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ABSTRACT

The 1990s were an unusually good decade for the largest American cities and, in particular, for the cities of the Midwest. However, fundamentally urban growth in the 1990s looked extremely similar to urban growth during the prior post-war decades. The growth of cities was determined by three large trends: (1) cities with strong human capital bases grew faster than cities without skills, (2) people moved to warmer, drier places, and (3) cities built around the automobile replaced cities that rely on public transportation. In the 1990s (as in the 1980s), more local government spending was associated with slower growth, unless that spending was on highways. We shouldn't be surprised by the lack of change in patterns of urban growth, after all the correlation of city growth rates across decades is generally over 70 percent.

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I. Introduction

In the 1950s, 60s, and 70s, almost every Northeastern or Midwestern city with more than 500,000 people shrank in every decade.[2] In the 1990s, a majority of such cities grew. New York City's population grew by nine percent. Chicago grew by four percent. Between 1950 and 1990, the share of Americans living in cities with more than 500,000 inhabitants fell every decade from a high of 17.54 percent in 1950 to 12.09 percent in 1990. In the 1990s, the share of population living in these big cities finally rose. Likewise, the share of the U.S. population living in cities with more than 7500 people per square mile rose from 7.1 percent to 7.8 percent during the 1990s.

Does this mean that city living is back? Is the New Urbanism movement (Katz, 1994), which sees a renewed demand for dense, walking cities, correct? Does the 2000 U.S. Census tell us that the production and consumption benefits of density have finally acted to reverse the slide of America's largest cities? Were the 1990s a radical break from the past, during which the demand for density has finally ended the push towards sprawl and the sun?

No. The growth rates of New York and Chicago were not representative of other dense cities, which generally declined. Unless we are comfortable extrapolating from these two places we cannot say that there was a major change in the basic path of urban America. Moreover, the increase in the growth rates of New York and Chicago between the 1980s and the 1990s was only slightly higher than the increase in the growth rate of the total U.S. population. Indeed, the most striking fact about city growth in the 1990s is the continuity with previous decades. City growth in the 1990s followed the same basic patterns found by previous researchers (Mills and Lubuele, 1995; Glaeser et al., 1995): there was no general rebirth of high-density cities. The century-long trend of people moving to places with good weather, low density and skilled inhabitants, just continued. With the sole exceptions of New York and Chicago, the only dense cities with more than 200,000 people that grew were either in California or Florida, or were unusually endowed with college graduates.[3] On average, the 18 dense cities without a

[2] The only exceptions are Milwaukee in the 1950s and Columbus in the 1970s.
[3] Throughout this paper, we use the same terminology as the census and use the term city to refer to the political unit. Technically, the fact that lies behind this sentence is that the only cities with more than 200,000 people which

preponderance of skill that are outside of California or Florida declined by more than 5 percent in the 1990s.

These facts highlight the three important trends in urban growth that persisted throughout the 20^{th} century. There was a flight to warm, dry places. Places built around the car replaced places built around walking and public transportation. People moved to cities with strong skill bases. Despite New York and Chicago, these facts remained strong in the 1990s.

Indeed, dryness and temperature were powerful predictors of growth at the city and the MSA level with or without region controls. The raw correlation of January temperature with city growth in the 1990s was 35 percent, and the raw correlation of rainfall with city growth was -41 percent. Rainfall and July temperature even remain significant when we control for region dummies. The magnitudes of these relationships were the same for the 1980s and the 1990s—we must conclude that the demand for warm weather continued unabated.

The trend to sprawl also persisted. Low-density cities grew faster than high-density cities. Cities with public transportation systems on average grew slower than cities where people generally drive. Naturally, we do not interpret this as an estimate of the causal impact of public transportation. Instead, to us this correlation indicates the ongoing trend away from cities built around older transportation technologies. Moreover, the impact of density and transport variables on growth was unchanged between the 1980s and the 1990s.

The high-density cities that tended to succeed were those with strong human capital bases. Variables like percent college educated remained persistent predictors of growth, especially outside of the west. The correlation between percent college graduate and the growth rate for cities with more than 200,000 people outside of the west was 60 percent (shown in Figure 1). Per capita income was also a strong predictor of growth. Poverty and unemployment negatively predicted growth. We interpret this (as we have in the past, see Glaeser et al., 1995) as evidence for the importance of local human capital in growth. The connection between skills

had density levels above the median for that group which grew in the 1990s were (1) either in the New York or Chicago CMSAs or in the states of California or Florida, or (2) were in the top-quarter of big, dense cities when cities are ranked by the share of their population that has a college degree.

and growth emphasized by Glaeser (1994) and shown to exist for every decade since 1880 by Simon and Nardinelli (1996) persisted in the 1990s. Despite the continuing strength of this fact, we do not know if local skills matter because of education spillovers in production or quality of life. Even if skills matter primarily for production, we do not know if they matter because knowledge leads to new ideas or because knowledge is a level effect that is increasingly valued in an increasingly idea-oriented economy.

Other relationships also remained similar to findings for earlier periods. Cities with more government spending did worse than cities with small governments. Manufacturing cities tended to do poorly (as in Glaeser et al., 1995). Surprisingly, employment in the health care industry was highly negatively correlated with urban growth. City population remained only very weakly correlated with city growth. As has been shown elsewhere (Glaeser et al., 1995, Eaton and Eckstein, 1997) there doesn't appear to be a strong tendency for urban populations to mean revert. That fact continued to be true in the 1990s.

The fact that urban trends basically continued in the 1990s doesn't make the data from the 1990s any less important. The facts have confirmed that we are witnessing a century-long movement towards better weather, and away from higher density public transportation and low skill cities. Furthermore, these facts stress the remarkable persistence of urban growth. As Figure 2 shows, the correlation between urban growth in the 1980s and urban growth in the 1990s was over 75 percent. This extraordinarily high correlation is something of a puzzle in and of itself.

The New Demand for Density

But what about the heralded growth of big, dense cities? For urban economists, the most salient fact about the growth of cities in the 1990s is the rebound of big, dense cities. This fact has been proclaimed. But is it true?

First, cities with more than 200,000 people grew at an average rate of 8.7 percent (8.2 percent if population weighted). The comparable rate for the U.S. population was 12.3 percent. In the

1980s, these larger cities grew by 5.3 percent, but the U.S. population only grew by 9.4 percent in that decade. If there was a speed-up of the largest cities as a whole, it was small.

But what about the fact that there were some big, dense cities that actually grew and were not in the Sunbelt? Consider the set of 28 cities that had more than 200,000 people in 1990, that had density levels in 1990 greater one person per fifth acre (or 2.5 people per half-acre) and that are not in California or Florida. Within that set of cities there were eleven cities that grew in the 1990s (there were also eleven such cities that grew in the 1980s). A slightly higher percentage grew in the 1990s, but after all, the U.S. population grew faster too.

Does this growth represent a change from historical patterns? A primary fact about urban growth is that skills predict growth. In 1990 there were 31 cities with more than 200,000 people and where college graduates outnumbered high school dropouts. All but one of those cities grew in the 1990s. The only exception was Washington, D.C. Of the 11 dense, non-sunbelt cities that grew in the 1990s, eight had more college graduates than high school dropouts (in 1990): Boston, MA, Omaha, NE, Portland, OR, Honolulu, HI, St. Paul, MN, Minneapolis, MN, Seattle, WA, and Columbus, OH.

There were only three dense cities with more high school dropouts than college graduates (in 1990) that grew in the 1990s outside of California, Texas and Florida: New York, Chicago and Jersey City (which is, after all, part of the New York metropolitan area). Thus, we are not really looking at a widespread phenomenon, we are looking at New York and Chicago.

There are many possible explanations for the success of these cities. They are the densest cities and therefore this could reflect a demand for super-high density either in production of high idea commodities or in consumption. These cities could just have done well because of immigrant population. Indeed, every city in the U.S. with more than 200,000 residents and more than 10 percent of residents foreign born (in 1990) grew in the 1990s, except for Newark (which almost grew). However, New York and Chicago are really only two data points, and it will be hard to learn much from them.

As much as we might like to believe that there was a general rebound in big, dense cities, it isn't really true. The growth rate of bigger cities went up relative to the 1980s, but the change in rates roughly mirrors the increased growth rate of the U.S. population. Of the eleven dense, non-sunbelt cities that grew in the 1990s, eight can be explained by the fact that high education cities generally grow (and they have since 1880, see Simon and Nardinelli, 1996). That leaves three cities in two metropolitan areas, and while the increased population of New York and Chicago is impressive, it does not make a trend.

In the next section, we consider a wider range of stylized facts about city growth in the 1990s to see if there are any major ways in which the 1990s looked different from previous decades.

II. Conceptual Issues and the Estimating Framework

Conceptually, we follow the approach to growth put forward in Glaeser et al. (1995) and further explicated in Glaeser (2000). We assume that we are always in a spatial equilibrium where (1) individual utility and (2) the returns to capital are equalized across space. These assumptions are not critical for the empirical work, but they are helpful in enabling us to write down a microeconomic system that allows us to interpret the results. Local output for city *i* at time *t* equals $A_{it}K_{it}^{a}L_{it}^{b}$, where A_{it} is city level productivity, K_{it} is city level capital and L_{it} is city level labor, which we assume equals *z* times total city population (denoted N_{it}), where 0 < z 1. The *z* parameter is meant to capture the fact that there are some non-working members of each city. Capital earns an exogenous rent *r* (equal to its marginal product assuming perfect competition).

Utility equals $C_{it}W_{it}/P_{it}$, where C_{it} is a city-level consumption amenity index, W_{it} represents city-level wages and P_{it} represents city-level prices. This must be equal some utility level *u* which is constant across cities. These equations produce the following equality, which must hold for every city:

$$(1)\quad Log(N_{it}) = \Theta_t + \frac{1}{1-a-b}Log(A_{it}) + \frac{1-a}{1-a-b}Log\left(\frac{C_{it}}{P_{it}}\right),$$

where Θ_t is a term that is constant across cities.[4] Thus, city level population is increasing in city-level productivity and city-level consumption amenities and declining in city-level prices.

