Local Growth Empirics

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CID Working Paper No. 23
July 1999

Working Papers
Center for International Development
at Harvard University

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Abstract

Using a newly constructed data panel on U.S. locality attributes, this paper sketches four sets of empirical facts on economic growth across U.S. counties. A first set of facts focuses on the time series and cross-correlation properties of local economic growth as measured by net migration, per capita income growth, and housing price growth. A second and a third set of facts focus on the geographical correlates of local growth over the 20th century and the non-government correlates of local growth over the period 1970 to 1990. A fourth set of facts focuses on the government fiscal policy correlates of local growth. Local economic growth from 1970 to 1990 is strongly negatively correlated with financial measures of initial local government size. This negative correlation is extremely robust across alternative specifications; an extensive set of control variables eliminates any obvious omitted variable bias; there is no indication of reverse causality; and the result is not driven by the elderly. Controlling for local government size, local growth is positively correlated with expenditures on elementary and secondary school education; it is negatively correlated with the percent of local tax revenue derived from personal income and selective sales taxes. A neoclassical model of local growth provides a framework for interpreting these correlations.

Keywords: Economic Growth, Factor Mobility, Migration, Compensating Differentials, Geography, Local Government

JEL Classifications: O51, R11, R50, J61

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*Thank you for advice and comments to Alberto Alesina, Robert Barro, Timothy Conley, Edward Glaeser, Claudia Goldin, Christopher Hanes, Matt Kahn, David Laibson, Philip Lane, Daniel Paserman, James Poterba, Lant Pritchet, Je¤rey Sachs, Jose Tavares, and Aaron Tornell. Thank you for financial support to the National Science Foundation, the Harvard Institute for International Development, and the Center for International Development at Harvard University. Nathaniel Baum-Snow and Krista Jacobs provided excellent research assistance. Errors and omissions are my own.

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1 Introduction

Why do some localities consistently grow at quicker rates than others? Large and sustained differences in economic growth rates among U.S. localities are an overwhelming empirical regularity throughout the 20th century. Blanchard and Katz (1992) document the persistence and variability of employment growth across U.S. states for the period 1950 to 1990. Borts (1960) finds similar persistence over the period 1909 to 1953. Barro and Sala-i-Martin (1991) find it with respect to net migration across states over the period 1900 to 1987. Figure 1 documents the same persistence and variability for net migration across U.S. counties over the period 1950 to 1990.

To the question of the sources of the variation in local growth rates, macroeconomics has given surprisingly little attention; at least not directly. Indirectly, however, the vast empirical literature on the sources of variation in growth rates across nation states addresses a similar question. The theory section below lays out the case that local growth as measured by net migration will capture several of the same processes that are likely to underlie cross-country growth as measured by changes in per capita income.

And so besides being of intrinsic interest, local growth empirics can provide clues to questions that have proved elusive in cross-country study. As elusive as any is the question, how does government affect economic growth?

Certainly, conventional wisdom holds that "good government" matters; consistent with this are the findings in Keefer and Knack (1995) and Mauro (1995) that per capita income growth is positively correlated with measures of rule of law and lack of government corruption. Beyond such minimal standards of good government, the most frequent finding from cross-country studies is an inverse correlation between income growth and various measures of government size (e.g. Barro, 1991). Disaggregating fiscal policy into its revenue and expenditure components, Easterly and Rebelo (1993) find the share of public investment in transportation and communications as well as governments' overall budget surpluses to be consistently positively correlated with income growth; for the numerous other fiscal variables they examine, however, they find any correlations with economic growth to be statistically fragile. The statistical fragility of the correlation between government and growth is reinforced by Levine and Renelt (1992) who find that a wide range of fiscal policy indicators can be made insignificant in cross-country growth regressions by slight variations in the set of conditioning variables. Indeed Easterly, Kremer, Pritchett, and Summers (1993) argue that the low serial correlation of country growth rates suggests that it is random shocks rather then country attributes (such as fiscal policy) that account for variations in growth rates. The overall picture that emerges from the cross-country growth literature, then, is that we still have much to learn about the links between fiscal policy and economic growth.

