.286**	-0.028	-0.0004	**0.188**				
Sig t	.000	.684	0.951	0.051				
West southwest	**-0.223**	**0.195**	-0.005	**0.335**				
Sig t	.000	.046	0.486	0.003				
Hawaii	-0.121	0.002	-0.014	-0.011				
Sig t	.162	.992	0.248	0.952				
Alaska	**-0.325**	Missing value	-0.013	Missing value				
Sig t	.000	--	0.384					

1. Coefficients that are significant at the 95% confidence level are noted in bold.

2. This column multiplies the significant regression coefficients by the full range of (positive) variations in the independent variable to measure how the predicted value of dependent variable changes over the full range possible variation in the independent variable.

3. This column multiplies the regression coefficients by the mean value of the change variables so as to provide a sense of how the predicted value of the dependent variables changes in responses to the actual changes in the independent variables during the time period in question.

- contribute to efforts to construct a valid model of the interaction between city and suburban performance; and
- help answer the question of whether suburban residents have suffered, benefitted, or been unaffected by the decline of central cities in so many metropolitan areas in recent years.

The study looked at 117 of the largest metropolitan areas during the 1980s. It examined the ability of such key indicators of urban health as city income growth, the city-suburban income gap, and city poverty to predict two key indicators of suburban and regional health: suburban income growth and MSA employment growth.

In addition to the indicators mentioned above, the multivariate regressions included control variables to account for the possible confounding influence of three particular factors:

- variation in the percent of the MSA population that resides in the central city;
- variation in the ability of cities to expand by annexing their suburbs; and
- variation by region due to unobserved factors.

The bivariate regression results largely confirmed some earlier research findings that purported to show that the suburbs were better off in general when the city was better off. For example, suburban income was found to grow faster when there was faster city income growth and falling city poverty; and faster regional job growth was found to be correlated with rising city income, a smaller city-suburban income gap, and lower city poverty rates.

The two multivariate regressions that were performed were found to be far more successful in predicting the outcomes in question than the bivariate regressions. Based on the adjusted R^2 measure of regression success, the multivariate regressions predict 99 percent of the variation in suburban income growth and 40 percent of the variation in MSA job growth. However, on the whole, the story told by the multivariate regressions is a far more ambiguous one than that told by the bivariate regressions.

Model #1 linked faster suburban income growth to faster city income growth, but it found only a very weak link to increases in urban poverty (much weaker than that found in the bivariate regression). It also found that suburban income growth was completely unrelated to David Rusk's elasticity measure or the proportion of MSA population residing in the central city. The regional dummy variables also had no impact.

Model #2 found that faster MSA job growth was predicted by faster city income growth and a greater ability of central cities to annex their suburbs, consistent with the theory that suburbs are better off when the city is better off. But the model also found that faster regional job growth was linked to a growing city-suburban income gap and a smaller city size relative to the MSA population. It also found that growing city poverty had no adverse effect on regional job growth rates. In addition, unspecified regional factors were found to have a powerful impact on job growth rates. These findings are by no means uniformly consistent with either side of the argument over whether faster job growth is a function of healthier central cities.

Overall, this study's inconclusive mix of findings muddies the water considerably on the question of whether suburbs suffer from, benefit from, or are unaffected by city decline.

On the other hand, this study's inconclusiveness does provide support for the argument advanced by Ihlanfeldt and Hill, et al. that there is a need for an empirically derived, theoretically grounded model of city-suburban interaction. Such a model would probably need to include additional variables, especially in the job growth model, and it would probably need to employ a more sophisticated statistical model than the simple ordinary least squares regression used in this case. It is hoped that this study's findings will contribute to efforts to construct such a model. ■

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tute (GPPI), from which the author received his MPP in 1998. Grateful acknowledgement is given to the author's faculty advisor, Dr. Jeffrey Mayer; GPPI faculty members Drs. Jens Ludwig, Jean Mitchell, and Richard Forshee for their comments; David Rusk for providing his data for use in this study; and to reviewers prior to publication here.