To clarify a few key concepts, we suppose that each city i has a set of K scalar characteristics, denoted $X_{i1}, \ldots, X_{ik}, \ldots, X_{iK}$. We prefer to think of these characteristics as unchanging over time. Letting X_i be the vector of these characteristics, we assume that $Log(A_{it}) = X_i' b_t + d_{it} + e_{it}$ and that $Log\left(\frac{C_{it}}{P_{it}}\right) = X_i' g_t + m_{it}$, where e_{it} and m_{it} are error terms that are orthogonal in both levels and changes to any observable characteristics and where $\hat{a}_t$ and $\tilde{a}_t$ are vectors of coefficients corresponding to the city-level characteristics. The term d_{it} is orthogonal in levels, but $d_{it+1} - d_{it} = X_{it}' q + x_{it}$ where x_{it} is a completely orthogonal error term. Using these terms, and combining the orthogonal error terms, we find that:

$$(2)\ Log\left(\frac{N_{it+1}}{N_{it}}\right) = \Delta\Theta + \frac{1}{1-a-b}\sum_k (b_{kt+1} - b_{kt} + (1-a)(g_{kt+1} - g_{kt}) + q_k) X_{ik} + z_{it}$$

where z_{it} is a completely orthogonal error term. Thus if a characteristic X_k—such as weather—positively predicts growth, this can come about for three reasons. First, this X_k variable may have become more important in the production process. This would mean that $b_{kt+1} > b_{kt}$. Second, this X_k variable may have become more important to consumers either by lowering the cost of living or raising the general set of local amenities. This would mean that $g_{kt+1} > g_{kt}$. Finally, this X_k variable may increase the rate of technological growth. This would mean that $q_k > 0$. We have assumed that there are only dynamic effects in the growth of productivity, but there may also be city-level attributes that are associated with dynamic changes in the quality of life.

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[4] In fact, $\Theta_t = -Log(z) + \frac{1}{1-a-b}\left(Log\left(a^a b^{1-a}\right) - aLog(r) - (1-a)Log(u)\right)$.

We will not attempt to determine why any particular variable is associated with later growth. However, it is important to note that all of those stories may possibly be true for any predictor of growth. When wage data for cities in 2000 becomes available, it will be possible (in the spirit of Glaeser et al., 1995) to determine the extent to which urban attributes are working through productivity or through amenities.

What characteristics might be thought to be important for urban growth? The literature on economic growth has long suggested that local spillovers means that local human capital should be a strong determinant of growth. Size and density might also be important. Casual observation suggests that the weather might be significant. Finally, industry level and political variables may also be important determinants of local productivity.

An Aside on the Unit of Analyses—MSAs vs. Cities

Generally the approach of geographic economists tends to focus on Metropolitan Statistical Areas (MSAs). These are multi-county units that are meant to capture local labor markets. They are available both in the form of Consolidated Metropolitan Statistical Areas (which are extremely large) and Primary Metropolitan Statistical Areas (or PMSAs which are somewhat smaller). We will look at the growth of MSAs, but we will also concentrate on cities.

Cities are, of course, political units that lie within metropolitan areas. They differ wildly in size, sometimes including the entire MSA, other times consisting only of a small downtown area. As such, comparing cities with one another does require a certain amount of tolerance for error.

However, there are also good reasons for focusing on cities. They are closer to representing traditional downtowns. While a firmer geographic construct—such as the population within 10 miles of the central business district—might actually be more attractive, in general data on such entities are not available. Thus, if we want to know the determinants of growth of downtown areas—true cities, as distinguished from suburbs, we are generally left to look at cities.

Moreover, we may be particularly interested in factors such as human capital spillovers that are generally thought to operate at a fairly local level. As such, sprawling geographic regions, such CMSAs, will be far from the appropriate unit of analysis. Because we are interested in the impact of local amenities, we are attracted to smaller units of observation and hence to cities. Finally, there are also political questions where cities are the perfect unit of analysis.

III. Data Description—Tables 1 and 2

Our data all comes from the 1980, 1990 and 2000 censuses. We have restricted ourselves to cities with more than 100,000 inhabitants at of 1990 or 1980 (respectively). Our 1980 and 1990 samples thus contain different cities because of our desire to have uniform selection criteria. Our previous discussions have tended to focus on cities with more than 200,000 people. This is useful because these larger cities are more likely to be true central cities, while cities with between 100,000 and 200,000 people will often be suburbs. Still, to get more statistical precision, we will be looking at the larger set of cities with more than 100,000 people. For consistency, our MSA sample will also consist of cities with more than 100,000 people

As discussed in Section II, our approach is to correlate urban growth in the 1990s with city characteristics in the previous decade. The sources for city (or MSA) level characteristics in 1980 and 1990 include the *County and City Data Book,* 1988, the *County and City Data Book, 1994*, and the *USA Counties 1998* database. The sources are more precisely detailed in the Data Appendix.

Tables 1 and 2: Means and Sample Correlations

In Tables 1a-1c we show the means and standard deviations of our variables. Among the things to notice in this data set is that the average log growth rate of cities in the 1990s was 9.76 percent. This is higher than the growth rate in the 1980s, which was 7.42 percent. However, the difference between the two growth rates was less than the change in overall U.S. population growth rates between the 1980s and the 1990s. The average growth rate of MSAs was higher, 12.04 percent, which reflects the general rise of the suburbs.

The maximum growth rate in both decades was over 60 percent. In the 1980s, the fastest growing city was Mesa, Arizona. In the 1990s, it was Las Vegas, Nevada. The minimum growth rate in the 1980s was –26 percent (Gary, Indiana). The minimum growth rate in the 1990s was –13.9 percent (Hartford, Connecticut). The range for MSA growth was comparable to the range for city growth –7.5 percent to 58.9 percent.

The range in per capita income across cities and MSAs in 1990 was quite vast. The seven poorest cities were either immigrant cities of the Sunbelt (Laredo, TX, Hialeah, FL, El Monte, CA) or declining cities of the Rustbelt (Gary, IN, Cleveland, OH, Detroit, MI, Newark, NJ). The three richest cities were suburbs (Stamford, CT, Alexandria, VA, Irvine, CA). The best educated cities were college towns (Ann Arbor, MI, Berkeley, CA). The least educated cities overlapped closely with the poorest cities. By and large the other income and education variables tend to be highly correlated with one another.

There was also a tremendous amount of heterogeneity in the weather variables. Mean January temperature as of 1990 ranged from 11.8 degrees (Minneapolis-St. Paul) to 71.4 degrees (Honolulu, HI). Mean July temperature ranged from the high 50s (Anchorage and San Francisco) to the low 90s (Phoenix and Las Vegas). Average annual precipitation ranged from 4.13 inches (Las Vegas) to over 65 inches (Tallahassee).

While we group all cities together, some cities are really traditional downtowns and others cover a wide range of suburbs. The varieties of cities in the data set show up in our sprawl variables. Some of the smaller cities (which tend to be suburbs) span less than 10 square miles. Among the larger cities (with more than 500,000 people in 1990), the two smallest cities are Boston and San Francisco (both are less than 50 square miles). Anchorage is by far the largest city in the U.S. with more than 1600 square miles. Houston and Oklahoma City are also two of the largest cities. Public transportation usage tended to be clumped around zero in 1990. In 120 of the 195 cities, less than four percent of the population used public transportation to get to work. There were 20 cities where more than fifteen percent of the population used public transportation, and in four of these cities more than one-third of the people used public transportation (Washington, D.C., Jersey City, NJ, San Francisco, CA, and New York, NY).

Finally, the government variables also show that cities differed a lot in their spending habits. Of course, much of this heterogeneity comes from state rules about spending—the r-squared from regressing spending on state dummies is over 70 percent. As such, we will only look at within state variation when connecting these variables with growth.

In Table 2, we look at correlations between our three measures of city growth and various dependent variables. We have put stars next to correlations that are statistically significant. The first line shows the correlation with initial population. In general, there was a slight negative relationship with initial population for cities and a slight positive relationship for metropolitan areas. However, in both cases the relationship is statistically insignificant.

However, the relationship with income tended to be quite strong, especially for cities. The relationships with temperature are particularly striking. Warmth, particularly January temperature, was highly correlated with growth at both the city and the metropolitan area level.

The sprawl measures—density, car usage and public transportation usage—were all reliably correlated with growth at the city level. The relationships at the MSA level were much weaker—perhaps because car usage is almost ubiquitous at the MSA level. The industry mix variables were occasionally highly correlated with city growth. We are particularly puzzled by the strong relationship between employment in health services and urban decline at both the city and MSA levels.

Unemployment was strongly negatively associated with city decline, but much less strongly associated with MSA decline. As MSAs, not cities, are generally thought to be relevant labor markets, we interpret this result as suggesting that the city-level correlation is reflecting the decline of low human capital cities. High school and college degrees both predicted later growth. Poverty was a strong negative correlate of growth. High percent black was also associated with population decline. This result can either reflect white racism or the correlation between percent black and poverty, which was over 60 percent in 1990.

Finally, cities with big governments grew much less quickly than cities with small governments. There was a negative correlation between growth and spending on schooling and a positive correlation between growth and spending on police. There was also a positive correlation between growth and spending on highways. Naturally, these spending patterns are interesting but do not represent causal impacts of spending. They are much more likely to reflect omitted variables which were correlated both with growth and with these types of spending.

IV. Results

In Table 3, we show our first set of regression results, which focus on the most basic facts of urban growth. Regressions (1), (5) and (9) look at the degree to which city populations mean reverted. These regressions show the basic correlation between initial levels of city population and later growth. Regressions (1) and (5) show that the connection between initial population and later city growth was stronger in the 1980s than in the 1990s. The connection between initial population and later growth was more likely to be negative in the past. Glaeser et al. (1995) found that this was even more true during earlier post-war decades. As regression (9) shows, there was a statistically insignificant positive relationship between initial MSA population and later MSA growth in the 1990s.