At the local level, literally hundreds of studies address the question of the effect of government on various measures of economic growth, and one can find among these support for nearly any hypothesized relationship. Estimates of the output elasticity of local public capital, for instance, range from high positive (Aschauer 1989, Munnell 1990) to zero (Ciccone and Hall 1996, Garcia-Milá, McGuire and Porter 1996) to negative (Evans and Karras 1994). And so again, little if any consensus emerges; the most we can say is that controlling for costs (i.e. taxes, charges, etc.), the majority of studies find some marginal benefits from higher levels of government services or government capital; and that controlling for such services and capital, the majority of studies find some marginal cost to higher taxes (Bartik 1991). But such conclusions are hardly surprising and offer little if any insight.

Using a newly constructed data panel on U.S. locality attributes and with an explicitly dynamic model of local growth to motivate interpretations, the present paper is able to sketch a considerably clearer picture of the linkages between government fiscal policy and economic growth. Measured by the rate of net migration, per capita income growth, or owner-occupied housing median value growth, local growth across U.S. counties over the period 1970 to 1990 is strongly negatively correlated with any of several financial measures of local government size. This negative correlation is extremely robust across alternative specifications; an extensive set of control variables eliminates any obvious omitted variable bias; there is no indication of reverse causality; and the result is not driven by the elderly. Controlling for local government size, local growth is positively correlated with expenditures on elementary and secondary school education; it is negatively correlated with the percent of local tax revenue derived from personal income and selective sales taxes.

The paper also documents strong correlations between economic growth and a number of non-government local attributes. U.S. county economic growth over the period 1970 to 1990 is positively correlated with suburban metropolitan locations and high initial levels of human capital; it is negatively correlated with medium initial levels of human capital, initial unemployment, and start-of-period violent crime; and it displays a strong nonlinear correlation with initial poverty — positive at low levels of poverty but negative at high levels of poverty.

The paper proceeds as follows: Section 2 outlines a theoretical framework for analyzing local growth and argues that population flows across localities serve as the best analog to per capita income growth across nation-states. Section 3 sketches the time series, cross correlation, and convergence behavior of three local growth metrics: population flows, per capita income growth, and housing median value growth. Section 4 makes explicit an empirical framework for analyzing the correlates of local growth. Section 5 examines the natural geography correlates of the level and growth rate of population density across the 20th century; interpreting the coefficients on exogenous geographical attributes from local growth regressions helps to clarify interpretations which may apply as well to time-varying local attributes. Sections 6 and 7 sketch the non-government and government correlates of local growth. Section 8 concludes.

2 Theory

The theoretical underpinning of the empirical analysis which follows is made up of a static theory of spatial equilibrium and its dynamic extension.

A Static Theory of Locational Choice

Both the static and dynamic models view the world as a system of small, open economies with high cross-border factor mobility. Optimizing individuals within such an integrated economy choose to live in the locality offering the highest utility; optimizing firms choose to locate in the locality offering the highest profits. The resulting shifts in local labor supply and labor demand effect a spatial equilibrium characterized by identical levels of utility and profits across localities. (Rosen, 1979; Roback, 1982; Gyourko and Tracy, 1989, 1991).

More formally, the equating of utility levels across localities can be captured by,

$$U\left(p, w; \text{quality of life}\right) = \left\{ \max_{c,n}\; u\left(c, n; \text{quality of life}\right) \text{s.t. } c + pn \leq w \right\} = \overline{U} \tag{1}$$

$$\begin{aligned} u_c\left(\cdot\right) &> 0;\; u_{cc}\left(\cdot\right) < 0 \\ u_n\left(\cdot\right) &> 0;\; u_{nn}\left(\cdot\right) < 0 \\ u_{\text{quality}}\left(\cdot\right) &> 0;\; u_{c,\text{quality}}\left(\cdot\right) = u_{n,\text{quality}}\left(\cdot\right) \end{aligned}$$