Appendix

Data Limitations

1. **Per capita income:** This study uses per capita income because it is relatively easy to recalculate when changes occur in MSA definitions. This also facilitates the separation of city and suburban income measures. A possible source of error in the figures is that the decennial census income numbers are based on self-reported money income for the year prior to the census year whose population is used in calculating the per capita figure.
2. **Cost of living variations:** This study uses the CPI-U price index from the Bureau of Labor Statistics to convert 1979 income figures into 1989 dollar values. However, the limitation of this method is that it applies a national inflation factor that ignores regional and local variations in inflation as well as different starting points in cost and standard of living.
3. **CES problems:** BLS's Current Employment Statistics (CES) data series has several important limitations. Because it counts employment by a survey of employers and not of residents (unlike the employment figures based on the Current Population Survey), it is not able to account for people who live in one MSA but work in another nearby. In addition, it counts people employed by more than one establishment at each establishment that reports them. It also excludes several categories of employers: farms, private households, proprietors, and the self-employed.

   Perhaps CES's most important limitation involves the changes in benchmarking and MSA definitions, whose impact is not always reflected retroactively in the historical data. This can lead to the presence of discontinuities in the time series and bias the results of an analysis. It would be useful in future research to run the same regressions using Regional Economic Information Service (REIS) employment figures from the Bureau of Economic Analysis of the U.S. Department of Commerce, which appears to more consistently adjust its historical time series to reflect changes in MSA definitions.

   Another limitation is that the currently available time series often reports figures for a Consolidated Metropolitan Statistical Area (CMSA) and not for the smaller Primary Metropolitan Statistical Areas (PMSAs) within them. For example, CES reports employment figures for the San Francisco-Oakland-San Jose CMSA but not for each of its three PMSAs. In such cases, this study uses the CMSA employment growth figure for all PMSAs within the CMSA.
4. **MSA definitions:** This study uses consistent MSA definitions for 1980 and 1990. These definitions are generally the ones used by the federal government prior to the changes that followed the 1990 census. (One exception is New York, where Nassau and Suffolk Counties were added to the MSA definition). However, there are many cases where the MSA definitions may not accurately reflect the true functioning of that metropolitan area, particularly in terms of its employment market. For example, the New York MSA excludes New Jersey counties, even those immediately adjacent to Manhattan that serve as bedroom suburbs of New York City. Dallas and Fort Worth are counted as two separate MSAs; the Los Angeles area as four.
5. **Cities and suburbs:** In this study, the figures for the city in each MSA count only the principal central city of each MSA, with the exception of Minneapolis and St. Paul, whose figures have been combined. In many other cases, however, using the Census Bureau's officially defined principal central city introduces an element of distortion into an analysis that seeks to clearly distinguish between city and suburb. Such a prac-

tice counts secondary cities within an MSA as suburbs even when they share more in common with the central city [(as is the case, for example, with Boston's Chelsea or Philadelphia's Camden or Kansas City, Kansas (an urban suburb of Kansas City, Missouri)]. Future research might begin to correct for this by creating indicators of urban distress that reflect the figures for all cities within an MSA.

Empirical Results

A. Bivariate Analysis

Bivariate regressions were performed for the purpose of comparison to the multivariate regressions and to earlier research. Table 6 provides the bivariate regression coefficients and their significance. This section outlines those results by variable.[7]

1. **Income**

   a. Bivariate regression of suburban income growth on city income growth: Produces a coefficient of 0.769 at a confidence level of over 99 percent ($p<.001$). The bivariate R^2 of 0.46 also indicates a highly significant degree of correlation. This strong correlation between city and suburban income growth supports findings by Savitch, et al., Voith, and Ledebur and Barnes.

   b. Bivariate regression of MSA job growth on city income growth: Produces a coefficient of 0.755 at a confidence level of over 99 percent ($p<.001$). The bivariate R^2 equals 0.15.

