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Economic growth in a cross-section of cities

Edward L. Glaeser*[a,b,c], José A. Scheinkman[d], Andrei Shleifer[a]

[a] *Harvard University, Cambridge, MA 02138, USA*
[b] *Hoover Institution, Stanford, CA 94305, USA*
[c] *National Bureau of Economic Research, Cambridge, MA 02138, USA*
[d] *University of Chicago, Chicago, IL 60637, USA*

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Abstract

We examine the relationship between urban characteristics in 1960 and urban growth between 1960 and 1990. Income and population growth move together, and both types of growth are (1) positively related to initial schooling, (2) negatively related to initial unemployment, and (3) negatively related to the initial share of employment in manufacturing. Racial composition and segregation are uncorrelated with urban growth across all cities, but in cities with large nonwhite communities segregation is positively correlated with population growth. Government expenditures (except for sanitation) are uncorrelated with growth; government debt is positively correlated with later growth.

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1. Introduction

Over the last 30 years, the growth experiences of United States cities have varied widely. The population of some cities grew significantly while other cities

* Corresponding author.

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virtually disappeared. Some dispersion of growth experiences can be explained by geographic factors, such as the movement of population west and south. But what are the economic forces that explain city growth over the last 30 years in a cross-section of the United States cities?

In this paper, we empirically investigate this question. We examine how the growth experiences of 203 large U.S. cities relate to their location, initial population, initial income, past growth, output composition, unemployment, inequality, racial composition, segregation, size and nature of government, and the education of their labor force. The primary purpose of our analysis is descriptive: we want to understand which cities grew between 1960 and 1990.

As a description, this analysis continues an extensive regional growth literature, including the studies by Borts (1960), Kain and Neidercorn (1962), Mills (most recently, 1992), and others. Our focus on human capital as a determinant of city growth is particularly closely related to Chinitz (1962), who emphasized the connection between urban success and the transmission of enterpreneurial skills. Similar arguments have been made by Jacobs (1969) and Marshall (1890).

In addition, our analysis aims to contribute to the recent studies of economic growth. Starting with Baumol (1986), Delong (1988), and Barro (1991), economists have compared income growth experiences of different countries as a function of their characteristics. These studies typically find weak evidence of convergence of incomes between countries, and stronger evidence that education, physical investment, political stability, and openness to trade contribute to growth. Other studies, including Barro and Sala-i-Martin (1991) and Blanchard and Katz (1992), look at growth experiences of U.S. states. Barro and Sala-i-Martin find much more income convergence between states than between countries. Blanchard and Katz show that employment growth in different states is very persistent, while unemployment is not.[1]

Looking at cities complements looking at countries and states in three ways. First, unlike countries, cities are completely open economies; there is tremendous movement of capital, labor, and ideas between cities. Cities are more specialized (and less arbitrary) economic units than states, and hence it may make more sense to study the movement of resources and convergence between cities than between states. National boundaries that bar factor mobility and national policies that encourage industrial diversification eliminate the gains from factor mobility. These forces complicate work on cross-national studies. Cities allow us to look at economic growth without these concerns.

Second, many of the cross-sectional – particularly the cross-national – studies of growth argue that ideas are important for growth. Various versions of this

[1] More precisely, they show that unemployment rate deviations from long-run state average unemployment levels are not persistent.

theory focus on the external benefits of physical capital or disembodied knowledge (Romer, 1986), human capital (Lucas, 1988), particular industries such as manufacturing or high-technology industries (Porter, 1991), and various other spillovers. Glaeser, Kallal, Scheinkman, and Shleifer (1992) found evidence that cross-industry intellectual externalities were particularly important for urban growth. This paper complements the earlier one. We now focus on whole cities, rather than individual industries, and on the sources of city-wide externalities, such as those from human capital.

Third, recent studies of economic growth across countries have focused on political and social, as well as economic determinants of growth. For example, several studies starting with Barro (1991) have shown that political instability is bad for growth, while Alesina and Rodrick (1994) and others have argued that inequality is bad for growth. DeLong and Shleifer (1993) have shown that limited government, as opposed to absolutist government, strengthened the growth of medieval cities. This paper will use the political and social characteristics of cities to provide further evidence on the importance of political and social factors for growth.

Section 2 presents a formal framework for our empirical work. Section 3 describes our data. Section 4 then presents our results on the relationship between economic characteristics of cities and their growth. Section 5 focuses on social and political characteristics of cities. Section 6 concludes.

2. A framework

This section provides a formal setting for our empirical work.[2] Cities will be treated as separate economies that share common pools of labor and capital. Differences in urban growth experiences cannot then come from savings rates or exogenous labor endowments. Because of our assumption of mobile labor and capital, cities differ only in the 'level of productivity' and the 'quality of life'. Total output in a city is given by

$$A_{i,t} f(L_{i,t}) = A_{i,t} L_{i,t}^{\sigma}, \tag{2.1}$$

where $A_{i,t}$ represents the level of productivity in city i at time t,[3] $L_{i,t}$ denotes population of city i at time t, $f(.)$ is a common across cities Cobb–Douglas production function. The coefficient of this production function, σ, is a nationwide production parameter.

[2] This framework is an extension of the framework used in Glaeser et al. (1992).

[3] We interpret $A_{i,t}$ broadly, to allow for the possibility that social, technological, and political forces all determine the overall productivity of a city.

The labor income of a potential migrant will be the marginal product of labor:[4]

$$W_{i,t} = \sigma A_{i,t} L_{i,t}^{\sigma - 1}. \tag{2.2}$$

Total utility equals wages multiplied by a quality of life index. We assume that this index is declining in the size of the city, or using a simple functional form:

$$\textit{Quality of life} = Q_{i,t} L_{i,t}^{-\delta}, \tag{2.3}$$

where $\delta > 0$. Quality of life is meant to capture a wide range of factors including crime, housing prices, and traffic congestion. Total utility of a potential migrant to city i is

$$\textit{Utility} = \sigma A_{i,t} Q_{i,t} L_{i,t}^{\sigma - \delta - 1}. \tag{2.4}$$

We initially assume free migration across cities. This assumption ensures constant utilities across space at a point in time, so each individual's utility level in each city must equal the reservation utility level at time t, which we denote $\underline{U}_t$. Thus, for each city:

$$\log\left(\frac{\underline{U}_{t+1}}{\underline{U}_t}\right) = \log\left(\frac{A_{i,t+1}}{A_{i,t}}\right) + \log\left(\frac{Q_{i,t+1}}{Q_{i,t}}\right) + (\sigma - \delta - 1)\log\left(\frac{L_{i,t+1}}{L_{i,t}}\right). \tag{2.5}$$