Here, $U(\cdot)$ represents an indirect utility function with the price of land services, p, and the wage level, w, as its arguments, and quality of life as a shift parameter. The underlying (direct) utility function, $u(\cdot)$, is increasing in consumption of a tradable good, c, and nontradable land services, n. With the tradable good as numeraire and normalizing the per capita quantity of inelastically supplied labor to one, individuals face the budget constraint that their tradable consumption plus their expenditure on land services not exceed the wage rate. The first two sets of derivative restrictions just establish that utility is strictly increasing in both the tradable and nontradable goods and that it is concave with respect to both of these. The third set of derivative restrictions establishes that a higher quality of life indeed raises individual utility but that it does not alter the relative utility trade-off between the tradable and nontradable goods.

The equal profit condition is captured by,

$$\Pi\left(w, \bar{r}; \text{productivity}\right) = \left\{ \max_{K,L}\; F\left(K, L; \text{productivity}\right) - wL - \left(1 + \bar{r}\right) K \right\} = \overline{\Pi} \tag{2}$$

$$F_K\left(\cdot\right) > 0;\; F_L\left(\cdot\right) > 0;\; F_{\text{productivity}}\left(\cdot\right) > 0$$

$\Pi\left(\cdot\right)$ represents a firm profit function which, given local wages and an exogenous interest rate, is the maximized value of firm production less its wage and interest bill. The derivative assumptions establish that the marginal products of capital and labor always remain positve and that higher productivity indeed raises output.

Normalizing the quantity of land to one, and assuming a flow of one unit of land services from each unit of land, a representative locality's resource constraint gives,

$$nL = 1 \tag{3}$$

Note that for the representative locality, L measures both population and population density. Generalizing to localities with different (fixed) quantities of land, L should be interpreted only as population density. For the analysis which follows, the key theoretical results are that

$$\frac{\mathrm{d}w}{\mathrm{d \ productivity}} > 0; \qquad \frac{\mathrm{d}p}{\mathrm{d \ productivity}} > 0; \qquad \frac{\mathrm{d}L}{\mathrm{d \ productivity}} > 0 \tag{4}$$

$$\frac{\mathrm{d}w}{\mathrm{d \ quality \ of \ life}} = 0; \qquad \frac{\mathrm{d}p}{\mathrm{d \ quality \ of \ life}} > 0; \qquad \frac{\mathrm{d}L}{\mathrm{d \ quality \ of \ life}} > 0 \tag{5}$$

Proofs of (4) and (5) are deferred to an appendix. The first two derivatives in each of these represent the compensating wage and land price differentials from variations in local productivity and quality of life. The basic intuition is captured in Figure 2. Panel A shows the rise in wages and land prices that accompany an increase in productivity. The horizontal loci represent the output-denominated wage at which firm profits equal some reservation level; an increase in productivity allows firms to pay a higher wage while staying equally profitable. The upward sloping locus represents combinations of output-denominated wages and land prices at which individual utility equals some reservation level. The increase in wages following the rise in productivity is partly offset by an increase in land prices. In a Hicksian sense, real wages remain unchanged. Panel B shows the constant output denominated wage and rise in land price that accompany an increase in quality of life; here, the real wage falls.[1]

The compensating wage and land price differentials shown in Figure 2 serve as the basis for using micro data to infer contributions from local attributes to productivity and quality of life. For example, Roback (1982) and Gyourko and Tracy (1989, 1991) examine the local attribute correlates of individual incomes and individual housing prices after controlling for individual-specific and house-specific characteristics (i.e. they examine the partial correlates

[1]The horizontal equal profit curves in Figure 2 are often shown as downward sloping (e.g. Roback, 1982). The difference in the present case is the absence of land from the production function, $F(\cdot)$. For production technologies in which land is an important input, the derivative of output denominated wages with respect to quality of life, $\frac{\mathrm{d}w}{\mathrm{d \ quality \ of \ life}}$, would be negative. In addition, the positive derivatives of population density with respect to each of productivity and quality of life in (4) and (5) may not follow.

of residuals from first stage regressions of income and house prices on individual and house characteristics). Focusing in particular on government's contribution to quality of life, Gyourko and Tracy (1991) find strong evidence that property tax rates and personal income tax rates detract from quality of life whereas state corporate income tax rates enhance quality of life (though they detract from productivity).