Regressions (2), (6) and (10) show the connection between population density and later growth with a three part spline that allows for a more flexible relationship between initial population and later growth. Again, there was no correlation for cities in the 1990s between population and later growth. In the 1980s, the correlations were similarly weak. For metropolitan areas, there appears to have been more of a positive relationship but again there is little here to go on.

The message of these regressions is that in the 1990s, we again saw essentially parallel growth of both cities and metropolitan areas. There is nothing intrinsic in big cities that makes them decline. The spline suggests that there is no threshold that cities need to reach before they take off. Overall, as in Glaeser et al. (1995) and Eaton and Eckstein (1997), the evidence supports the view that city growth is independent of initial city size. Figure 3 shows the relationship between city growth and the logarithm of city population. The variance of city growth was unquestionably higher for cities with lower population levels, but there was no effect of city population on mean growth.

Regressions (3), (7) and (11) include our basic controls: initial income, median age of city residents and regions. All three of these types of variables related strongly to growth. Income was a very powerful predictor of later growth. This appears to have been true in the 1980s as well (but not in earlier decades, see Glaeser et al., 1995). In the 1980s, the effect was less statistically significant, but the magnitude was actually larger. As wages are, in part, the visible evidence of human capital, these results are our first hint that the human capital level of the city was actually important. Of course, this result could also just represent the possibility that some cities were hit with positive labor demand shocks that then induced migrants to come to the city.

Regression (3), (7) and (11) also show that cities with more young people tended to grow more quickly than cities with more old people. This is perhaps because younger people tend to move more often than the old and growing cities tend to attract a larger number of young people. Finally, we control for region. Regional effects on city growth were quite impressive. The impact of being in the west was a 15 percent increase in growth (relative to being in the northeast). Cities in the south grew more than 10 percent faster than cities in the northeast. These effects were almost the same at the city and the MSA level. The parallel impact of region on the two geographic units means that the big regional fact is just uneven population growth, not uneven development of cities.

When we compare the role of regions in the 1980s and 1990s, we see that there were two changes between the decades. First, in the 1990s, midwestern cities did better than northeastern cities. In the 1980s, northeastern cities did better. Controlling for other variables, this represents roughly an 8 percent swing in relative performance. Second, the south did better in the 1990s (relative to the northeast or the west) than in did in the 1980s. Put together, these facts tend to suggest that the center of the U.S. gained ground relative to the coasts in the 1990s.

Regressions (4), (8) and (12) include the lagged growth rate of the city. One of the more striking facts about urban growth is the tremendous persistence of growth rates. The correlation between the growth rate of cities in the 1980s and cities in the 1990s was 77 percent. Figure 2 shows this impressive relationship graphically. The effects of including lagged growth in the regressions are impressive. The r-squared of the basic city-level regression doubles when lagged growth is included. The coefficient on lagged growth is 0.58 which means that if the city grew 1 percent more quickly in the 1980s, it grew on average 0.58 percent more quickly in the 1990s.

Many variables become insignificant when lagged growth is included in the regression. The regional patterns become muted. The regression suggests that controlling for lagged growth, the northeast was the one loser in the 1990s. The impact of age and income disappears. As controlling for lagged growth eliminates most of the variation across cities, we will not include lagged growth in any further regressions, because that would make it impossible for us to use regressions to understand the patterns of growth across cities. Still, while lagged growth doesn't help us to explain the city-specific factors that were correlated with later growth, there is no question that past growth is the best predictor of future growth.

Geographic Determinism Revisited: Urban Growth and the Weather

In Table 4, we look at the role of the weather. While the discipline of geography has tended to reject geographic determinism for decades, recent research by Jeffrey Sachs and others (see, for example, Gallup, Sachs, and Mellinger, 1999) tends to find big connections between the weather and later economic growth. Previous work of ours (Glaeser et al., 2001; see also Glaeser and Shapiro, 2001) has emphasized the connection between weather and city growth. That paper argued that the movement of people to warmer, drier cities suggested an increasing importance of consumer amenities relative to production facilities. In the framework of the model, this would mean that $g_{kt+1} > g_{kt}$ for climate, and that climate is being valued increasingly highly over time. This increasing value might occur because of rising incomes. Alternatively, the urban advantages associated with cold, wet places (proximity to rivers, comfort without air-conditioning in factories over the summer) might have become less important. As declining transportation costs have eroded the advantages of attributes like proximity to natural resources or rivers, workers have moved to locales that provide consumption advantages.

The connection between growth and the weather appears to have continued to hold in the 1990s, but there were some notable differences with prior decades. In the first regression, we look at the effect of mean July temperature. This variable was an important predictor of growth at both the MSA and the city level in both the 1980s and the 1990s. A one standard deviation increase in this variable (6.3 degrees) led to 5.1 percent increase in the growth rate (40 percent of a standard deviation) in the 1990s. The correct view is that this weather variable was important, but hardly overwhelming. The connection between temperature and later growth was strong, but there was sufficient variation that it would be wrong to think that we live in a world where weather determines urban growth.

In regressions (2), (5) and (8) we look at rainfall. Rainfall was associated with slower growth both in the 1980s and the 1990s. The impact of rainfall on growth in the 1990s appears to have been somewhat weaker than in the 1980s, but still the variable remained strong. A one standard deviation decrease in this variable (15 inches) led to a 4 percent increase in the growth rate over the decade. People moved to drier climates and this was true at both the city and the MSA level.

In regressions (3), (6) and (9) we look at the impact of January temperature. Among cities in the 1990s, there was no impact of January temperature on growth, once we control for region. Without regional controls, the effect of January temperature was quite significant—the correlation between growth and January temperature across the U.S. as a whole was 35 percent. The decline of January temperature represents a change from the 1980s where January temperature had a significant effect on city growth. In the 1990s, January temperature still mattered for MSA growth. The smaller effect of January temperature on cities in the 1990s seems to represent smaller growth of central cities in some Sunbelt states, mostly California. While California cities still grew 6 percent faster than our entire sample of cities, they grew 8 percent more slowly than cities in the west more broadly. Since California cities have extremely mild winters (13 degrees warmer than the west generally and 8 percent warmer than our southern cities), the slow growth of California lessens the impact of this weather variable. [5]

Overall, climate was still clearly important. Dry, hot places grew faster probably because they appeal to consumers. However, the dominance of weather appears to have declined somewhat. In the 1980s, only four very cold cities (defined as having mean January temperatures below 30 degrees) grew by more than 12 percent. In the 1990s, twelve such cold cities grew that fast. Of course, in general the cold regions did not do well, but some cold cities have done better. Understanding this change appears to be an important avenue for future research.

The Rise of Edge Cities

In Table 5, we look at a second phenomenon: the rise of edge cities (Garreau, 1991). The broad urban history of the 20th century has seen the replacement of higher density cities, built around public transportation, with medium density cities built around automobiles (see Glaeser and Kahn, 2001). Table 5 looks at whether this change continued in the 1990s.

Regressions (1), (4) and (7) examine urban density and car use. We include the logarithm of land area in these cities. Since we are controlling for the logarithm of population, including this control is equivalent to controlling for density. At the city level, land area had a weakly positive effect in both the 1980s and 1990s. A one standard deviation increase in land area was related to a 2 percent increase in the growth rate of cities in both decades. At the MSA level, the impact of density was much stronger. Big MSAs grew much more quickly than small MSAs.

The proportion of workers driving alone to work also had a correlation with growth at the city level (but not at the MSA level). As the share of workers who drive rose by 10 percent, the growth rate over the 1990s rose by 2.5 percent (20 percent of a standard deviation). The impact of driving in the 80s was almost identical. Interestingly, the coefficient on percent driving is only statistically significant in the city regressions—not the MSA regressions. Thus, driving

[5] Indeed, when we remove cities in California from regression (3) we find a significant positive relationship between January temperature and city growth similar in magnitude to that found in the 1980s.

cities did well relative non-driving cities within MSAs, but across MSAs, driving was not particularly attractive. One explanation for this difference is that the heterogeneity in this variable across MSAs was quite small relative to the heterogeneity across cities—there are no MSAs in our sample with less than 50 percent of people driving alone to work. The impact of driving and land density together provide us with the general facts suggesting that cities built around automobiles are doing better than older cities built around higher densities and other forms of transportation, in terms of within-MSA competition for people.

Regressions (2), (5) and (8) look at public transportation use. In this case, we use a dummy variable capturing whether more than five percent of the population used public transportation. This dummy variable is meant to capture whether the city had any real public transportation system at all. We prefer this specification because it minimizes the extent to which public transportation is capturing urban poverty (as in Glaeser, Kahn and Rappaport, 2000). In both the 1980s and the 1990s, public transportation usage was negatively associated with city growth. Cities where more than five percent of the population used public transportation grew 5.7 percent more slowly than cities where less than five percent of the population used public transportation. The effect in the 1980s was even larger.

Why were public transportation and high densities associated with slower growth? In regression (3), we control for the share of the housing stock in the city that was built before 1939. This is a tricky variable to include as it reflects in no small part the past growth of the city. Cities that have been growing quickly will tend to have a lot of newer housing and as such the value of this variable will be lower. Since the variable is itself a product of the growth rate interpreting it is difficult. Still, we include it to show that one interpretation of the public transportation result is that this variable just captures older cities. When we include the share of the city's housing stock (as of 1990) that was built before 1939, the coefficient on the public transportation usage variable drops by over 60 percent and becomes statistically insignificant. The land area parameter estimate drops by about a quarter. As such these variables can be interpreted as just capturing the fact that newer cities are replacing older cities.

This fact makes it particularly important to stress that we are not suggesting that our results can be interpreted as an estimate of the impact of building more public transportation. Cities with more public transportation grew more slowly in the 1980s and the 1990s, but this was probably due to a host of factors associated with these relatively old, relatively high-density cities. Indeed, the effect of public transportation disappears when you control for the age of the housing stock. People appear to have left public transportation cities, but they did not necessarily do so because of public transportation itself. Omitted correlates of public transportation are likely to have caused the shift.