We also assume that

$$\log\left(\frac{A_{i,t+1}}{A_{i,t}}\right) = X'_{i,t}\beta + \varepsilon_{i,t+1}, \tag{2.6a}$$

$$\log\left(\frac{Q_{i,t+1}}{Q_{i,t}}\right) = X'_{i,t}\theta + \zeta_{i,t+1}, \tag{2.6b}$$

where $X_{i,t}$ is a vector of city characteristics at time t which determines the growth in both the quality of life in the city and the growth of city level productivity. Combining (2.5), (2.6a), and (2.6b) yields

$$\log\left(\frac{L_{i,t+1}}{L_{i,t}}\right) = \frac{1}{1 + \delta - \sigma} X'_{i,t}(\beta + \theta) + \chi_{i,t+1}, \tag{2.7}$$

$$\log\left(\frac{W_{i,t+1}}{W_{i,t}}\right) = \frac{1}{1 + \delta - \sigma} X'_{i,t}(\delta\beta + \sigma\theta - \theta) + \bar{\omega}_{i,t+1}, \tag{2.8}$$

[4] Assuming wages are average output makes no qualitative difference for the calculations.

where χ_{it} and $\bar{\omega}_{it}$ are error terms uncorrelated with urban characteristics.[5] The net result is that employment growth regressions can be interpreted as showing how city level variables (the X's) determine the sum of quality of life and productivity growth. The wage growth regressions can be thought of as showing a weighted average of the productivity growth and $\sigma - 1$ times quality of life growth.

One difficulty in interpreting wage growth regressions is that they may be reflecting population composition changes as well as compensation changes. While our model presumes homogeneous labor (like most growth models), heterogeneity of labor is a principal feature of urban growth. We will handle this problem by (1) discussing how our results might be interpreted in a heterogeneous labor model and (2) examining movements of population subgroups to allow different urban characteristics to attract different people differently.

Migration vs. convergence

A negative correlation between initial wages and wage growth (convergence) might occur because (1) technology improves more slowly in advanced cities (real convergence) or (2) because the in-migration of labor to high-wage regions causes the wages in those regions to decline. For the second explanation to make sense, migration of labor must respond slowly to shocks in local labor demand. To examine this question, this subsection presents a model with migration costs and delayed labor supply responses to local shocks.

We assume that the quality of life for potential migrants declines not only in the level of population but also in the growth rate of population. This decline might occur because the costs of migration are rising in the number of in-migrants. A negative connection between the quality of life and growth might also occur because it takes time to build certain public goods, or basic infrastructure, or housing. The residents of quickly growing cities may suffer in terms of quality of life until those cities are built up. Quality of life is now given by

$$\textit{Quality of life} = Q_{i,t} L_{i,t}^{-\delta_1} \left(\frac{L_{i,t}}{L_{i,t-1}} \right)^{-\delta_2}. \tag{2.3'}$$

In this case the correctly specified wage growth equation is[6]

$$\log\left(\frac{W_{i,t+1}}{W_{i,t}}\right) = \frac{X'_{i,t}(\delta_1\beta + \delta_2\beta + \sigma\theta - \theta)}{1 + \delta_1 + \delta_2 - \sigma} - \frac{\delta_2(1-\sigma)}{1 + \delta_1 + \delta_2 - \sigma} \log\left(\frac{L_{i,t}}{L_{i,t-1}}\right) + \bar{\omega}_{i,t+1}. \tag{2.8'}$$

[5] Formally, $\chi_{i,t+1} = (-\log(\underline{U}_{t+1}/\underline{U}_t) + \varepsilon_{i,t+1} + \zeta_{i,t+1})/(1 + \delta - \sigma)$ and $\bar{\omega}_{i,t+1} = ((1-\sigma) \times \log(\underline{U}_{t+1}/\underline{U}_t) + \delta\varepsilon_{i,t+1} + (\sigma - 1)\zeta_{i,t+1})/(1 + \delta - \sigma)$.

[6] The definition of $\bar{\omega}_{i,t+1}$ in (2.8') has been changed appropriately.

If lagged growth rates of population are omitted from the regressions and $\delta_2 \neq 0$, then the coefficients on initial characteristics will be biased (and in particular, the coefficient on initial wages should be biased downwards since current wages are positively correlated with lagged growth). Including lagged population growth rates into a wage growth regression is a test of the existence of this bias. As long as the coefficient on the lagged population growth rate is zero, we can accept that $\delta_2 = 0$. If the coefficient is nonzero, then we must concern ourselves with the possibility that convergence comes from in-migration slowly meeting labor demand and wages being driven down by in-migration.

Controlling for lagged growth rates may have substantial costs. If the first version of our model is correct, and our measures of the X variables are imperfect, and the true X variables are correlated with lagged growth (perhaps because lagged growth came about because of lagged X variables), then controlling for lagged growth rates will decrease the signal to noise ratio in the X variables and spuriously lower the coefficients on these variables.

3. Data description

The analysis in this paper is based on a sample of 203 U.S. cities between 1960 and 1990, although we also use some information from 1950. The data were hand-collected from County and City Data Books (1950, 1960, 1970), the 1990 Census (earlier censi provided the basis for the Data Books – the data are absolutely comparable), and from Taeuber and Taeuber (1965). Sample selection is primarily determined by our reliance on Taeuber and Taeuber for racial characteristics of cities: they looked at all United States cities which in 1960 had over 1,000 occupied housing units with a nonwhite head. The resulting sample of 203 cities includes all but one of the largest 100 cities in the United States, but oversamples Southern cities in the next 100. We have verified that none of the principal results of this paper change if we restrict attention to the largest 100 cities.

Table 1 presents the means and correlations of the variables used in this study (Appendix I provides variable definitions). The average city population in our sample of 203 cities is 269,000 in 1960, growing to an average of 288,000 in 1990, which amounts to only 8.5% growth over the whole period. East St. Louis shrunk the most in this sample (70% over 30 years) whereas Las Vegas grew the most (139% over 30 years). In this sample, 40% of the cities are in the South, 27% are in the Central Region, 19% are in the Northeast, and the remaining 14% are in the West. In 1960, these cities have an average of 25.5% of their activities in manufacturing, an unemployment rate of 5.4%, black population equal to 18% of total, and the average median years of schooling of the population above 25 years old in these cities is 10.8 years.

Table 1
Means and standard deviations, city variables

	Mean	Std. dev.	Minimum	Maximum
Changes				
Growth in log of population 1960–1990	0.085	0.396	−0.691	1.389
Growth in log of population 1950–1960	0.037	0.054	−0.065	0.309
1960 Starting variables				
Log of population	11.864	0.931	10.168	15.867
Per capita income ($1000)	1.993	0.4088	1.150	3.872
Migrants per capita	17.154	8.588	4.2	42.6
Geographical				
South	0.397	0.490	0	1
Central	0.270	0.445	0	1
Northeast	0.191	0.394	0	1
Race				
Segregation index	86.19	7.46	60.4	98.1
Weighted segregation index	1.589	1.090	0.145	5.054
% nonwhite	18.09	11.91	2.1	57.5
Labor force				
Unemployment rate	5.4	1.7	1.9	10.5
Manufacturing share of employment	0.255	0.118	0.043	0.589
Education				
Median years of schooling	10.833	1.116	8.4	13.7
% of pop with 16 + yrs of school	8.9	4.533	2.5	38.7
% of pop with 12–15 yrs of school	33.781	6.463	17.4	49.5
% of pop with less than 5 yrs of school	8.333	3.948	1.9	21.4
Income inequality				
% of pop earning under $3000	19.437	7.411	5.0	41.6
% of pop earning over $10,000	15.98	6.383	5.7	43.8
Government				
Per capita revenue	103.639	64.423	11.775	581.353
Property tax share of revenue	0.445	0.175	0.082	0.876
Intergov funds share of revenue	0.161	0.109	0.0002	0.516
Per capita expenditure	110.002	66.107	13.931	634.169
Police share of expenditure	0.121	0.043	0.039	0.240
Highway share of expenditure	0.133	0.070	0.014	0.428
Sanitation share of expenditure	0.143	0.083	0.026	0.534
Per capita debt	205.326	164.684	8.146	1679.698

However, as Table 1 illustrates, there is a great deal of variation in all of these variables.