With aggregate data, the difficulty in controlling for inter- and intra-locality heterogeneity in the labor force and housing stock make wages and land prices more difficult to use. Population density offers a more natural metric for capturing underlying variations in productivity and quality of life. Consistent with the idea that people vote with their feet (Tiebout, 1956), areas of high population density represent areas with high levels of productivity and quality of life. Map 1, which shows 1990 population density relative to the U.S. average, represents the result of such a "vote". A shortcoming of population density is that it cannot distinguish between productivity and quality of life. In a certain sense, distinguishing between the two may not matter: both positively contribute to utility (quality of life directly, productivity indirectly via higher wages). But in terms of drawing lessons for countries, the failure to distinguish between productivity and quality of life is relevant. As quality of life is a normal good, the demand for which is increasing with income, individuals in developing countries are likely to place a lower relative value on quality-of-life attributes.

The major advantage of aggregate data is that it is available for a much wider cross-section of geographic units than is microdata. Census anonymity requirements allow the release of microdata only for counties with populations of at least 100,000. In 1990 only 450 (approximately) of the 3,000 plus U.S. counties and county-equivalents were above this threshold. The Roback (1982) and Gyourko and Tracy (1989, 1991) studies are based on cross-sections of 98, 125, and 130 U.S. cities, respectively.

Dynamics

The above theory lays the basis for looking at the correlations between population density, wage levels, housing prices and local attributes. The present paper focuses instead on the relationship between the growth rates of these and local attributes.

One motivation for the difference is the concern for the possible endogeneity of the local attributes. Only with purely exogenous local attributes can there be any sense in interpreting correlations with population density. Hence Rappaport and Sachs (1999) can argue that the strong positive correlation between population density and coastal proximity suggests a combined productivity and quality-of-life effect. But a finding, say, of a positive correlation between proximity to a major airport and population density may be due either to a combined productivity and quality-of-life effect or, more obviously, to the tendency to locate airports near major population centers.

Examining the correlates of the growth rates of population density, wages, and housing prices rather than the correlates of their levels at best only partly solves the problem of endogeneity; after all, endogeneity in levels implies endogeneity in growth rates. But to the extent that the local attributes being examined are relatively persistent across time, the imparting of causal interpretations to partial correlations may not be unwarranted.

A second reason for examining the correlates of growth is that the system made up of U.S. localities does not appear to be in a long run steady state. The persistence of population flows and employment growth already discussed along with the finding of convergence in per capita income documented in Barro and Sala-i-Martin (1991) and below suggest instead a system on an equilibrium transition path. If so, the identifying assumption of static equilibrium underlying compensating differential empirics may lead to incorrect estimates of the contributions of local attributes to local productivity and quality of life. Based on population flows and relative per capita incomes across U.S. states over the period 1971 to 1988, Greenwood et al. (1991), similarly conclude that the system made up of U.S. states is away from its long run steady-state thereby biasing estimates of compensating differentials.

Rappaport (1999) lays out a dynamic model of local growth which nests the static equilibrium above as its long run steady state. Adjustment costs proportional to the rates of capital investment and population flows allow for extended equilibrium transition paths to the long run steady state following local shocks. Along such equilibrium transition paths, higher utility and profit flows will be associated with living and owning capital in some localities rather than others. The model is basically a straightforward extension of the Ramsey-Cass-Koopmans neoclassical growth model. Along with the investment and labor mobility frictions, the only other key additional element is the augmenting of individual utility to include a local inelastically supplied nontradable good, land services, and a local public good, quality of life.