Growth, Industry Structure and Unemployment

In Table 6, we look at the correlations between growth and initial industrial structure. Past work (Glaeser et al., 1995) found a connection between manufacturing employment and growth during earlier post-war decades (particularly the 1950s and 1960s). In the 1980s and 1990s, the effect of manufacturing employment was negative but statistically insignificant at the city level (as shown in regressions (1) and (4)). In regression (7), we show that manufacturing still predicted decline at the MSA level.

In regressions (2), (5) and (8), we include a wider range of industry level controls. Here manufacturing employment is being compared with professional employment, not with all other industries. In this case, manufacturing was a significant negative predictor at both the MSA and the city level. Wholesale and retail trade was significantly positive at the city level but not the MSA level. We have more limited industrial data in the 1980s, but this data also suggests that trade employment positively predicted growth at the city level. While the difference between MSA and city level results makes interpretation difficult, we tend to see this positive impact as suggesting that commercial cities did well in the 1980s and the 1990s.

Regressions (2) and (8) do show two industries which appear to have been strongly correlated with urban decline. Employment in health services turns out to have strongly predicted urban decline. The remarkable strength of this correlation is shown in Figure 4. We are unsure why this correlation is so robust, but it is clearly a strong, stylized fact of growth in the 1990s. It is also clear that employment in public administration negatively predicted growth. One explanation for these industry effects is that these are the industries that remain in declining cities.

Regressions (3), (6), and (9) look at the impact of urban unemployment. Unsurprisingly, there was a strong tendency for population to flee high unemployment cities. The magnitude of this effect was quite large. A one-standard deviation increase in unemployment (2.6 percent) was related to a 4.8 decrease in the growth rate. As discussed in previous research, this finding can be interpreted as meaning that population leaves cities with negative labor demand shocks. An alternative interpretation is that unemployment correlated with low human capital and it was that lack of human capital that eliminated growth.

Growth and Human Capital

In Table 7, we look at the correlation between city growth and education levels within the cities. Because of the high correlation between skill levels and average wages (over 70 percent), we have excluded initial income from these regressions. There are many reasons why education may be related to city growth. Glaeser (1994) suggested that the relationship might be because high human capital people produce more new ideas (in the language of the model $\theta_k > 0$). Alternatively, skilled people might generate static production spillovers and these might have gotten more important in an increasingly idea-oriented economy (in the language of the model $\beta_{kt+1} > \beta_{kt}$ for skilled workers). Finally, skilled people might have become more important for purely consumption related reasons. Nonetheless, the connection between initial years of schooling and urban population growth is one of the most remarked upon facts of urban development (Glaeser, 1994, Glaeser et al. 1995, Black and Henderson, 1999, Simon and Nardinelli, 1996).

In regressions (1) through (3), we find that there was still a connection between human capital and later city growth in the 1990s. Figure 1 shows the relationship between percent college-educated and later growth. We have excluded per capita income because of the high correlation of this variable with years of schooling. Well educated cities grew by much more than poorly educated cities. As the share of the people in the city aged 25 or more with college degrees rose by 10 percent in 1990, the expected growth rate of the city in the 1990s rose by 2.3 percent. The impact of high school degrees on city growth was even stronger. As the share of the population that are high school dropouts fell by 10 percent, the expected growth rate of the city rose by 3.9 percent. When we include both of these variables, high school appears to have been much more important than college. Oddly, the impact of education on MSA growth looks quite different, as shown in regressions (7) through (9). College education was positively associated with MSA growth, and high school education was actually negatively associated with that growth.

The impact of percent high school graduates in the 1980s and the 1990s was quite similar. However, percent college educated did not predict urban growth in the 1980s. After looking at the data in detail, we found that this lack of correlation was completely due to the impact of California. In California, higher human capital cities tended to grow slowly and low human capital cities tended to grow quickly. One explanation for this phenomenon is that lower human capital cities attracted the large inflow of immigrants and the higher human capital cities imposed growth controls. Whatever the reason, California looked different from the rest of the U.S. and from historical experience. In that state, human capital deterred growth. Elsewhere, it encouraged growth. Once we exclude California, the coefficient on percent college graduates is large and similar across decades and between MSAs and cities. The general tendency of higher skilled cities to grow quickly seems to be one of the most persistent facts in city growth.

Growth, Race and Poverty

In Table 8, we look at the relationship between local poverty and population growth. In both the 1980s and the 1990s, there was a massive negative impact of local poverty. Controlling for this variable completely eliminates the impact of per capita income (indeed, the effect of this variable becomes negative in the 1980s). Local poverty was the human capital variable with the strongest correlation with urban growth. The effect of this variable was indeed massive—as shown in Figure 5. A one standard deviation increase in the local poverty rate (6.6 percent) caused a 6 percent decrease in the urban growth rate in the 1990s. In the 1980s, the effect was even larger. The same increase in the poverty rates was related to a growth decline of almost 12 percent.

At the MSA level, there was no effect of local poverty and the effect of per capita income remained strong. It seems that the bottom end of the human capital distribution was more important at the city level, but that the mean of the distribution was more important at the MSA level. The weak effect of poverty at the MSA level corresponds with the negative effect of high school graduation rates at the MSA level in Table 7. One possible explanation for this fact might be that poverty at high densities drove down the attractiveness of cities. This mattered less at the lower densities of MSAs. At the MSA level, human capital might have mattered more because it increased the rate of growth of new industry.

One question is whether high poverty just reflects low labor demand. To address this possibility, we look at race. Race is sadly highly correlated with poverty, but it will not be a direct consequence of lower labor demand (i.e. a city won't see an mechanical increase in percent black just because its labor demand falls). Growth decreased strongly with percent black at both the MSA and the city level. While this effect might reflect white racism, our preferred interpretation is that this result shows more about the connection between local poverty and urban decline. In regressions (3), (6) and (9), we look at both variables. At the city level, poverty was more important than race. At the MSA level, race was more important.

Tables 7 and 8 have together illustrated the continuing importance of human capital in determining city growth. Skilled cities grew. Unskilled cities declined. To us, this suggests that urban policy must address local skill levels.

Growth and Government

In Table 9, we look at the correlations between government policy variables and later growth. In these regressions, we restrict ourselves to cities. MSAs are not governmental units and as such it makes sense to focus on cities. A problem with this analysis is that in some areas other governmental units take on city functions. Some types of spending might therefore have been low in some cities, not because there was little spending on this type of commodity, but because the commodity was being provided by a different level of government. To correct for this possibility, we have included state dummies in these regressions.

Regression (1) shows the negative effect of overall city spending on growth in the 1990s. This effect was fairly large—a one standard deviation increase in government spending was related to a 3 percent decrease in the growth rate over the decade. In the 1980s, there was also a significant relationship. Rappaport (1999) also found such a correlation in the 1970s. Earlier Glaeser et al. (1995) looked at the effect of 1960 government spending on growth over the next 30 years and found no significant correlation. Thus, it seems that in the middle of the century, big local governments were not associated with urban decline, but since 1970s, big per capita city spending negatively predicted local growth.

In regressions (2) and (4), we look at whether there was a relationship between city growth and the way government spending was allocated. The omitted categories are spending on public welfare, fire protection, and miscellany in the 1990s and spending on miscellany in the 1980s. In the 1990s, the only category of spending which was positively correlated with later growth was highways. This category was positively correlated with growth in the 1980s as well. Furthermore, the impact of this variable survives controlling for the overall size of government. We believe that this again supports the importance of the move to sprawled cities.

Other types of government spending—such as schooling—were important correlates of growth in the past (see Rappaport, 1999) but don't seem to be correlated with growth in the 1990s. Police spending was also an important correlate of growth in the 1980s, but not in the 1990s. It is always hard to interpret the correlation between government spending types and later growth, since spending is likely to be a response to underlying urban conditions. Still, it is important to know the basic stylized fact of government spending and city growth in the 1990s: cities with more spending grew less unless that spending was on highways.

V. Conclusion

In this paper, we have examined the correlates of urban growth in the 1990s. In many ways, growth in the 1990s looked like growth during previous decades. The correlation of growth rates between the 1980s and the 1990s was extraordinarily high, over 75 percent, and this permanence makes it unsurprising the basic stylized facts remain. There are three reliable facts about city growth in the post-war period. People moved to drier, warmer cities. Cities with high levels of human capital did well and cities with large numbers of the poor did poorly. Lower density cities that center around cars did better than higher density, public transportation cities. These facts were true at both the city and MSA level. The 1990s merely confirmed results from previous decades.

Indeed, this study finds only two modest changes between the 1980s and the 1990s. First, bigger cities of the Northeast and the Midwest did slightly better in the 1990s than in previous decades. The post-war era has seen massive decline in those cities. In the 1990s, overall city growth sped up and those cities declined less often. Second, in the 1990s, Midwestern cities did much better than they had previously. For example, in the 1980s, no Midwestern city grew by more than 12 percent. In the 1990s, six Midwestern cities grew that quickly.

We therefore think that the fundamental lesson of urban growth in the 1990s is the remarkable continuity of urban growth patterns. In the last decade, as in all previous post-war decades, urban growth was driven by the increasing importance of consumers and their tastes for cars, good weather, and the skill base of the local community.