2. **Income gap**

   a. Bivariate regression of suburban income growth on the city-suburb income ratio: Yields a coefficient of -0.223 at a confidence level of over 99 percent ($p<.001$) with a bivariate R^2 of 0.12. This indicates that when other factors are not considered, a higher income ratio (a smaller income gap between city and suburb) is associated with slower suburban income growth.

   b. Bivariate regression of MSA job growth on the city-suburb income ratio: Yields a coefficient of 0.22 at a confidence level of 96 percent ($p=.04$) with a bivariate R^2 of 0.04, indicating that a higher income ratio (smaller income gap) is associated with faster MSA job growth.

3. **Change in income gap**

   a. Bivariate regression of suburban income growth on change in the city-suburb income ratio: Yields a coefficient of -0.7 at a confidence level of over 99 percent ($p<.001$) with a bivariate R^2 of 0.20. This indicates that an increase in the income ratio during the 1980s (a shrinking income gap) was associated with slower suburban income growth when other factors are not considered.

   b. Bivariate regression of MSA job growth on change in the city-suburb income ratio: Yields a coefficient that is not significantly different from zero, with a bivariate R^2 less than 0.01, meaning changes in the city-suburb income gap are unrelated to changes in MSA job growth.

4. **Urban poverty**

   a. Bivariate regression of suburban income growth on city poverty: Yields a coefficient that is not significantly different from zero, with a bivariate R^2 of 0.01. This indicates that variations in central city poverty rates bear no relationship to variations in suburban income growth.

   b. Bivariate regression of MSA job growth on city poverty: Yields a coefficient of -1.06 at a confidence level of over 99 percent ($p=.008$), with a bivariate R^2 of 0.06. This coefficient indicates that every one point increase in the urban poverty rate is associated with a one point drop in the region's rate of employment growth, when no other factors are considered.

5. **Change in urban poverty**

   a. Bivariate regression of suburban income growth on change in city poverty: Yields a coefficient of -0.321 ($p<.001$), with a bivariate R^2 of 0.33. This indicates that a one point increase in the city poverty rate over the decade was associated with a one-third point decline in the suburban income growth rate, when no other factors are considered.

   b. Bivariate regression of MSA job growth on change in city poverty: Yields a coefficient

Table 6: Bivariate Regression Results

Continuous Variables

	Model #1: Dependent variable: Suburban per capita income growth 1979-1989						Model #2: Dependent variable: MSA job growth 1980-90					
Bivariate regression on...	**F**	**Sig F**	**Adj R2**	**Std Err of Estimate**	**B**	**Sig t**	**F**	**Sig F**	**Adj R2**	**Std Err of Estimate**	**B**	**Sig t**
City PCI growth 79-89 [PCICitGr]	97.325	0	0.454	0.08653	0.769	0	19.219	0	0.14	0.1891	0.755	0
City/suburb PCI ratio average [PCIRatAv]	15.855	0	0.114	0.1102	-0.223	0	4.321	0.04	0.029	0.2009	0.22	0.04
City/suburb PCI ratio change 79-89 (as % of 79) [PCIRatCh]	29.191	0	0.196	0.105	-0.7	0	0.949	0.332	0	0.2039	0.248	0.332
Avg of city poverty 1979, 1989 [PovAvg]	1.279	0.26	0.002	0.1169	0.252	0.26	7.32	0.008	0.053	0.1984	-1.06	0.008
City poverty change 79-89 (as % of 79) [PovChng]	56.097	0	0.322	0.0964	-0.321	0	16.523	0	0.122	0.1911	-0.353	0
Avg city poverty conc. ratio 79, 89 [PovConAv]	20.355	0	0.143	0.1084	0.09	0	0.962	0.329	0	0.2039	-0.0395	0.329
% of MSA pop in city, 1990 [CitPctPop]	8.927	0.003	0.064	0.1133	-0.165	0.003	1.698	0.195	0.006	0.2033	-0.139	0.195
Rusk's elasticity scale [Elas4-39]	10.41	0.002	0.075	0.1126	-0.003	0.002	12.618	0.001	0.094	0.1941	0.00634	0.001