We use the segregation index from Taeuber and Taeuber (1965). This index is defined as the percentage of nonwhites who would have to move so that the

Table 2
Raw correlations, city variables

	GR6090	*GR5060*	*LNPOP*	*PCINC*	*STH*	*CENT*	*NE*	*SEG*
Changes								
Growth in log of population 1960–1990	1	0.52	−0.08	−0.02	0.26	−0.28	−0.32	0.08
Growth in log of population 1950–1960	0.52	1	−0.02	0.00	0.23	−0.15	−0.35	0.23
1960 starting variables								
Log of population	−0.08	−0.02	1	0.11	−0.13	0.04	0.01	−0.02
Per capita income (000)	−0.02	0.00	0.11	1	−0.47	0.07	0.22	−0.40
Geographical								
South	0.26	0.23	−0.13	−0.47	1	−0.49	−0.39	0.54
Central	−0.28	−0.15	0.04	0.07	−0.49	1	−0.30	0.12
Northeast	−0.32	−0.35	0.01	0.22	−0.39	−0.30	1	−0.42
Race								
Segregation index	0.08	0.23	−0.02	−0.40	0.54	0.12	−0.42	1
% nonwhite	−0.04	−0.17	−0.02	−0.38	0.51	−0.21	−0.16	0.34
Labor force								
Unemployment rate	−0.25	−0.28	0.01	−0.33	−0.19	0.01	0.11	−0.13
Manufacturing share of employment	−0.45	−0.35	−0.02	−0.01	−0.48	0.40	0.32	−0.19
Education								
Median years of schooling	0.39	0.45	0.01	0.58	−0.08	0.00	−0.27	−0.07
Government								
Per capita revenue	−0.07	−0.09	0.26	0.20	−0.14	−0.17	0.34	−0.26
Per capita expenditure	−0.02	−0.05	0.22	0.14	−0.08	−0.20	0.28	−0.21
Per capita debt	0.22	0.23	0.23	−0.08	0.21	−0.19	−0.05	0.17

Table 2 (continued)

	%NONW	UNEM	MERG	MEDYRS	REV	EXP	DEBT
Changes							
Growth in log of population 1960–1990	−0.04	−0.25	−0.45	0.39	−0.07	0.22	−0.02
Growth in log of population 1950–1960	−0.17	−0.28	−0.35	0.45	−0.09	0.23	−0.05
1960 starting variables							
Log of population	−0.02	0.01	−0.02	0.01	0.26	0.23	0.22
Per capita income (000)	−0.38	−0.33	−0.01	0.58	0.20	−0.08	0.14
Geographical							
South	0.51	−0.19	−0.48	−0.08	−0.14	0.21	−0.08
Central	−0.21	0.01	0.40	0.00	−0.17	−0.18	−0.20
Northeast	−0.16	0.11	0.33	−0.27	0.34	−0.05	0.28
Race							
Segregation index	0.34	−0.13	−0.19	−0.07	−0.26	0.17	−0.21
% nonwhite	1	0.13	−0.19	−0.38	0.05	0.12	0.10
Labor force							
Unemployment rate	0.13	1	0.29	−0.48	−0.02	−0.11	0.01
Manufacturing share of employment	−0.19	0.29	1	−0.50	0.06	−0.20	0.03
Education							
Median years of schooling	−0.38	−0.48	−0.50	1	−0.11	−0.02	−0.14
Government							
Per capita revenue	0.05	0.02	0.06	−0.11	1	0.51	0.97
Per capita expenditure	0.12	−0.11	−0.20	−0.02	0.51	1	0.58
Per capita debt	0.10	0.01	0.03	−0.14	0.97	0.58	1

white/nonwhite distribution is uniform over blocks of a city.[7] A value of 0 would correspond to a perfectly integrated city, a value of 100 would correspond to a city where no whites live on blocks with any nonwhites.

The correlation matrix in Table 2 points to some obvious and some less obvious results. The omitted dummy in this sample is for Western cities. The correlation matrix shows that Southern cities in the sample tend to have relatively smaller populations, somewhat lower median education levels, dramatically lower per capita incomes, lower unemployment, lower commitment to manufacturing, and much higher segregation than average. In contrast, Northeastern cities are large, have surprisingly low median levels of education, higher per capita income, higher unemployment, a much higher fraction of output in manufacturing, and lower segregation. Educated cities tend to have a higher per capita income, lower unemployment, and lower share of employment in manufacturing. In general, the correlations are what one might expect.

A more casual look at the data is provided in Appendix II which describes the data in more detail for four cities: Phoenix, Arizona; Greensboro, North Carolina; Yonkers, New York; and East Chicago, Illinois. Phoenix's population has almost doubled in the past 30 years, and it is now one of the 10 largest cities in America. Phoenix is now, and was in 1960, a well educated city[8] whose success has not come in traditional manufacturing (which was always a small part of the economy) but rather in services and high-tech areas (electronic machinery is its largest industry). Government has acted to increase Phoenix's population in two ways: (1) a growing state government provided more employment for workers in Phoenix[9] and (2) municipal (and state) authorities have kept a strong commitment to laissez faire.[10]

Durham is also an urban success (albeit on a smaller scale), growing 55.7% over the sample period. Durham benefited from its access to a center of human capital (Duke University),[11] low wages, and the usual regional advantages that made southern cities successful in this period.

If in 1960 Yonkers, N.Y., existed on a featureless plain, it would have contained three of the ingredients which have typically led to disaster among post-war American cities: an orientation towards manufacturing, a high unemployment rate, and a low level of education. However, Yonkers held its ground,

[7] The index assumes only nonwhites moving.

[8] The median years of education were 11.8.

[9] Ades and Glaeser (1995) argue that capital cities grow because of tax dollars raised in the hinterland that are spent on services and bureaucracy in the capital.

[10] Local government expenditures per capita are only 60% of the national average.