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Table 1: Summary statistics

Panel A: Cities, 1990-2000

Variable	N	Mean	Std. dev.	Min.	Max.
Log(Population growth)	195	0.0976	0.1263	-0.1392	0.6164
Population	195	326813	628524	100217	7322564
Per capita income ($1000, 1990)	195	14.2507	3.3550	6.981	27.092
Median age of residents	195	31.5651	2.3347	25.6	40.1
Percent age 25+ with high school or higher degree	195	75.6754	9.4810	44.3	95.1
Percent age 25+ with college or higher degree	195	22.5103	9.0653	6	64.2
Percent persons with income below poverty level	195	15.7154	6.5878	2.6	37.3
Mean July temperature (F)	195	76.3256	6.3165	58.4	93.5
Average annual precipitation (inches)	195	32.3395	15.1642	4.13	65.71
Mean January temperature (F)	195	39.3405	13.3658	11.8	71.4
Land area (square miles)	195	103.662	159.042	8.4	1697.6
Percent driving alone to work	195	71.9431	10.4294	24	90.1
> 5% taking public transportation to work (dummy)	195	0.3128	0.4648	0	1
Percent housing built before 1939	195	18.2887	16.9102	0	68.1
Percent civilian employment in…					
Manufacturing	195	15.7641	6.4885	3.6	40.2
Wholesale and retail trade	195	28.6815	2.4921	11.9	28.7
Financial/ insurance/ real estate	195	7.5015	2.0975	4	15.4
Health services	195	9.0138	2.2660	4.4	17.1
Public administration	195	5.3477	3.3112	1.6	22.2
Percent civilian unemployment	195	7.2010	2.6239	2.8	19.7
City government expenditures per capita ($)	195	1139.50	806.20	347	7154
Percent city government expenditures on…					
Education	195	6.7985	15.7716	0	58.7
Health / hospitals	195	2.9303	6.2300	0	59.5
Police	195	14.5072	5.8414	4	31.7
Highways	195	9.4554	5.7375	0.7	38.5
Sewage / sanitation	195	11.8985	7.5386	0	38.2

Table 1: Summary statistics (continued)

Panel B: Cities, 1980-1990

Variable	N	Mean	Std. dev.	Min.	Max.
Log(Population growth)	170	0.0742	0.1521	-0.2644	0.6364
Population	170	336543	644155	100220	7071639
Per capita income ($1000, 1990)	170	12.9284	2.1911	7.8899	21.2321
Median age of residents	170	29.5318	2.6000	25.2	43.2
Percent age 25+ with high school or higher degree	170	68.0923	9.8933	42.3667	90.7154
Percent age 25+ with college or higher degree	170	18.2816	7.4061	6.1853	56.2242
Percent persons with income below poverty level	170	14.4256	5.3694	2.2268	32.7793
Mean July temperature (F)	170	76.4012	5.9952	58.1	92.3
Average annual precipitation (inches)	170	33.5235	14.3813	4.19	64.64
Mean January temperature (F)	170	37.8053	12.9706	11.2	72.6
Land area (square miles)	170	105.182	168.824	8	1732
Percent driving alone to work	170	64.5090	10.5780	20.0983	81.0429
> 5% taking public transportation to work (dummy)	170	0.4941	0.5014	0	1
Percent housing built before 1939	170	25.1073	18.6630	0.8673	73.0314
Percent civilian employment in…					
Manufacturing	170	18.6870	8.1463	2.8901	45.1312
Wholesale and retail trade	170	19.6586	2.9129	10.8855	25.9836
Health, education, and other professional	170	20.7521	5.1159	9.3553	49.8453
Percent civilian unemployment	170	6.8167	2.7448	2.2182	18.4832
City government expenditures per capita ($)	169*	630.98	365.92	258	3089
Percent city government expenditures on…					
Education	169*	8.2317	16.0428	0	50.7751
Health / hospitals	169*	3.5163	7.3819	0	50.1632
Police	169*	13.0016	5.4731	3.5405	29.9177
Highways	169*	9.6594	5.7233	0.8652	36.4425
Sewage / sanitation	169*	12.7500	7.7739	0.2320	40.3386

* City government data for Honolulu not available for 1980-81 fiscal year.

Table 1: Summary statistics (continued)

Panel C: MSAs, 1990-2000

Variable	N	Mean	Std. dev.	Min.	Max.
Log(Population growth)	251	0.1204	0.1007	-0.0749	0.5886
Population	251	784670	1784318	101450	17.9 m
Per capita income ($1000, 1990)	251	13.1996	2.2248	6.6298	21.9479
Median age of residents	251	32.6145	3.2834	22.5	53.6
Percent age 25+ with high school or higher degree	251	31.0268	5.5870	16.4610	48.8040
Percent age 25+ with college or higher degree	251	19.3368	5.7712	9.4907	36.5068
Percent persons with income below poverty level	251	13.8795	5.1595	6.3498	41.8768
Mean July temperature (F)	251	76.6885	5.4625	58.4	93.7
Average annual precipitation (inches)	251	37.5990	13.9800	3.17	65.71
Mean January temperature (F)	251	35.2303	13.2052	4.3	71.4
Land area (square miles)	251	268.406	390.064	39.33	3937.03
Percent driving alone to work	251	76.6845	4.4406	53.1579	85.1677
> 5% taking public transportation to work (dummy)	251	0.0478	0.2138	0	1
Percent housing built before 1939	251	16.1948	11.5124	0.6203	50.7594
Percent civilian employment in…	251				
Manufacturing	251	17.0331	7.4124	3.6012	46.2939
Wholesale and retail trade	251	22.3683	2.1109	16.7184	28.5886
Financial/ insurance/ real estate	251	6.0426	1.9374	2.7291	16.2597
Health services	251	8.8074	2.0578	5.0442	24.4810
Public administration	251	4.9510	2.7954	1.6491	19.5311
Percent civilian unemployment	251	6.3874	1.8783	2.7783	14.3296

Table 2: Simple correlations with log(population growth)

Beginning-of-period variable	Panel A: Cities, 1990-2000	Panel B: Cities, 1980-1990	Panel C: MSAs, 1990-2000
Log(Population)	-0.0888	-0.1370	0.0988
Per capita income ($1000, 1990)	0.3087*	0.2596*	0.1128
Median age of residents	-0.1127	-0.2032*	-0.1018
Mean July temperature (F)	0.2436*	0.2125*	0.3795*
Average annual precipitation (inches)	-0.4164*	-0.4689*	-0.1943*
Mean January temperature (F)	0.3506*	0.3988*	0.4146*
Log(Population per square mile)	-0.3049*	-0.2902*	-0.2071*
Percent driving alone to work	0.3119*	0.3015*	-0.1406*
> 5% taking public transportation to work (dummy)	-0.3566*	-0.3609*	-0.0883
Percent housing built before 1939	-0.5904*	-0.5603*	-0.6051*
Percent civilian employment in…			
Manufacturing	-0.1487*	-0.2441*	-0.3524*
Wholesale and retail trade	0.2319*	0.3090*	0.1038
Financial/ insurance/ real estate	0.1967*	N/A	0.1860*
Health services	-0.5237*	N/A	-0.3618*
Public administration	-0.1070	N/A	0.0802
Health, education, and other professional	N/A	-0.1392	N/A
Percent civilian unemployment	-0.4569*	-0.4194*	-0.1003
Percent age 25+ with high school or higher degree	0.3750*	0.4500*	-0.4916*
Percent age 25+ with college or higher degree	0.2455*	0.2343*	0.2411*
Percent persons with income below poverty level	-0.4730*	-0.4292*	0.1156
Percent black	-0.4989*	-0.4682*	-0.0684
Log(City government expenditures per capita)	-0.3515*	-0.3033*	N/A
Percent city government expenditures on…			
Education	-0.2577*	-0.1392	N/A
Health / hospitals	-0.0983	-0.0944	N/A
Police	0.2122*	0.3098*	N/A
Highways	0.3872*	0.3101*	N/A
Sewage / sanitation	0.0333	0.0680	N/A

* Correlation statistically significant at the 5% level.

Table 3: Basic growth facts

Independent variable	Panel A: Cities, 1990-2000				Panel B: Cities, 1980-1990				Panel C: MSAs, 1990-2000			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Intercept	0.2853	0.5260	0.2746	-0.3468	0.4148		0.5079	0.1820	0.0012	-0.8210	0.0178	0.0579
	(0.1518)	(0.5639)	(0.1642)	(0.1321)	(0.1904)		(0.1915)	(0.1660)	(0.0764)	(0.5056)	(0.0885)	(0.0640)
Log(Population)	-0.0153		-0.0075	0.0065	-0.0277		-0.0171	-0.0024	0.0093		-0.0028	0.0044
	(0.0123)		(0.0104)	(0.0078)	(0.0155)		(0.0125)	(0.0107)	(0.0060)		(0.0061)	(0.0044)
Log(Pop) (slope for pop. < 200k)		-0.0355				0.0033				0.0784		
		(0.0476)				(0.0607)				(0.0425)		
Log(Pop) (slope for 200k < pop. < 500k)		-0.0174				-0.0810				-0.0284		
		(0.0419)				(0.0554)				(0.0310)		
Log(Pop) (slope for 500k < pop. < 1m)		0.0236				0.0677				0.0601		
		(0.0848)				(0.1238)				(0.0409)		
Log(Pop) (slope for pop. > 1m)		-0.0181				-0.0350				-0.0172		
		(0.0598)				(0.0791)				(0.0189)		
Per capita income ($1000, 1990)			0.0099	0.0012			0.0077	-0.0017			0.0118	-0.0002
			(0.0027)	(0.0021)			(0.0050)	(0.0043)			(0.0032)	(0.0025)
Median age of residents			-0.0102	0.0078			-0.0130	-0.0033			-0.0034	-0.0030
			(0.0036)	(0.0031)			(0.0037)	(0.0034)			(0.0018)	(0.0013)
Midwest (dummy)			0.0419	0.0353			-0.0468	-0.0385			0.0538	0.0510
			(0.0272)	(0.0201)			(0.0333)	(0.0281)			(0.0177)	(0.0128)
South (dummy)			0.1094	0.0485			0.0651	0.0014			0.1260	0.0517
			(0.0252)	(0.0193)			(0.0306)	(0.0269)			(0.0169)	(0.0132)
West (dummy)			0.1534	0.0302			0.1719	0.0846			0.1637	0.0578
			(0.0260)	(0.0216)			(0.0349)	(0.0312)			(0.0198)	(0.0160)
Lagged growth				0.5755				0.3759				0.5431
				(0.0459)				(0.0456)				(0.0363)
N	195	195	195	193*	170	170	170	170	251	251	251	251
Adjusted R^2	0.0027	-0.0102	0.3054	0.6169	0.0129	0.0016	0.3711	0.5540	0.0058	0.0119	0.2967	0.6324

Independent variables correspond to the beginning of the period for each panel. Standard errors in parentheses. See Data Appendix for details.