Regional Dummy Variables

Regional regressions		**Model #1: Dependent variable: Suburban per capita income growth 1979-1989**				**Model #2: Dependent variable: MSA job growth 1980-1990**			
		9 regions	**5 regions**	**4 regions**	**3 regions**	**9 regions**	**5 regions**	**4 regions**	**3 regions**
	F	15.29	22.837	15.109	22.67	3.944	3.966	3.233	4.894
	Sig F	0	0	0	0	0.001	0.005	0.025	0.009
	Adj R2	0.496	0.43	0.267	0.272	0.155	0.096	0.056	0.065
	Std Err of the Estimate	0.083	0.0884	0.1002	0.1	0.1874	0.1939	0.1981	0.1972
Midwest	**B**	-0.215	-0.19	-0.19	-0.19	-0.00843	-0.00855	-0.00855	-0.00855
	Sig t	0	0	0	0	0.884	0.884	0.886	0.886
West	**B**	-1.168	-0.143	-0.143		0.111	0.111	0.111	
	Sig t	0	0	0		0.094	0.1	0.107	
Sun/West=Sunbelt+W	**B**			-0.153				0.111	
	Sig t				0				0.048
Sunbelt=S2+SW	**B**			-0.158				0.111	
	Sig t			0				0.058	
South2=S+FI	**B**		-0.0897				0.172		
	Sig t		0.001				0.007		
SW=ESW+WSW	**B**		-0.242				0.0303		
	Sig t		0				0.646		
South	**B**	-0.107				0.123			
	Sig t	0				0.06			
Florida	**B**	-0.137				0.327			
	Sig t	0.001				0			
East southwest	**B**	-0.286				-0.02839			
	Sig t	0				0.684			
West southwest	**B**	-0.223				0.195			
	Sig t	0				0.046			
Hawaii	**B**	-0.121				0.001968			
	Sig t	0.162				0.992			
Alaska	**B**	-0.325				missing			
	Sig t	0				–			

of -0.353 ($p<.001$), with a bivariate R^2 of 0.13. This indicates that a one point increase in the city poverty rate over the decade was associated with a one-third point decline in regional job growth.

6. **Urban poverty concentration**

   a. **Bivariate regression of suburban income growth on MSA poverty concentration ratio:** Yields a coefficient of 0.09, with a bivariate R^2 of 0.15, meaning that MSAs whose poverty is more concentrated in the central city tend to have faster suburban income growth.

   b. **Bivariate regression of MSA job growth on MSA poverty concentration ratio:** Yields a coefficient that is not significantly different from zero, with a bivariate R^2 of less than 0.01, meaning that variations in poverty concentration are not correlated with variations in job growth.

7. **Proportion of population in the city**

   a. **Bivariate regression of suburban income growth on the proportion of MSA population residing in the central city:** Yields a coefficient of -0.165 ($p=.003$), with a bivariate R^2 of 0.07. This indicates that MSAs with more of their population within the central city tend to have slower income growth in their suburbs, when other factors are not taken into account.

   b. **Bivariate regression of MSA job growth on the proportion of MSA population residing in the central city:** Yields a coefficient that is not significantly different from zero, with a bivariate R^2 of 0.015, indicating no significant correlation between these two variables.

8. **Elasticity**

   a. **Bivariate regression of suburban income growth on Rusk's elasticity scale:** Yields a coefficient of -0.003 ($p=.002$), with a bivariate R^2 of 0.08. This indicates that when other factors are not considered, higher elasticity MSAs tend to have slower suburban income growth.

   b. **Bivariate regression of MSA job growth on Rusk's elasticity scale:** Yields a coefficient of 0.006 ($p<.001$), with a bivariate R^2 of 0.10, linking more elastic MSAs to faster job growth.

9. **Region**

   a. **Bivariate regression of suburban income growth on regional dummy variables:** Bivariate analysis indicates significant regional effects on suburban income growth. (Appendices 2 and 3, available from the author) show actual mean values for income growth by region.)

   b. **Bivariate regression of MSA job growth on regional dummy variables:** Job growth is also significantly correlated with region in bivariate analysis. Fastest job growth is found in Florida and the West Southwest, with slowest growth in the Northeast and Midwest.