[11] While Durham's median years of schooling were low (9.9 years), it had a high (12.3%) percent of college graduates.

losing only 0.3% of its population since 1960. The explanation is simple – the flight to the suburbs from New York saved Yonkers from precipitous decline.[12]

Suburbanization could not save East Chicago. Despite its proximity to a major city, which has been rapidly suburbanizing (both North and West), East Chicago's population fell 60% since 1960 because (1) an extraordinarily high share of its labor force is in manufacturing (58.9%, more than double that of Yonkers) and (2) a low level of its population are high-school graduates (27.3%, or about one-half of Yonkers).

4. Economic determinants of city growth

In this paper, the primary measure of city growth is the growth of population.[13] Population growth might not be appropriate for a country because population is relatively immobile and differences in population growth mainly reflect differences in fertility. Across cities, population growth captures the extent to which cities are becoming increasingly attractive habitats and labor markets. Income growth is a natural measure of productivity growth across countries because labor is immobile. When labor is mobile as it is across U.S. cities – and across U.S. states – the situation is radically different. Within the U.S. economy, migration responds strongly to growth opportunities (Blanchard and Katz, 1992). As we saw in the model, income growth will capture some portion of productivity growth, but it will also capture declines in quality of life. Income growth is therefore a less straightforward measure of urban success.

One concern about our population measure is the movement of population to city suburbs, even when people continue to work in the city. For example, when people avoid pollution, bad schools or racial tension in a city, they move to the suburbs. Because of this suburbanization, the city's population falls even if its employment doesn't drop. To address this concern, we examine not only the growth of city populations, but also the growth of the populations of standard metropolitan statistical areas (SMSAs) as a function of city characteristics.

Table 3 presents the basic results on city and SMSA population growth as a function of initial conditions. The first column presents the regression of city population growth on only the initial population, initial income per capita, and geographical dummies. The regression confirms the well-known fact that (the omitted) Western cities grew the fastest, Southern cities grew the second fastest, Central cities grew third fastest, and Northeastern cities grew the slowest during

[12] This example suggests that cities' outcomes are often a function of neighboring areas attributes. We have dealt with this problem by running regressions both for cities and for SMSAs.

[13] Using employment growth provides qualitatively equivalent results in almost all cases.

Table 3
City growth and initial growth conditions, dependent variable: growth in log of variable (1960–1990)

Variable	(1) City population	(2) City population	(3) City population	(4) SMSA[a] population	(5) City income	(6) City income
Intercept	0.831	0.295	0.620	0.361	15.578	15.562
Log (population 1960)	− 0.045	− 0.016	− 0.034	0.007	− 0.013	− 0.012
	(0.025)	(0.024)	(0.024)	(0.026)	(0.01)	(0.01)
Per capita income 1960 ($1000)	0.068	− 0.052	0.010	0.102	− 0.012	− 0.010
	(0.066)	(0.063)	(0.064)	(0.116)	(0.026)	(0.027)
Migrants per capita 1960		0.020				
		(0.003)				
Growth in log of population 1950–1960			0.251			0.023
			(0.045)			(0.019)
Geographical dummies						
South	− 0.209	− 0.214	− 0.166	− 0.107	0.18	0.177
	(0.081)	(0.074)	(0.076)	(0.082)	(0.031)	(0.032)
Central	− 0.529	− 0.374	− 0.387	− 0.430	0.004	0.006
	(0.079)	(0.076)	(0.076)	(0.076)	(0.03)	(0.03)
Northeast	− 0.619	− 0.364	− 0.405	− 0.374	− 0.031	− 0.021
	(0.082)	(0.085)	(0.083)	(0.088)	(0.031)	(0.034)
N	203	203	197	133	201	201
Adj. R^2	0.296	0.411	0.373	0.268	0.368	0.364

Numbers in parentheses are standard errors.

[a]SMSA regression excludes Las Vegas SMSA.

this sample period. These regional dummies cannot be easily rendered insignificant with our economic variables, suggesting that weather and other regional characteristics have played an important role in migration and hence the growth of cities.

This regression also shows that population of larger cities grew slower, a finding which is not robust. More interestingly, there is no evidence that the population of richer cities grew slower, which is not consistent with the basic convergence idea that capital (and with it, labor) should move to regions where wages are lower. In later regressions, we use regional dummies, initial population, and initial income per capita as permanent controls.

The middle two regressions in Table 3 begin to address the issue of persistence of growth rates. They show that cities that attracted migrants in the past[14] and cities that grew faster between 1950 and 1960, also continued to grow faster after 1960. These results are highly statistically significant and consistent with the similar findings at the state level of Blanchard and Katz (1992). We return to persistence of growth rates later when we split the sample period. The fourth regression in Table 3 repeats the basic specification for SMSAs.[15]

Again, there is no evidence of convergence. One interesting finding is that Northeastern SMSAs did relatively better than Northeastern cities. We believe that this finding occurs because the movement of population to the suburbs is more important in the Northeast than in other regions. SMSAs also show less population convergence than cities. Indeed, limits on available land should make congestion more important in the densely populated inner city than in the more open SMSA.

Regression (5) in Table 3 presents the results for per capita income growth. The only significant coefficient is the South dummy, which confirms the well-known result that Southern incomes grew faster. In the West, population grew the fastest; in the South, income did. As before, there is no significant evidence of convergence.

Regression (6) repeats (5) controlling for past population growth. This procedure follows Eq. (2.8′) and is meant to estimate δ_2. The insignificant correlation between lagged population growth and future income growth fails to reject the hypothesis that $\delta_2 = 0$, or that the second effect is statistically insignificant. These results suggest that our findings on income growth are actually reflecting productivity movements, not a gradual return to nationwide average wages from slow migration.[16]

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[14] By definition these cities have had high levels of gross population growth.

[15] We excluded Las Vegas from all SMSA regressions. We found that Las Vegas was an extreme outlier that influenced many of our regressions in perverse ways. Moreover, we believe that since we have not included gambling-related controls which would explain Las Vegas' outlier status, it is appropriate to exclude Las Vegas from the regressions.

[16] None of our subsequent income growth results change if we control for lagged employment growth; we do not report those findings.

Table 4
City growth and manufacturing, dependent variable: growth in log of variable (1960–1990)

Variable	(1) City total population	(2) City manufacturing employment	(3) City non-manufacturing employment	(4) SMSA[a] total population	(5) City income
Intercept	1.167	− 8.398	5.622	0.560	15.703
Log (population 1960)	− 0.050	0.776	− 0.417	0.035	− 0.015
	(0.025)	(0.076)	(0.041)	(0.025)	(0.01)
Per capita income 1960 ($1000)	0.012	− 0.062	− 0.019	0.007	− 0.033
	(0.067)	(0.208)	(0.095)	(0.112)	(0.027)
Manufacturing share 1960	− 0.799	− 2.482	− 0.670	− 0.977	− 0.283
	(0.253)	(0.783)	(0.355)	(0.230)	(0.096)
Geographical dummies					
South	− 0.244	0.144	− 0.233	− 0.107	0.167
	(0.080)	(0.246)	(0.114)	(0.077)	(0.031)
Central	− 0.433	− 0.416	− 0.341	− 0.293	0.039
	(0.083)	(0.258)	(0.119)	(0.078)	(0.032)
Northeast	− 0.516	− 0.729	− 0.389	− 0.227	0.003
	(0.087)	(0.269)	(0.124)	(0.089)	(0.033)
N	203	189	189	133	201
Adj. R^2	0.326	0.456	0.406	0.354	0.392

Numbers in parentheses are standard errors.