* Growth rate in 1980s for Santa Clarita, CA and Moreno Valley, CA not available.

Table 4: Growth and climate

Independent variable	Panel A: Cities, 1990-2000			Panel B: Cities, 1980-1990			Panel C: MSAs, 1990-2000		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	-0.2833 (0.1771)	0.2963 (0.1616)	0.2825 (0.1654)	-0.2049 (0.2225)	0.5897 (0.1872)	0.5233 (0.1896)	-0.5252 (0.1145)	0.0471 (0.0883)	0.0400 (0.0877)
Log(Population)	-0.0132 (0.0096)	-0.0094 (0.0102)	-0.0075 (0.0104)	-0.0207 (0.0116)	-0.0209 (0.0122)	-0.0187 (0.0124)	-0.0119 (0.0058)	-0.0038 (0.0061)	-0.0071 (0.0062)
Per capita income ($1000, 1990)	0.0111 (0.0025)	0.0086 (0.0027)	0.0099 (0.0027)	0.0118 (0.0047)	0.0049 (0.0049)	0.0095 (0.0050)	0.0172 (0.0031)	0.0128 (0.0032)	0.0126 (0.0032)
Median age of residents	-0.0097 (0.0033)	-0.0062 (0.0039)	-0.0101 (0.0036)	-0.0127 (0.0035)	-0.0076 (0.0040)	-0.0158 (0.0039)	-0.0034 (0.0017)	-0.0025 (0.0018)	-0.0042 (0.0018)
Mean July temperature (F)	0.0081 (0.0013)			0.0096 (0.0018)			0.0080 (0.0012)		
Average annual precipitation (inches)		-0.0026 (0.0009)			-0.0040 (0.0012)			-0.0015 (0.0006)	
Mean January temperature (F)			-0.0004 (0.0009)			0.0025 (0.0012)			0.0019 (0.0007)
Midwest (dummy)	0.0303 (0.0251)	0.0191 (0.0281)	0.0402 (0.0275)	-0.0629 (0.0310)	-0.0717 (0.0332)	-0.0424 (0.0331)	0.0403 (0.0164)	0.0445 (0.0179)	0.0580 (0.0176)
South (dummy)	0.0459 (0.0255)	0.1132 (0.0249)	0.1169 (0.0302)	-0.0133 (0.0319)	0.0822 (0.0301)	0.0169 (0.0379)	0.0670 (0.0178)	0.1372 (0.0173)	0.0887 (0.0214)
West (dummy)	0.1508 (0.0239)	0.0878 (0.0351)	0.1626 (0.0330)	0.1578 (0.0324)	0.0800 (0.0435)	0.1187 (0.0428)	0.1508 (0.0183)	0.1296 (0.0239)	0.1321 (0.0226)
N	195	195	195	170	170	170	251	251	251
Adjusted R^2	0.4144	0.3282	0.3025	0.4608	0.4086	0.3841	0.4050	0.3114	0.3154

Independent variables correspond to the beginning of the period for each panel. Standard errors in parentheses. See Data Appendix for details.

Table 5: Growth and transportation

Independent variable	Panel A: Cities, 1990-2000			Panel B: Cities, 1980-1990			Panel C: MSAs, 1990-2000		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(Population)	-0.0137 (0.0189)	-0.0194 (0.0163)	-0.0075 (0.0159)	-0.0221 (0.0211)	-0.0252 (0.0180)	-0.0109 (0.0176)	-0.0254 (0.0082)	-0.0190 (0.0086)	-0.0167 (0.0079)
Per capita income ($1000, 1990)	0.0089 (0.0026)	0.0094 (0.0026)	0.0059 (0.0026)	0.0063 (0.0049)	0.0051 (0.0048)	-0.0024 (0.0049)	0.0139 (0.0032)	0.0152 (0.0032)	0.0091 (0.0031)
Median age of residents	-0.0099 (0.0035)	-0.0098 (0.0035)	-0.0062 (0.0034)	-0.0108 (0.0039)	-0.0099 (0.0038)	-0.0065 (0.0037)	-0.0030 (0.0020)	-0.0038 (0.0018)	-0.0005 (0.0017)
Log(Land area) (square miles)	0.0270 (0.0148)	0.0302 (0.0136)	0.0231 (0.0131)	0.0259 (0.0176)	0.0280 (0.0162)	0.0199 (0.0156)	0.0410 (0.0104)	0.0394 (0.0103)	0.0365 (0.0095)
Percent driving alone to work	0.0025 (0.0011)			0.0026 (0.0012)			-0.0009 (0.0014)		
> 5% taking public transportation to work (dummy)		-0.0566 (0.0196)	-0.0208 (0.0208)		-0.0763 (0.0202)	-0.0393 (0.0213)		-0.0681 (0.0284)	-0.0433 (0.0266)
Percent housing built before 1939			-0.0031 (0.0008)			-0.0035 (0.0009)			-0.0050 (0.0008)
N	195	195	195	170	170	170	251	251	251
Adjusted R^2	0.3604	0.3697	0.4185	0.4031	0.4357	0.4850	0.3359	0.3501	0.4415

Regional dummies and intercepts included in regressions but not reported.
Independent variables correspond to the beginning of the period for each panel. Standard errors in parentheses. See Data Appendix for details.

Table 6: Growth and industry mix

Independent variable	Panel A: Cities, 1990-2000			Panel B: Cities, 1980-1990			Panel C: MSAs, 1990-2000		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(Population)	-0.0096 (0.0105)	-0.0109 (0.0100)	0.0042 (0.0102)	-0.0185 (0.0127)	-0.0199 (0.0125)	-0.0105 (0.0118)	-0.0013 (0.0061)	-0.0052 (0.0060)	0.0029 (0.0063)
Per capita income ($1000, 1990)	0.0098 (0.0027)	0.0052 (0.0032)	0.0005 (0.0032)	0.0076 (0.0050)	0.0064 (0.0048)	-0.0070 (0.0056)	0.0102 (0.0033)	0.0078 (0.0035)	0.0042 (0.0040)
Median age of residents	-0.0106 (0.0036)	-0.0083 (0.0036)	-0.0098 (0.0034)	-0.0129 (0.0038)	-0.0154 (0.0037)	-0.0116 (0.0035)	-0.0025 (0.0018)	-0.0019 (0.0019)	-0.0032 (0.0018)
Percent civilian employment in…									
Manufacturing	-0.0015 (0.0013)	-0.0045 (0.0016)		-0.0009 (0.0013)	-0.0027 (0.0016)		-0.0020 (0.0008)	-0.0034 (0.0011)	
Wholesale and retail trade		0.0078 (0.0038)			0.0077 (0.0038)			0.0023 (0.0031)	
Financial/ insurance/ real estate		0.0043 (0.0044)						0.0047 (0.0037)	
Health services		-0.0188 (0.0044)						-0.0144 (0.0027)	
Public administration		-0.0054 (0.0029)						-0.0058 (0.0022)	
Health, education, and other professional					-0.0049 (0.0023)				
Percent civilian unemployment			-0.0184 (0.0040)			-0.0200 (0.0043)			-0.0118 (0.0038)
N	195	195	195	170	170	170	251	251	251
Adjusted R^2	0.3067	0.4312	0.3731	0.3692	0.4098	0.4431	0.3126	0.4036	0.3209

Regional dummies and intercepts included in regressions but not reported.
Independent variables correspond to the beginning of the period for each panel. Standard errors in parentheses. See Data Appendix for details.

Table 7: Growth and human capital

Independent variable	Panel A: Cities, 1990-2000			Panel B: Cities, 1980-1990			Panel C: MSAs, 1990-2000		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(Population)	-0.0030 (0.0104)	-0.0106 (0.0105)	-0.0083 (0.0123)	-0.0111 (0.0124)	-0.0192 (0.0125)	-0.0189 (0.0133)	0.0009 (0.0054)	0.0031 (0.0053)	0.0061 (0.0055)
Median age of residents	-0.0073 (0.0033)	-0.0054 (0.0033)	-0.0051 (0.0040)	-0.0104 (0.0036)	-0.0113 (0.0037)	-0.0078 (0.0038)	0.0034 (0.0019)	0.0014 (0.0017)	0.0016 (0.0018)
Excludes California?	NO	NO	YES	NO	NO	YES	NO	NO	YES
Percent age 25+ with high school or higher degree	0.0039 (0.0009)			0.0037 (0.0012)			-0.0063 (0.0015)		
Percent age 25+ with college or higher degree		0.0023 (0.0009)	0.0036 (0.0011)		0.0004 (0.0014)	0.0035 (0.0015)		0.0042 (0.0010)	0.0043 (0.0011)
N	195	195	151	170	170	144	251	251	235
Adjusted R^2	0.3225	0.2798	0.3380	0.3970	0.3623	0.3007	0.3108	0.3085	0.3502

Regional dummies and intercepts included in regressions but not reported.
Independent variables correspond to the beginning of the period for each panel. Standard errors in parentheses. See Data Appendix for details.