B. Multivariate Regression Analyses

Multivariate regression analysis is performed so as to control for potentially confounding factors and assess the independent effects of each independent variable on the dependent variables, suburban income growth and MSA job growth. The results reported and discussed in this section and the one that follows are from the first column of each of the two multivariate regressions in Table 7, which reports the results for the regression that divides the country into nine regions.

1. **Model #1: Multivariate regression analysis of factors affecting suburban income growth**

   For the model as a whole, the F statistic of 814.59 is significant at the 99 percent confidence level, indicating that a significant relationship exists between the explanatory variables and suburban income growth. The adjusted R^2 of 0.99 suggests that the variables in the model explain 99 percent of the variation in suburban income growth during the 1980s. The standard error of the estimate is 0.011, which is less than one-tenth of the standard deviation of the dependent variable (0.117). This section reports the findings of the multivariate regression analysis for each explanatory variable in Model #1.

   a. **Income:** The multivariate regression coefficient of 1.02 on city income growth ($p<.001$) indicates that even when other factors are controlled for, city and suburban incomes rise and

Table 7: Multivariate Regression Results[1]

Independent variables		Model #1: Dependent variable: Suburban per capita income growth 1979-1989			Model #2: Dependent variable: MSA job growth 1980-90		
		9 regions	5 regions	3 regions	9 regions	5 regions	3 regions
	F	814.594	1044.957	1232.397	6.025	6.737	6.768
	Sig F	0	0	0	0	0	0
	Adj R2	0.991	0.991	0.991	0.402	0.381	0.34
	Std Err of the Estimate	0.011	0.0111	0.0112	0.1576	0.1605	0.1657
City PCI growth 79-89 [PCICitGr]	B	1.017	1.015	1.036	1.037	0.999	0.563
	Sig t	0	0	0	0.001	0.002	0.044
City/suburb PCI ratio average [PCIRatAv]	B	-0.012	-0.0128	-0.0089	0.258	0.159	0.07111
	Sig t	0.277	0.238	0.398	0.11	0.3	0.637
City/ suburb PCI ratio change 79-89 [PCIRatCh]	B	-1.194	-1.186	-1.203	-0.774	-0.654	-0.336
	Sig t	0	0	0	0.009	0.027	0.199
Avg of city poverty 79, 89 [PovAvg]	B	0.02554	-0.0183	0.00119	-0.2134	-0.481	-0.772
	Sig t	0.499	0.618	0.972	0.7	0.376	0.131
City poverty change 79-89 (as % of 79) [PovChng]	B	-0.018	-0.0198	-0.0226	-0.1634	-0.182	-0.138
	Sig t	0.044	0.028	0.01	0.209	0.163	0.287
Avg of city poverty conc. ratio 79, 89 [PovConAv]	B	0.000038	-0.0003	-0.0009	0.09323	0.0939	0.09962
	Sig t	0.994	0.944	0.854	0.207	0.211	0.185
% of MSA pop in city, 1990 [CitPctPop]	B	0.01449	0.01293	0.00941	-0.28	-0.326	-0.28
	Sig t	0.115	0.16	0.267	0.038	0.017	0.031
Rusk's elasticity scale [Elas4-39]	B	-0.0003	-0.0003	-0.0003	0.00795	0.008881	0.01051
	Sig t	0.143	0.186	0.115	0.005	0.002	0
Midwest	B	-0.0097	-0.0096		0.212	0.212	
	Sig t	0.053	0.06		0.004	0.004	
West	B	-0.0024	-0.0025	0.00474	0.196	0.182	0.01776
	Sig t	0.661	0.643	0.206	0.015	0.022	0.754
Sunbelt=S2+SW	B			0.008			0.02214
	Sig t			0.034			0.69
South2=S+FI	B		0.004			0.146	
	Sig t		0.525			0.067	
SW=ESW+WSW	B		-0.002			0.229	
	Sig t		0.74			0.014	
South	B	0.00181			0.103		
	Sig t	0.748			0.206		
Florida	B	0.0118			0.261		
	Sig t	0.094			0.011		
East southwest	B	-0.0004			0.188		
	Sig t	0.951			0.051		
West southwest	B	-0.0051			0.335		
	Sig t	0.486			0.003		
Hawaii	B	-0.0143			-0.0108		
	Sig t	0.248			0.952		
Alaska	B	-0.0126			Missing		
	Sig t	0.384					