Figure 3 shows the dynamic response of population, land prices, and wages following three sorts of possible local shocks: to a locality's capital stock, to its level of productivity, and to its level of quality of life. Literally interpreted, capital shocks might correspond to wars and natural disasters. More metaphorically, they might correspond to changes in the terms of trade or in technology which disproportionately affect the installed capital base of some localities relative to others but which do not affect long run levels of productivity. Productivity shocks might correspond to changes in the terms of trade or in technology which disproportionately interact with the fixed attributes of some localities relative to others. The impact of NAFTA on U.S.–Mexico border localities serves as one such example; the effect of a technology-driven fall in the relative price of manufactured goods on localities which benefit from agglomeration economies in the production of tradable service goods (e.g. New York City and finance) serves as another example. Quality-of-life shocks might correspond to changes in technology or to changes in tastes: for instance the impact of air conditioning on previously uninhabitable desert localities or the growth of new leisure activities such as surfing and skiing.[2]

[2] The distinction between capital and productivity shocks just outlined may be somewhat arbitrary; evidence of dynamic localization spillovers in which past industrial concentration contributes to current productivity levels implies that a terms of trade shock, for instance, which does not interact with any *fixed* local attributes may nevertheless impact local productivity by devaluing local accumulated knowledge (Henderson, 1995). The key

The dynamic response to a negative capital shock is shown in Panel A. At time zero, local capital stock is shocked downward from its steady-state level. Both wages and land prices fall immediately; local population is instantaneously fixed but immediately begins flowing out of the locality in search of higher wages elsewhere. The low wages and high marginal product of capital following the shock cause capital to flow into the locality in turn causing wages to begin converging back towards their steady-state level. Eventually such rising wages along with lower land prices cause the outflow of population to reverse. The rising wages along with the eventual reversal of the population outflow cause land prices to begin to appreciate. Although it represents just a single calibration of the dynamic model, Panel A accurately captures the dynamic model's prediction that the bulk of local adjustment to capital shocks is via local wages. Put differently, local growth as measured by per capita income is much more sensitive to capital shocks than is local growth as measured by population or housing prices. Both the shock itself and the subsequent inflow of capital directly impact the marginal product of labor. In contrast, the response of land sales price follows only indirectly from a lower demand for land due to lower local wages and population levels. That land sales price reflects the present discounted value of current and future demands for land and given that such demand is only temporarily low further dampens the effect of capital shocks on land prices. Note that following capital shocks, population flows, per capita income growth, and land price growth will each show some negative serial correlation; per capita income growth and land price growth will tend to be positively correlated with each other but either positively or negatively correlated with population flows depending on time period.

The response to a positive productivity shock is sketched in Panel B. Both wages and land sales price jump concurrent with the shock: wages being directly tied to productivity and land prices reflecting the higher labor wealth of present residents plus the expected inflow of new residents. Population begins flowing in attracted by the higher wage level; capital also flows in attracted both to the newly higher level of productivity as well as to the inflow of population. The transition path sketched in the panel is based on a 20 percent increase in total factor productivity; for nontrivial productivity shocks across a wide range of calibrations (in particular, the levels of the capital and labor mobility frictions), the persistent flow of population over an extended time period is a qualitatively regular result.[3]

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distinguishing feature between shocks that induce time paths as depicted in panels A and B of Figure 3 is their permanence. Evidence that the temporal magnitude of dynamic localization economies is on the order of seven years (Henderson 1997) suggests that a shock to such a dynamic localization economy will induce a time path that in the short to medium run will look something like that associated with a productivity shock but that in the long run will look more like the time path associated with a capital shock.

[3] To be sure, the persistence can be made arbitrarily small by making the absolute levels of the two frictions go to zero. The absolute level of the capital friction can be calibrated based on the steady-state shadow value of capital. The particular calibration depicted in Figure 3 has a steady-state shadow value of capital equal to 1.35 and a labor friction which

For the calibration shown in Figure 3, the inflow of population is still at 24 percent of its initial rate after 30 years. Both wages and land sales prices also show persistence; but because the largest portion of their overall adjustment comes through their initial discrete jumps, such persistence is smaller than with population. The three time series show positive co-movement; the initial discrete jumps in wages and land sales price but not population imply that the degree of such co-movement will depend on time period.