[a]SMSA regression excludes Las Vegas SMSA.

Table 4 examines the relationship between city population growth and the share of initial employment in the manufacturing sector. The first column shows that the population of cities significantly involved in manufacturing grew slower than that of cities less involved in manufacturing. This result holds true even controlling for regions and other initial conditions identified in Table 3. The next two columns show that a high initial exposure to manufacturing had an adverse effect on the growth of both manufacturing and nonmanufacturing employment in a city, and not just on the growth of the city's population. Moreover, manufacturing cities' populations relatively declined not just because people escaped to the suburbs: the population of whole SMSAs grew slower as well. Finally, manufacturing cities relatively declined not only in terms of population, but also in terms of per capita income. A one standard deviation

increase in manufacturing's share of employment is associated with a 3.4% decline in income between 1960 and 1990.

These results suggest that cities followed the fortunes of the industries that they were exposed to initially. Nonmanufacturing activities did not move into cities where manufacturing declined; rather, the population of these cities (relatively) declined through emigration, and incomes fell as well. These results seem particularly supportive of a vintage capital model, where cities that invested in older types of capital do not replace that capital as it becomes obsolete because (1) existing capital represents a sunk investment and (2) the pre-existing capital 'crowds out' newer capital.[17] As the capital becomes more out-of-date, the marginal product of labor, the wage rate, and eventually population fall.

Table 5 focuses on initial unemployment and subsequent population growth. High initial unemployment reduces subsequent population growth of both the city and its SMSA. The middle columns show that a high initial unemployment rate adversely affects the growth rate of both employed and unemployed populations, and not just the total urban population. There are two natural interpretations of this effect: (1) cities with high unemployment rates declined as workers responded to business cycle shocks through emigration, or (2) unemployment is proxying for omitted human capital variables, and cities with high unemployment lacked the skilled labor forces necessary for success in our period.[18] The last regression in Table 5 also shows that initial unemployment reduces subsequent income growth; a one standard deviation drop in the unemployment rate creates a 3.75% fall in income.

Table 6 presents results on the initial education levels and subsequent population growth. The first column of Table 6 shows that initial median years of schooling exert a positive and significant influence on the subsequent population growth, using our standard controls as well as the initial unemployment rate and manufacturing share.[19] Once we control for education, we also get the income convergence result – namely that cities with higher initial per capita income grow less. This result is similar to Barro's (1991) finding of conditional convergence.[20] A closer inspection of what it is about schooling that matters

[17] This crowding out may occur because scarce resources (such as land) are used with the older capital.

[18] We believe that the strong persistence in unemployment rates over time (more than 80% between 1960 and 1990) makes the interpretation that unemployment is proxying for omitted human capital variables more plausible.

[19] Miracky (1994) also finds a correlation between schooling levels and urban growth between 1977 and 1990.

[20] This result is not changed when we control for past population growth rates, so we do not believe that it is simply the outcome of wages falling as migrants catch up with demand.

Table 5
City growth and unemployment, dependent variable: growth in log of variable (1960–1990)

Variable	(1) City population	(2) City unemployed	(3) City employed	(4) SMSA[a] population	(5) City income
Intercept	1.777	4.544	3.787	0.963	15.944
Log (population 1960)	− 0.050	− 0.172	− 0.166	0.030	− 0.015
	(0.024)	(− 0.048)	(0.045)	(0.025)	(0.009)
Per capita income 1960 ($1000)	− 0.116	− 0.354	− 0.278	− 0.050	− 0.084
	(0.074)	(0.149)	(0.141)	(0.111)	(0.0297)
Unemployment rate 1960	− 0.057	− 0.164	− 0.086	− 0.047	− 0.022
	(0.016)	(0.031)	(0.030)	(0.017)	(0.006)
Manufacturing share 1960	− 0.631	− 0.623	− 1.381	− 0.888	− 0.225
	(0.250)	(0.490)	(0.463)	(0.227)	(0.095)
Geographical dummies					
South	− 0.370	− 0.121	− 0.243	− 0.172	0.116
	(0.085)	(0.168)	(0.159)	(0.079)	(0.033)
Central	− 0.521	− 0.067	− 0.269	− 0.356	0.006
	(0.084)	(0.165)	(0.156)	(0.079)	(0.032)
Northeast	− 0.570	− 0.462	− 0.321	− 0.266	− 0.018
	(0.086)	(0.169)	(0.160)	(0.160)	(0.032)
N	203	201	201	133	201
Adj. R^2	0.364	0.268	0.203	0.387	0.426

Numbers in parentheses are standard errors.

[a]SMSA regression excludes Las Vegas SMSA.

shows that the percentage of the population with 12 to 15 years (high-school graduates or some college) is more important than the percentage of the population with over 16 years (college graduates). This result suggests the importance of a well-educated labor force, not just of the top of the education distribution. Interestingly, median years of schooling are less significant if we look at the SMSA population, suggesting that schooling may have contributed to suburbanization and not just city growth.

One interesting question in the theory of economic growth is whether the average or the total quantity of human capital speeds up economic growth. One can build human capital spillover models in the spirit of Lucas (1988) in which growth is proportional to either total or average education. As a rough test of

Table 6
City growth and education, dependent variable: growth in log of variable (1960–1990)

Variable	(1) City population	(2) City population	(3) City population	(4) SMSA[a] population	(5) City income
Intercept	0.819	− 1.108	1.104	0.422	15.664
Log (population 1960)	− 0.042	− 0.043	− 0.040	0.038	− 0.012
	(0.024)	(0.025)	(0.024)	(0.025)	(0.009)
Per capita income 1960 ($1000)	− 0.212	− 0.223	− 0.235	− 0.177	− 0.155
	(0.085)	(0.087)	(0.093)	(0.136)	(0.034)
Unemployment rate 1960	− 0.044	− 0.044	− 0.042	− 0.044	− 0.018
	(0.017)	(0.017)	(0.017)	(0.017)	(0.0065)
Manufacturing share 1960	− 0.353	− 0.322	− 0.300	− 0.686	− 0.144
	(0.276)	(0.281)	(0.284)	(0.259)	(0.105)
Median years of schooling 1960	0.080	0.075		0.059	0.024
	(0.035)	(0.035)		(0.038)	(0.013)
Median schooling 1960 * Log (population 1960)		− 0.015			
		(0.023)			
Percent of population with 12–15 years of schooling			0.014		
			(0.006)		
Percent of population with 16 + years of schooling			0.007		
			(0.008)		
Geographical dummies					
South	− 0.309	− 0.320	− 0.278	− 0.152	0.133
	(0.089)	(0.090)	(0.092)	(0.079)	(0.034)
Central	− 0.489	− 0.503	− 0.461	− 0.353	0.016
	(0.085)	(0.088)	(0.086)	(0.079)	(0.032)
Northeast	− 0.476	− 0.490	− 0.424	− 0.243	0.01
	(0.094)	(0.097)	(0.101)	(0.089)	(0.036)
N	203	203	203	133	201
Adj. R^2	0.377	0.375	0.379	0.395	0.432

Numbers in parentheses are standard errors.