1. Results for alternative regional configurations are included to show that they do not substanstantially alter the results. For the 3-region configuration, Midwest is combined with Northeast and becomes the reference category.

fall together. This high level of correlation between city and suburban income growth supports findings in earlier research by Savitch, et al., Voith, and Ledebur and Barnes.

b. Income gap: The multivariate regression coefficient on the city-suburb income ratio variable is not significantly different from zero (p=.277). This indicates that when other factors are considered, variations in the income ratio have no systematic relationship with variations in suburban income growth rates.

c. Change in the income gap: The multivariate regression coefficient on the variable for change in the city-suburb income ratio equals -1.2 (p<.001). This indicates that the six percent average drop in the income ratio that took place during the 1980s (the growth in the city-suburban income gap) was associated with about seven percentage points of faster suburban income growth. This is about 40 percent of the 17 percent average increase in suburban per capita income during the 1980s.

d. Urban poverty: The multivariate regression coefficient on the city poverty rate is not significantly different from zero (p=.50). This indicates that variations in central city poverty rates bear no relationship to variations in suburban income growth.

e. Change in urban poverty: The multivariate regression coefficient on the variable for change in the city poverty rate equals -0.018 (p<.05). This suggests that bigger increases in poverty in the city are linked to smaller, but only slightly smaller, increases in suburban income. Thus, a 50 percent increase in the city poverty rate, for example from .10 to .15, would be associated with about a one percentage point drop in overall suburban income growth during the same period. On average, city poverty rates during the 1980s increased by 15 percent, from about .16 to about .18 on average. These regression results indicate that had there been no increase in city poverty, suburban income growth rates would have been about one-third of a percentage point higher than they were, all other things being equal.

f. Urban poverty concentration: The multivariate regression coefficient on the variable for the MSA's urban poverty concentration ratio is not significantly different from zero (p=.994). This indicates that poverty concentration ratios do not vary in any systematic manner with suburban income growth, when other factors are accounted for.

g. Proportion of population in the city: The multivariate regression coefficient on the variable for the proportion of MSA population residing in the central city equals 0.0145 at a marginal confidence level (p=.115). The sign on this coefficient indicates that when more of the region's residents live in the city, suburban income grows faster. However, in practical terms, the coefficient is so small that the entire range of variation in this variable would be responsible for variation of only about one percentage point in the suburban income growth rate (out of total variation range of 58 percentage points).

h. Elasticity: The multivariate regression coefficient on the variable for Rusk's elasticity scale equals -0.0003 at an insignificant confidence level (p=.143), indicating that this variable has no significant independent effect on suburban income growth.

i. Region: In contrast to the bivariate regression results, the multivariate regression indicates that regional effects on suburban income growth are virtually nonexistent. When using nine regions, none of the coefficients differs from 0 with a confidence level greater than 95 percent. When the regions are recombined into three—Rustbelt (Northeast and Midwest), Sunbelt (South, Florida, and Southwest), and West (dropping Alaska and Hawaii)—the coefficients indicate that there was a "Sunbelt effect" increasing suburban income growth by one percentage point over the course of the decade compared to Rustbelt states.