Table 8: Growth and poverty

Independent variable	Panel A: Cities, 1990-2000			Panel B: Cities, 1980-1990			Panel C: MSAs, 1990-2000		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(Population)	0.0107	0.0069	0.0140	0.0127	0.0031	0.0137	-0.0041	0.0025	0.0012
	(0.0102)	(0.0097)	(0.0098)	(0.0118)	(0.0118)	(0.0117)	(0.0062)	(0.0059)	(0.0060)
Per capita income ($1000, 1990)	-0.0024	0.0062	-0.0002	-0.0230	-0.0018	-0.0191	0.0151	0.0126	0.0160
	(0.0033)	(0.0025)	(0.0032)	(0.0108)	(0.0048)	(0.0065)	(0.0042)	(0.0031)	(0.0040)
Median age of residents	-0.0105	-0.0091	-0.0095	-0.0123	-0.0135	-0.0127	-0.0027	-0.0056	-0.0048
	(0.0034)	(0.0033)	(0.0032)	(0.0033)	(0.0034)	(0.0033)	(0.0019)	(0.0018)	(0.0019)
Percent persons with income below poverty level	-0.0096		-0.0057	-0.0182		-0.0134	0.0022		0.0023
	(0.0017)		(0.0019)	(0.0026)		(0.0035)	(0.0018)		(0.0017)
Percent black		-0.0031	-0.0023		-0.0039	-0.0017		-0.0033	-0.0033
		(0.0005)	(0.0005)		(0.0007)	(0.0009)		(0.0007)	(0.0007)
N	195	195	195	170	170	170	251	251	251
Adjusted R^2	0.4009	0.4271	0.4509	0.5145	0.4832	0.5235	0.2982	0.3593	0.3615

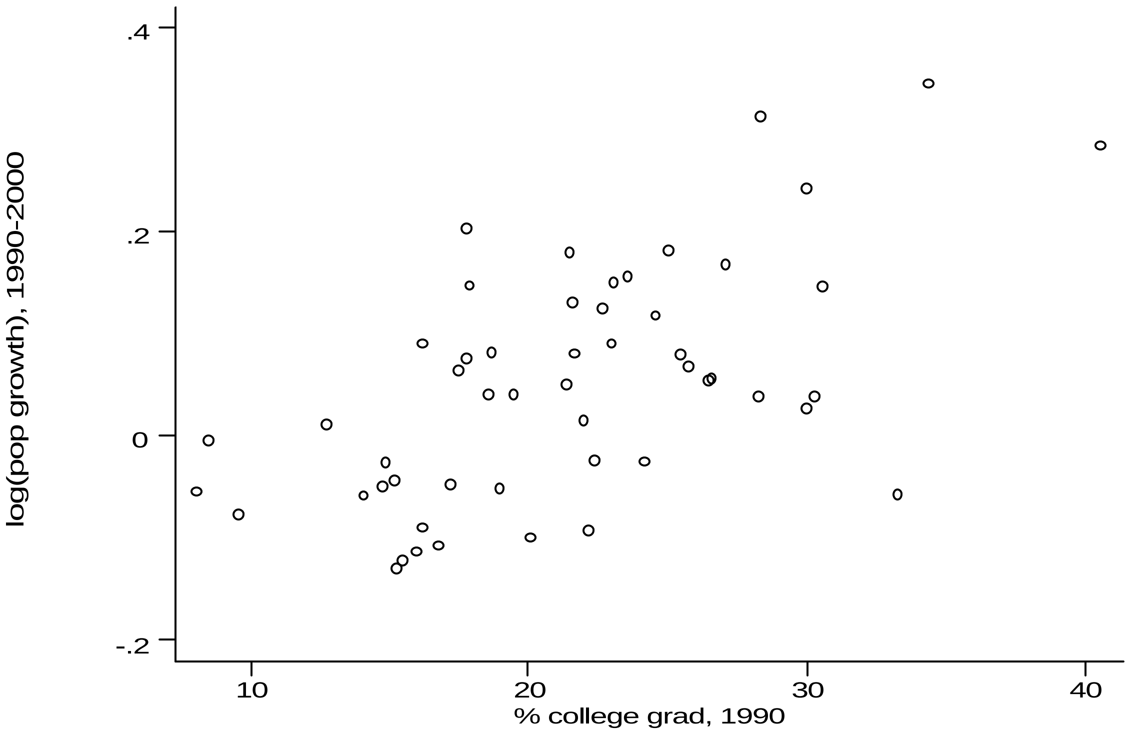
Regional dummies and intercepts included in regressions but not reported.
Independent variables correspond to the beginning of the period for each panel. Standard errors in parentheses. See Data Appendix for details.

Table 9: Growth and local government

Independent variable	Panel A: Cities, 1990-2000			Panel B: Cities, 1980-1990		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Population)	0.0091	0.0040	0.0173	0.0005	0.0066	0.0140
	(0.0096)	(0.0093)	(0.0098)	(0.0136)	(0.0131)	(0.0136)
Per capita income ($1000, 1990)	0.0125	0.0099	0.0111	0.0051	0.0008	0.0020
	(0.0024)	(0.0026)	(0.0026)	(0.0056)	(0.0055)	(0.0054)
Median age of residents	-0.0123	-0.0101	-0.0097	-0.0174	-0.0126	-0.0125
	(0.0036)	(0.0038)	(0.0037)	(0.0048)	(0.0048)	(0.0048)
Log(City government expenditures per capita)	-0.0619		-0.1060	-0.0668		-0.0772
	(0.0203)		(0.0311)	(0.0318)		(0.0430)
Percent city government expenditures on…						
Education		0.0010	-0.1060		0.0027	0.0030
		(0.0010)	(0.0311)		(0.0019)	(0.0019)
Health / hospitals		-0.0001	0.0008		0.0019	0.0025
		(0.0012)	(0.0010)		(0.0015)	(0.0015)
Police		-0.0004	-0.0049		-0.0002	-0.0031
		(0.0017)	(0.0021)		(0.0028)	(0.0032)
Highways		0.0041	0.0017		0.0082	0.0067
		(0.0016)	(0.0017)		(0.0022)	(0.0024)
Sewage / sanitation		0.0007	-0.0000		0.0040	0.0038
		(0.0011)	(0.0011)		(0.0015)	(0.0015)
N	195	195	195	169*	169*	169*
Adjusted R^2	0.5950	0.5800	0.6087	0.4776	0.5167	0.5255

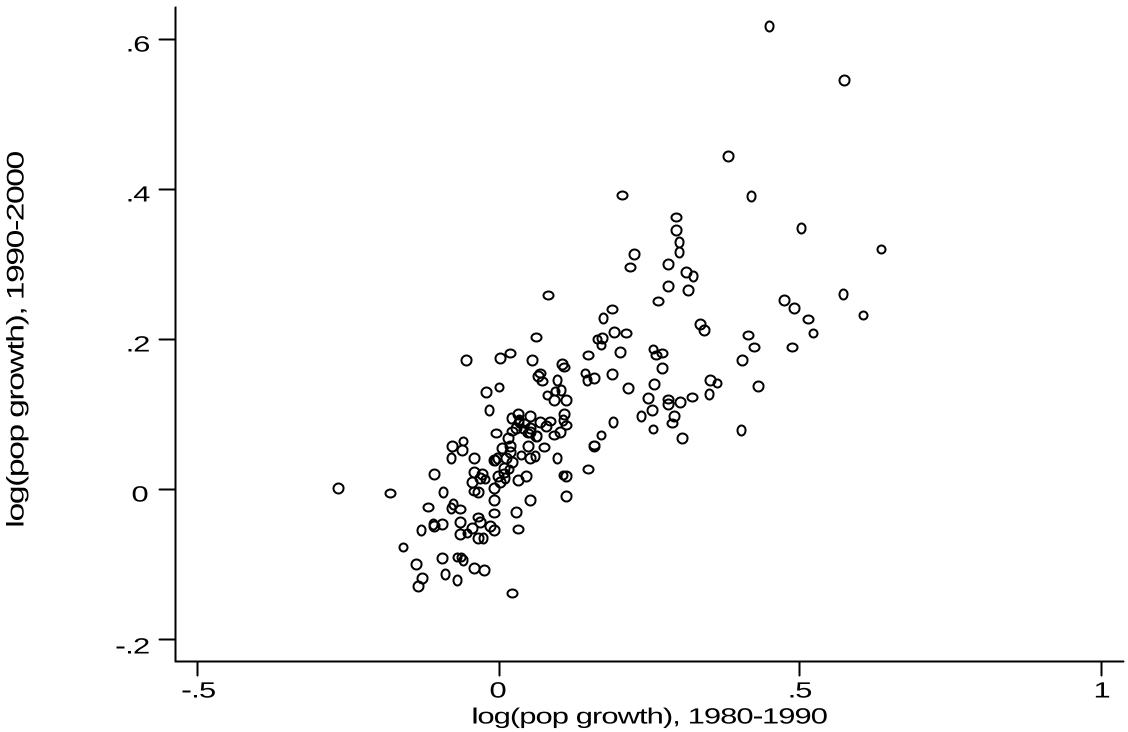
State dummies and intercepts included in regressions but not reported.
Independent variables correspond to the beginning of the period for each panel. Standard errors in parentheses. See Data Appendix for details.
* City government data for Honolulu not available for 1980-81 fiscal year.