[a]SMSA regression excludes Las Vegas SMSA.

these theories, Table 6 presents a regression in which both the average education and a proxy for the total stock of education are included. Our proxy for the total stock of education is (median years of schooling in the city minus average median years of schooling across cities) times (log of population minus average

log of population). The results suggest that average education matters and total education does not.[21]

Finally, the last regression in Table 6 examines the effect of education on subsequent per capita income growth. The basic result, similar to that for countries, is that cities with higher median years of schooling show faster subsequent per capita income growth. Here a one standard deviation rise in median years of schooling raises income 2.78% over the period.

Overall, the results on income growth closely resemble the results on population growth. Unemployment lowers growth. Manufacturing lowers growth. Initial education raises growth. The fact that income and population results are similar suggests that either (1) movements in wages and population are generally determined by productivity changes, and not quality of life changes [i.e., in Eqs. (2.7) and (2.8) the β terms are much larger than the θ terms in absolute value], or (2) the same factors that cause increases in productivity cause decreases in quality of life [i.e., the β terms have the reverse sign as the θ terms]. We find the second explanation less plausible, since it requires one to believe that unemployment makes cities a more pleasant place to live. Income results may also reflect changes in labor force composition. Since cities with growing populations have also had increases in the percent college-educated, it is possible that the correlation between income growth and population growth occurs because population growth is accompanied by an upgrading in the human capital quality of the population.[22]

Tables 3 through 6 have presented some results on the growth of cities over 1960–1990. Since we have some data for 1950, we can actually look at two twenty-year periods, 1950–1970 and 1970–1990, as is done in Table 7. Initial unemployment rates and manufacturing shares negatively affect employment growth in both subperiods, although the effect of the initial manufacturing share is insignificant in the second subperiod. High unemployment appears to be worse for growth after 1970. The effect of median years of schooling on subsequent growth has increased after 1970 (although this result is not statistically significant). This result is consistent with studies that show the increased importance of education after 1970 in other contexts (for example, Murphy and Welch, 1991).

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[21] Population growth and income growth are both correlated with growth in percent college educated; we do not report these results. Cities become more appealing in this way as they grow. However, we did not find the growth in percent college educated (or any other meaningful measure of human capital stocks) to be significantly related (in either direction) to our measures of initial conditions.

[22] We cannot with our data look at income within subgroups of the population, so it is difficult for us to distinguish whether rises in income represent higher income for all the residents of the city or whether they represent a shift in the human capital composition of the labor force. A preliminary examination of other data has suggested that compositional shifts explain a significant, but not overwhelming, portion of income changes.

Table 7
City growth and education for two subperiods, dependent variable: 20-year growth in log of population

Variable	(1) City population (1950–1970)	(2) City population (1950–1970)	(3) City population (1970–1990)	(4) SMSA[a] population (1970–1990)
Intercept	1.314	1.187	0.372	0.206
Log (initial population)	− 0.073	− 0.073	− 0.019	− 0.021
	(0.023)	(0.023)	(0.014)	(0.014)
Median income 1950	− 0.034	0.038		
	(0.065)	(0.034)		
Per capita income 1970 ($1000)			− 0.096	− 0.101
			(0.033)	(0.033)
Initial median years of schooling	0.032	0.038	0.064	0.081
	(0.034)	(0.024)	(0.023)	(0.024)
Initial unemployment rate	− 1.32	− 1.797	− 3.512	− 0.044
	(1.477)	(1.444)	(1.182)	(0.012)
Initial manufacturing share	− 0.536	− 0.493	− 0.197	− 0.141
	(0.262)	(0.261)	(0.172)	(0.173)
% nonwhite	− 0.386		− 0.268	
	(0.265)		(0.106)	
Geographical dummies				
South	− 0.068	− 0.128	− 0.249	− 0.29
	(0.111)	(0.103)	(0.06)	(0.058)
Central	− 0.219	− 0.24	− 0.441	− 0.462
	(0.102)	(0.102)	(0.054)	(0.054)
Northeast	− 0.401	− 0.413	− 0.38	− 0.406
	(0.096)	(0.096)	(0.061)	(0.061)
N	197	197	202	202
Adj. R^2	0.351	0.347	0.496	0.482

Numbers in parentheses are standard errors.

[a]SMSA regression excludes Las Vegas SMSA.

In summary, the results for cities are surprisingly similar to the results for countries in that cities with 'good' characteristics, such as low manufacturing exposure, high education, and low unemployment, grow faster. There is little evidence of that bigger cities have a lower population growth or that richer cities have a lower income growth (although income convergence is stronger once we control for city characteristics).

5. Population growth and social characteristics of cities

In this section, we examine the effect of several social and political characteristics on the growth of U.S. cities, 1960–1990. The social measure we use to proxy for social tension in a city are income (and education), inequality, racial composition, and segregation of the population. We also look at the effect of composition of government spending on subsequent growth.

Table 8 presents the results on city population growth and inequality, controlling for the initial conditions that have been shown to matter so far. Controlling for mean income, the percent of the population that has income above $10,000 in 1960 raises city growth – although this result disappears if we look at the SMSA. In addition, the percent of the population that has income below $3,000 in 1960 has no effect on city growth, but substantially raises SMSA growth. This result suggests that, in this period, social tensions resulting from substantial poverty in a city manifested themselves through suburbanization. At the same time, the second column presents the surprising result that a high percentage of uneducated people is associated with higher city growth, which might mean that an abundance of inexpensive, low human capital labor attracted capital, or, alternatively, that we are not fully accounting for regional variation.

Regression (5) shows the connection between schooling inequality and income growth. Urban income growth is positively related to the share of college-educated workers. Median years of schooling becomes insignificant when college-educated workers share is controlled for.

Table 9 presents the results on city growth and racial composition. Without any but our standard Table 3 controls, percent nonwhite weakly slows down city growth, although this result is not particularly robust, and disappears when more controls such as initial unemployment, manufacturing share, and median years of schooling are added. Obviously, race in this sample is correlated with the initial economic characteristics of a city.

The segregation index has no effect on subsequent growth. However, weighted segregation, defined as the segregation index times the percentage of the population that is black (to differentiate between segregated cities with a large number of blacks and those with a few) has a positive influence on future growth. Another way of seeing this result is by looking only at cities with over 10% nonwhites. For these cities, segregation positively affects growth, perhaps because segregation lessened racial discord or because whites demanded segregation. This result is inconsistent with Benabou (1993), who argues that under certain conditions segregation is costly to growth because of diminished knowledge spillovers.