2. Model #2: Multivariate regression analysis of factors impacting on MSA job growth

For the model as a whole, the F statistic of 6.025 is significant at the 99 percent confidence level, indicating that a significant relationship

exists between the explanatory variables and the outcome of interest (MSA job growth). The adjusted R^2 of 0.40 suggests that the variables in the model explain 40 percent of the variation in MSA job growth during the 1980s. The standard error of the estimate is 0.1576, which is 23 percent less than the standard deviation of the dependent variable (0.204). This section reports the findings of the multivariate regression analysis for each explanatory variable in Model #2.

a. Income: The multivariate regression coefficient of 1.04 on city income growth (p=.001) indicates that even when other factors are controlled for, city income growth and regional job growth rise and fall together.

b. Income gap: The multivariate regression coefficient of 0.258 on the city-suburban income ratio (p=.11) is not significant at the 95 percent confidence level. This indicates that there is no relationship between the size of the city-suburb income gap and regional job growth rates. This is in contrast to findings by Ledebur and Barnes that associate a smaller income gap with faster job growth (they use a different time period and a different population of MSAs).

c. Change in income gap: The regression coefficient on the variable for change in the city-suburb income ratio during the 1980s equals -0.774 (p<.01). This indicates that the 6 percent average drop in the income ratio that took place during the 1980s (the growth in the city-suburban income gap) was associated with about 4.5 percentage points of faster MSA employment growth. This implies that, had the average income gap remained unchanged during the decade instead of growing, MSA job growth would have averaged 24.5 percent instead of 29 percent. This is a finding that runs counter to findings by Ledebur and Barnes that associate a smaller income gap with faster job growth.

d. Urban poverty: The multivariate regression coefficient on the city poverty rate is not significantly different from zero (p=.7). This indicates that variations in central city poverty rates bear no relationship to variations in regional employment growth rates.

e. Change in urban poverty: The multivariate regression coefficient on the variable for change in the city poverty rate equals -0.163 (p=.21). Since the coefficient is not significant, we can not reach any conclusions about the impact of changes in urban poverty rates on MSA job growth.

f. Urban poverty concentration: The multivariate regression coefficient on the variable for the MSA's urban poverty concentration ratio equals 0.093 (p=.21). Since the coefficient is not significant, we can not reach any conclusions about the impact of urban poverty concentration rates on metropolitan employment growth.

g. Proportion of population in the city: The multivariate regression coefficient on the variable for the proportion of MSA population residing in the central city equals -0.28 (p<.04). This coefficient indicates that when more of the region's residents live in the city, MSA job growth is slower. The full range of variation in this variable is associated with 25.5 percentage points of variation in regional employment growth rates (out of a total variation range of 117 percentage points in job growth rates).

h. Elasticity: The multivariate regression coefficient on the variable for Rusk's elasticity scale equals 0.008 (p=.005). This coefficient indicates that regions with more elastic central cities have substantially faster employment growth rates, all other things being equal. The full range of variation in elasticity is associated with 28 percentage points of variation in regional employment growth rates (out of a total variation range of 117 percentage points in job growth rates). It is worth noting that the effects of this variable and the previous one appear to largely offset each other. Elasticity and proportion of population in the city generally rise and fall together, with a Pearson's correlation of .51 and a bivariate R^2 of .30.

i. Region: In contrast to the multivariate regression results for suburban income growth, the multivariate regression results for MSA job

growth indicate highly significant regional effects, independent of the effects of the other variables.

NOTES

1. One way to avoid this pitfall might be to look at changes in income rather than absolute levels, since changes may be more a function of changes in economic productivity than of historical cost of living factors. However, even changes in income could be more the result of regional factors that affect both city and suburban economies than of factors that influence the two differentially.
2. "Unfortunately, Voith is not able to identify his central city equations, so whether suburban income growth similarly affects central cities is unknown. Moreover, to augment his sample size he uses growth rates calculated over the last two decades in one specification and the last three decades in another specification, but he does not investigate whether the strength of the central city effects on the suburbs have changed over time. (page 138)"
3. Grateful acknowledgement is given to David Rusk for providing his data for use in this study. Rusk's study of elasticity in *Cities Without Suburbs* is based on the Census Bureau-defined Metropolitan Statistical Areas (MSAs). Of the 320 MSAs recognized by the Census Bureau in 1993, he excludes from his analysis 131 MSAs with less than 200,000 total population and another 48 with central cities containing fewer than 100,000 residents. He also excludes as anomalous cases three city-less MSAs, 13 white-only MSAs, five declining mining regions, and three Mexican border towns. (For a full explanation of his inclusion criteria, see *Cities Without Suburbs* pages 49-51.)
4. Definitions of regions were included in the original paper as Appendix 1, available from the author.
5. A fuller explanation of the combined effects in this case is available in Appendix 4 of the original paper.
6. Appendix 2, available from the author, compares the means of the dependent variables by region.