Figure 1: The importance of skilled inhabitants, 1990-2000



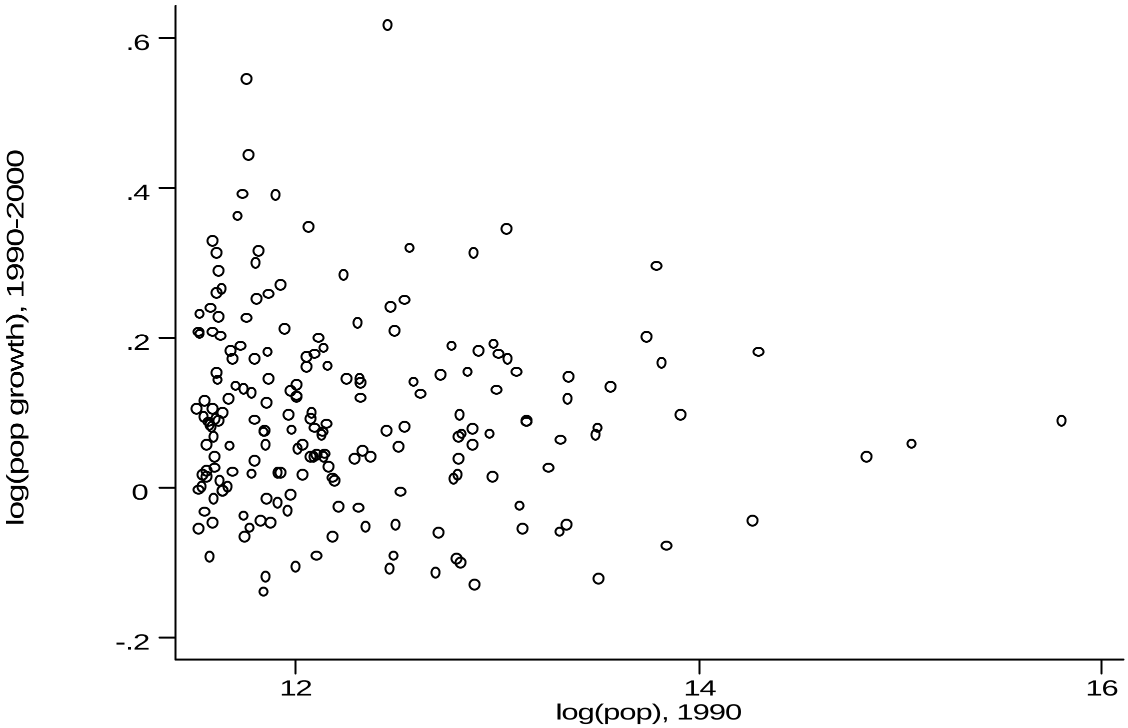
Sample is all cities with population of 200,000 or more in 1990 outside of the West (52 observations).

Figure 2: Persistence in city growth rates, 1980-2000



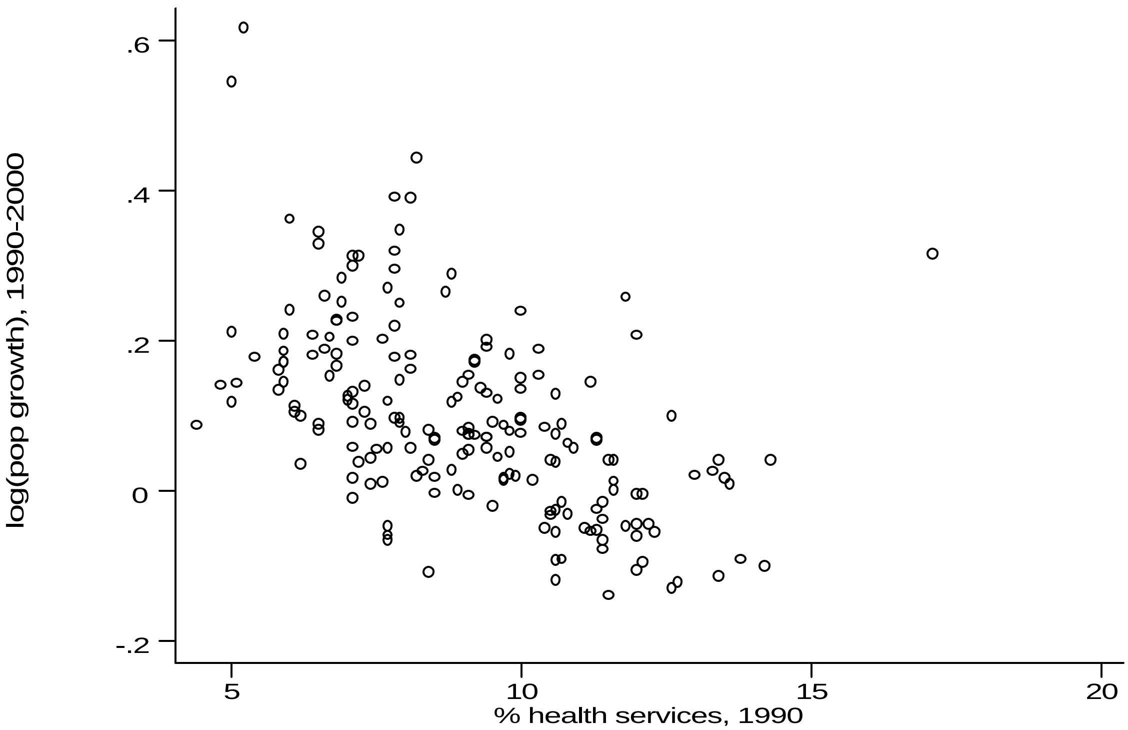
Sample is all cities with population of 100,000 or more in 1990 and available population data for 1980 (193 observations).

Figure 3: Growth and initial population, 1990-2000



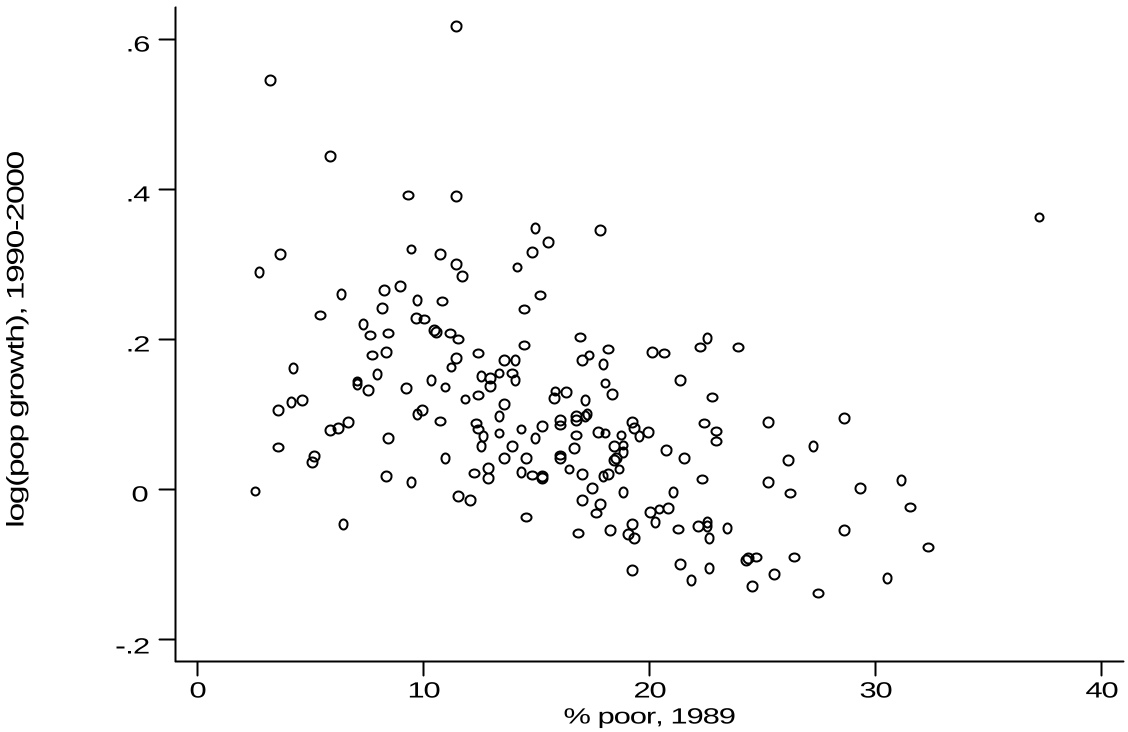
Sample is all cities with population of 100,000 or more in 1990 (195 observations).

Figure 4: Growth and health services, 1990-2000



Sample is all cities with population of 100,000 or more in 1990 (195 observations).

Figure 5: Growth and poverty, 1990-2000



Sample is all cities with population of 100,000 or more in 1990 (195 observations).

Data Appendix

Panel A: Cities, 1990-2000

From the *County and City Data Book 1994* we obtained data on all U.S. cities for the beginning of the 1990s. We then dropped all cities with fewer than 100,000 residents in 1990 to obtain our final sample of 195 cities. We obtained data on population in 2000 for these 195 cities from the U.S. Census.[6] Definitions of Northeast, West, Midwest, and South regions are from the U.S. Census. Data on 1980 population used to calculate the growth rate during the 1980s are also from the *County and City Data Book 1994*. Data on 1980 populations for Moreno Valley, California and Santa Clarita, California were not available. Complete documentation and details on original sources are available in the *County and City Data Book 1994*.

Panel B: Cities, 1980-1990

From the *County and City Data Book 1983* we obtained data on all U.S. cities for the beginning of the 1980s. We then dropped all cities with fewer than 100,000 residents in 1980 to obtain our final sample of 170 cities. We obtained data on population in 1990 for these 170 cities from the *County and City Data Book 1994*. Data on 1970 population used to calculate the growth rate during the 1970s are from the *County and City Data Book 1983*. Data on city government spending per capita and spending composition for the 1980-1981 fiscal year were not available for Honolulu, Hawaii.

Panel C: MSAs, 1990-2000.

From *USA Counties 1998* we obtained a list of the counties comprising each MSA as of 1998. We used these definitions for both 1990 and 2000 to ensure a consistent definition of each entity. We obtained county populations for 2000 from the U.S. Census and aggregated over the counties in each MSA to obtain MSA population in 2000.[7] MSA population in 1990, MSA population in 1980, and all other MSA variables were obtained by a similar aggregation except as noted below. We dropped all MSAs with fewer than 100,000 residents in 1990 to obtain our final sample of

[6] As of June 2001 such data are accessible at http://blue.census.gov/population/www/cen2000/phc-t5.html.
[7] As of June 2001 county populations can be obtained from http://blue.census.gov/population/www/cen2000/phc-t4.html.

251 MSAs. For each MSA in our sample, the major component city was identified and merged with data on:

- Census-defined regions.
- Climate data from the *County and City Data Book 1994*.

A list of each MSA and its identified major city is available on request from Jesse Shapiro at jmshapir@fas.harvard.edu.