Table 10 examines the relationship between city growth and the levels and composition of government receipts and expenditures in 1960. It does not appear that either 1960 per capita revenue or 1960 per capita expenditure

Table 8
City growth and inequality, dependent variable: growth in log of variable (1960–1990)

Variable	(1) City population	(2) City population	(3) City population	(4) SMSA[a] population	(5) City income
Intercept	1.007	− 0.083	0.854	− 1.458	15.871
Log (population 1960)	− 0.037	− 0.042	− 0.045	0.024	− 0.01
	(0.025)	(0.024)	(0.024)	(0.026)	(0.009)
Per capita income 1960	− 0.430	− 0.162	− 0.314	0.437	− 0.147
($1000)	(0.158)	(0.093)	(0.122)	(0.219)	(0.037)
Unemployment rate	− 0.043	− 0.046	− 0.044	− 0.043	− 0.015
1960	(0.017)	(0.017)	(0.0169)	(0.016)	(0.007)
Manufacturing share	− 0.398	− 0.359	− 0.521	− 0.304	− 0.107
1960	(0.324)	(0.280)	(0.312)	(0.263)	(0.106)
Median years of schooling	0.072	0.143	0.064	0.090	0.004
1960	(0.039)	(0.047)	(0.038)	(0.037)	(0.018)
% population with income	0.016			− 0.007	
greater than $10,000	(0.010)			(0.012)	
% population with income	0.001			0.026	
less than $3,000	(0.007)			(0.007)	
Percent of population with		0.023			− 0.004
5 − years of schooling		(0.010)			(0.004)
Percent of population with		− 0.007			0.007
16 + years of schooling		(0.009)			(0.003)
Median income 1960			0.007		
			(0.006)		
Geographical dummies					
South	− 0.311	− 0.350	− 0.278	− 0.216	0.131
	(0.094)	(0.091)	(0.093)	(0.077)	(0.036)
Central	− 0.471	− 0.447	− 0.479	− 0.351	0.004
	(0.085)	(0.086)	(0.085)	(0.075)	(0.033)
Northeast	− 0.453	− 0.462	− 0.460	− 0.214	0.002
	(0.095)	(0.094)	(0.095)	(0.085)	(0.036)
N	203	203	203	133	201
Adj. R^2	0.379	0.386	0.378	0.460	0.439

Numbers in parentheses are standard errors.

[a]SMSA regression excludes Las Vegas SMSA.

Table 9
City growth and race, dependent variable: growth in log of variable (1960–1990)

Variable	(1) City population	(2) City population	(3) City population	(4) SMSA[a] population	(5) City income
Intercept	0.908	0.938	1.481	0.355	15.627
Log (population 1960)	− 0.043 (0.025)	− 0.042 (0.024)	− 0.043 (0.024)	0.033 (0.027)	− 0.012 (0.009)
Per capita income 1960 ($1000)	0.043 (0.067)	− 0.202 (0.086)	− 0.159 (0.088)	− 0.146 (0.146)	− 0.117 (0.035)
% nonwhite 1960	− 0.005 (0.002)	− 0.002 (0.002)	− 0.048 (0.025)	0.002 (0.003)	0.001 (0.001)
Unemployment rate 1960		− 0.043 (0.017)	− 0.039 (0.017)	− 0.043 (0.017)	− 0.019 (0.007)
Manufacturing share 1960		− 0.402 (0.285)	− 0.429 (0.284)	− 0.653 (0.265)	− 0.128 (0.108)
Median years of schooling 1960		0.070 (0.038)	0.060 (0.038)	0.061 (0.038)	0.027 (0.014)
Segregation index 1960			− 0.006 (0.006)		
Segregation 1960 * % nonwhite 1960			0.529 (0.284)		
Geographical dummies					
South	− 0.150 (0.085)	− 0.289 (0.093)	− 0.296 (0.103)	− 0.162 (0.081)	0.127 (0.036)
Central	− 0.517 (0.078)	− 0.483 (0.085)	− 0.482 (0.092)	− 0.358 (0.079)	0.014 (0.033)
Northeast	− 0.602 (0.082)	− 0.479 (0.094)	− 0.478 (0.094)	− 0.242 (0.089)	0.01 (0.036)
N	203	203	203	133	201
Adj. R^2	0.308	0.375	0.381	0.392	0.431

Numbers in parentheses are standard errors.

[a]SMSA regression excludes Las Vegas SMSA.

significantly influence subsequent population growth. Expenditure levels in 1960 are positively related to later income growth, but this result is not robust. However, 1960 debt levels (holding revenue constant) are positively associated

Table 10
City growth and government expenditure, dependent variable: growth in log of variable (1960–1990)

Variable	(1) City population	(2) City population	(3) City population	(4) City population	(5) City income
Intercept	0.803	0.734	0.771	0.812	15.66
Log (population 1960)	− 0.047 (0.025)	− 0.056 (0.025)	− 0.048 (0.025)	0.042 (0.025)	− 0.018 (0.01)
Per capita income 1960 ($1000)	− 0.225 (0.087)	− 0.183 (0.091)	− 0.229 (0.086)	− 0.216 (0.087)	− 0.125 (0.034)
Median years of schooling 1960	0.085 (0.036)	0.081 (0.036)	0.088 (0.036)	0.077 (0.038)	0.029 (0.014)
Unemployment rate 1960	− 0.044 (0.017)	− 0.035 (0.017)	− 0.043 (0.017)	− 0.044 (0.017)	− 0.018 (0.006)
Manufacturing share 1960	− 0.340 (0.277)	− 0.366 (0.283)	− 0.344 (0.277)	− 0.413 (0.277)	− 0.13 (0.104)
Per capita revenue 1960	0.290 (0.392)	− 0.492 (0.501)			
Property revenue share 1960		0.137 (0.163)			
Intergovernmental revenue share 1960		0.202 (0.235)			
Per capita debt 1960		0.462 (0.175)			
Per capita expenditure 1960			0.408 (0.370)	0.445 (0.466)	0.297 (0.156)
Police share of expenditure 1960				− 0.504 (0.678)	
Highway share of expenditure 1960				− 0.003 (0.388)	
Sanitation share of expenditure 1960				0.557 (0.294)	
Geographical dummies					
South	− 0.305 (0.089)	− 0.325 (0.089)	− 0.303 (0.089)	− 0.329 (0.095)	0.13 (0.034)
Central	− 0.482 (0.085)	− 0.486 (0.085)	− 0.475 (0.085)	− 0.492 (0.090)	0.018 (0.032)
Northeast	− 0.483 (0.095)	− 0.485 (0.104)	− 0.481 (0.094)	− 0.481 (0.097)	− 0.008 (0.037)
N	203	203	203	201	201
Adj. R^2	0.375	0.389	0.378	0.378	0.44

Numbers in parentheses are standard errors.

with subsequent growth.[23] In addition, a higher fraction of expenditures which go to sanitation (perhaps a useful type of government spending) is associated with faster subsequent growth. Interestingly, a higher fraction of expenditures which go to highway construction – a plausible measure of infrastructure spending – is not associated with higher subsequent growth. In sum, there are no striking results on the effect of government revenue or spending on growth, which is in line with much of the evidence on growth of countries.