REFERENCES

Blair, John P., Samuel R. Staley, and Zhongcai Zhang. Summer 1996. "The Central City Elasticity Hypothesis: A Critical Appraisal of Rusk's Theory of Urban Development," *Journal of the American Planning Association*, 62:3, pages 345-353.

Bureau of the Census, *County and City Data Book: 1994*. 1994. Washington, D.C.: U.S. Department of Commerce, Economics and Statistics Administration.

Hartshorn, Truman A. and Peter O. Muller. 1989. "Suburban Downtowns and the Transformation of Metropolitan Atlanta's Business Landscape," *Urban Geography* 10, pp. 375-395. Hicks, Donald P. 1987. "Urban Policy in the U.S.: Introduction," *Urban Studies* 24, pp. 439-446.

Hill, Edward W., Harold L. Wolman, and Coit Cook Ford, "Can Suburbs Survive Without Their Central Cities? Examining the Suburban Dependence Hypothesis." November 1995. *Urban Affairs Review* 31:2, pp. 147-174.

Ihlanfeldt, Keith R. June 1995. "The Importance of the Central City to the Regional and National Economy," *Cityscape* 1:2.

Ledebur, Larry C. and William R. Barnes. February 1993. "All in It Together: Cities, Suburbs, and Local Economic Regions," A Research Report of the National League of Cities.

Ledebur, Larry C. and William R. Barnes. September 1992. "City Distress, Metropolitan Disparities, and Economic Growth," combined revised edition, A Research Report of the National League of Cities.

Mills, Edwin S. 1990. "Do Metropolitan Areas Mean Anything?" A Research Note, *Journal of Regional Science* 30:3, pp. 415-419.

Peirce, Neal, Curtis Johnson, and Peter Hall. 1993. *Citistates*. Washington, DC: Seven Locks Press. Persky, Joseph, Elliott Sclar, and Wim Wiewel, *Does America Need Cities? An Urban Investment Strategy for National Prosperity*. Washington, DC: Economic Policy Institute.

Rusk, David, *Cities Without Suburbs*, second edition. Baltimore: Johns Hopkins University. 1995.

Rusk, David. April 1, 1997. "Sprawl, Race, and Market Share: The Impact of Elasticity on the Health of Central Cities and Metro Areas: A Rebuttal to 'The Central City Hypothesis: A Critical Appraisal of Rusk's Theory of Urban Development.'" Prepared for The Land Economics Foundation of Lambda Alpha International.

Savitch, H.V., and Ronald K. Vogel, eds. 1996. *Regional Politics: America in a Post-City Age. Urban Affairs Annual Reviews* 45. Thousand Oaks, California: Sage Publications.

Savitch, H.V., David Collins, Daniel Sanders, and John P. Markham. 1992. "The Regional City and Public Partnerships" in Ronald Berkman, et al. (eds.), *In the National Interest: The 1990 Urban Summit*. New York: Twentieth Century Fund Press.

Savitch, H.V., David Collins, Daniel Sanders, and John P. Markham. 1993. "Ties That Bind: Central Cities, Suburbs, and the New Metropolitan Region," *Economic Development Quarterly* 7:4, pp. 341-357.

Voith, Richard P. November 1994. "Do Suburbs Need Cities," Working Paper No. 93-27/R, Economic Re-

search Division, Federal Reserve Bank of Philadelphia.

Voith, Richard P. 1993. "Changing Capitalization of CBD-Oriented Transportation Systems: Evidence from Philadelphia 1970-1988," *Journal of Urban Economics* 33, pp. 361-376.

Voith, Richard P. 1992. "City and Suburban Growth: Substitutes of Complements?" *Business Review*, (September/October), pp. 21-33, Federal Reserve Bank of Philadelphia.