6. Conclusion

This paper has presented a variety of partial correlations between growth of city populations and these cities' initial characteristics. A key variable for cities, as for countries, is initial education level of the population. Several other economic variables, such as initial unemployment and exposure to manufacturing, proved important as well. We were relatively less successful in identifying important social and political variables; we did find that our weighted segregation measure was positively correlated with income and population growth. In many respects, however, the story of growth of cities is similar to that of the growth of countries. Since cities' differences are not created by different savings rates or different labor force endowments, our results suggest that higher education levels influence later growth not through savings but through influencing the growth of technology.

Many of the most interesting explanations for the connection between growth and initial human capital levels across countries have focused on productive externalities generated by schooling. Since these externalities should be particularly prevalent in cities, finding a connection between growth and initial schooling across urban centers supports the view of schooling as a generator (through spillovers) of growth. The robust relationship between schooling and growth for SMSAs, city employment, and city income growth provides more evidence supporting the positive role of education in economic expansion.

Appendix 1: Description of variables

Population (City): This variable comes from the 1950–1970 county and city data books and is the number of persons living within the political unit of the city. It does not count commuters. This variable is ultimately derived from the census.

[23] This correlation between debt levels and later growth may be because higher expected growth levels made it cheaper to borrow, or because cities anticipating high levels of population growth invested heavily in infrastructure to serve that growth.

Population (SMSA): This variable again comes from the 1950–1970 county and city data books and the 1990 census. Since SMSA definitions have changed over the relevant sample period, we have used the county definitions from 1990 and reconstructed SMSAs in 1960 using the 1990 definitions. The population counts themselves are from the census.

Regions: The four regional classifications are standard. We used the regional definitions given by Taeuber and Taeuber (1965).

Per Capita Income: This variable was created from two variables included in the city and county data books. Aggregate income is described as the amount received by all income recipients 14 years and older. This variable was then divided by the population measure.

Manufacturing's Share: This variable (again from the data books, which will be our sources for all the remaining variables unless noted) represents the share of workers who are employed who worked in manufacturing industries, which means specifically industries with SIC codes 20–39.

Unemployment Rate: This variable refers to the share of the labor force that is currently unemployed. The usual problems about workers who have dropped out of the labor force apply.

Median Years of Schooling: This variable gives the median years of schooling for all persons 25 years and older.

16 +, 12–16, 12 Years of Schooling Share of Population: These variables again refer to the schooling of persons 25 years and over.

Percentage Nonwhite: This refers to the share of the population not classified as whites, and it includes Hispanics.

Segregation Index: This index comes from Taeuber and Taeuber (1965) and is described in the text of our paper and in their book. This index measures the percentage of the nonwhite population that would have to move to achieve perfect integration. The range of the index is between 0 (perfect integration) and 100 (complete segregation – all of the nonwhite population would have to move).

3000 −, 10000 + Share of Population: These variables refer to the shares of the population that earn less than 3,000 or more than 10,000 dollars per year among the working population

Government Expenditures, Revenues, and Debt: These variables are from the county and city data books and are formed by dividing total government expenditures, revenues, and debt by population figures described above.

Appendix II: Description of four cities

Durham, North Carolina	*1960*	*1990*
Population	78,302	136,611
% high-school graduates	38.2%	78.5%
Per capita income	$1,1647	$10,257
% manufacturing	25.4%	N/A
% unemployment	4.9%	4.5%
% nonwhite	36.3%	48.3%
Per capita government expenditures	$101.2	$468.0
East Chicago, Illinois	*1960*	*1990*
Population	57,669	33,892
% high-school graduates	27.3%	57.7%
Per capita income	$1,821	$7,905
% manufacturing	58.9%	31.5%
% unemployment	4.5%	14.3%
% nonwhite	24.0%	62.0%
Per capita government expenditures	$143.9	$1135.0
Phoenix, Arizona	*1960*	*1990*
Population	439,170	983,403
% high-school graduates	48.7%	64.3%
Per capita income	$2,013	$8,807
% manufacturing	16.6%	25.0%
% unemployment	4.7%	6.9%
% nonwhite	5.8%	18.3%
Per capita government expenditures	$63.52	$111.90
Yonkers, New York	*1960*	*1990*
Population	190,634	188,082
% high-school graduates	47.9%	73.6%
Per capita income	$2,691	$13,112
% manufacturing	25.7%	7.2%
% unemployment	3.7%	4.9%
% nonwhite	4.2%	15.8%
Per capita government expenditures	$187.2	$1322.0

References

Ades, A. and E. Glaeser, 1995, Trade and circuses: Explaining urban giants, Quarterly Journal of Economics CX, 195–228.

Alesina, A. and D. Rodrik, 1994, Distributive politics and economic growth, Quarterly Journal of Economics CIX, 465–490.

Barro, R., 1991, Economic growth in a cross-section of countries, Quarterly Journal of Economics CVI, 407–444.

Barro, R. and X. Sala-i-Martin, 1992, Convergence, Journal of Political Economy 100, 223–251.

Baumol, W.J., 1986, Productivity growth, convergence and welfare: What does the long run data show?, American Economic Review 76, 1072–1085.

Benabou, R., 1993, Working of a city: Location, education and production, Mimeo.

Blanchard, O. and L. Katz, 1992, Regional evolutions, Brookings Papers on Economic Activity 1, 1–76.

Borts, G., 1960, The equalization of returns and regional economic growth, American Economic Review 50, 319–347.

Chinitz, B., 1962, Contrasts in agglomeration: New York and Pittsburgh, American Economic Review, Papers and Proceedings 52, 279–289.

DeLong, J.B., 1988, Productivity growth, convergence and welfare: Comment, American Economic Review 78, 1138–1154.

DeLong, J.B. and A. Shleifer, 1993, Princes and merchants: European city growth before the industrial revolution, Journal of Law and Economics 36, 671–702.

Glaeser, E., H. Kallal, J. Scheinkman, and A. Shleifer, 1992, Growth in cities, Journal of Political Economy 100, 1126–1152.

Jacobs, J., 1969, The economy of cities (Vintage, New York, NY).

Kain, J. and D. Neidercorn, 1963, An econometric model of metropolitan development, Regional Science Association Papers 11, 000–000.

Lucas, R.E., 1988, On the mechanics economic development, Journal of Monetary Economics 12, 3–42.

Marshall, A., 1890 Principles of economics (Macmillan, London).

Mills, E.S., 1992, Forecasting the growth of metropolitan areas, Mimeo.

Miracky, W., 1994, Cities and the product cycle, Mimeo.

Murphy, K. and F. Welch, 1992, The structure of wages, Quarterly Journal of Economics CVII, 285–326.

Porter, M., 1990, The comparative advantage of nations (Free Press, New York, NY).

Romer, P., 1986, Increasing returns and long-run growth, Journal of Political Economy 94, 1002–1037.

Taeuber, A. and K. Taeuber, 1965, Negroes in cities (McGraw-Hill, New York, NY).