The final panel of Figure 3 sketches the dynamic response to a positive quality-of-life shock. Following the shock, population begins to flow into the locality; as with productivity shocks, across a wide range of calibrations the population flow shows considerable persistence over an extended time period. Concurrent with the shock, land sales price jumps discretely, a reaction to the expected inflow of population, and then continues to rise. Wages, in contrast, remain instantaneously fixed as the quality-of-life shock does not affect the marginal product of labor; the inflow of population, however, causes the marginal product of labor to decrease so that following a quality-of-life shock, wages begin to fall. The population inflow also causes a rise in the marginal product of capital thereby inducing a capital inflow which dampens the fall in wages. The capital inflow eventually causes wages to begin to rise and eventually they return to their original pre-shock level, a result which parallels that $\frac{\mathrm{d}w}{\mathrm{d \ quality \ of \ life}} = 0$ in the static model above. In Panel C, the small magnitudes of the movement in wages make them barely discernible; such small magnitudes in nominal wage movements following quality-of-life shocks are a qualitatively regular result across a wide range of calibrations. Quality-of-life shocks induce positive co-movement between population flows and land sales price growth rates; as with capital and productivity shocks, the degree of co-movement will depend on time period. Wage growth may be either positively or negatively correlated with both population flows and housing price growth, again depending on time period.

Overall, the dynamic theory suggests that different types of underlying shocks will result in different time paths for local observables. Both population flows and the growth rate of land sales prices react in the "right" direction following productivity and quality-of-life shocks; population flows offer the additional attractive quality that they are not particularly sensitive to the choice of time period in identifying such shocks. Wage growth, in contrast, may signal either a positive productivity shock, a recent negative quality-of-life shock, or a less-recent positive quality-of-life shock; for both productivity and quality-of-life shocks, the behavior of the wage growth rate is sensitive to the time period under examination (i.e. relative to when the shock occurred). The nonmonotonic response to capital shocks by all three growth metrics somewhat complicates matters. Positive population inflows, for instance, may signal the response to a positive productivity or a positive quality-of-life shock, but also the eventual return inflow of population following a negative capital shock. The different types of shocks also effect different convergence behaviors for the three growth metrics. Capital shocks imply that both income and land prices will show strong conver-

allows a net migration response to income gaps which far exceeds empirical estimates in Barro and Sala-i-Martin (1991) and in Section 3 below.

gence (i.e. an inverse correlation between initial starting levels and subsequent growth). Productivity shocks imply that population, income, and land prices will show divergence; and quality-of-life shocks, that population and land prices will show divergence.

Together these predictions help to interpret the four sets of stylized empirical facts on economic growth across U.S. counties documented below. In particular, the predicted high persistence of net migration and that it reacts in the "right" direction to both productivity and quality-of-life shocks suggest it as the preferred metric for estimating the correlates of such shocks. Just as the cross-section of U.S. county population densities can be interpreted as representing individuals' "votes" with respect to underlying productivity and quality of life, the net migration flows shown in Map 2 can be interpreted as capturing the pattern of individuals' changes in votes.

3 The Local Growth Process

The following subsections document five facts on the local growth process. Population growth shows persistence across time but housing price growth and income growth do not. Housing prices show positive co-movement with both population and per capita income although the magnitudes vary considerably depending on time period. Population tends to flow to localities with higher housing values and higher per capita incomes; but again this varies considerably by time period. Per capita income and housing prices display absolute convergence for some time periods but not for others; population density displays absolute divergence for some time periods but not for others. And all three growth metrics display conditional convergence.

Persistence

The most salient local growth fact is the persistence of population flows. Blanchard and Katz (1992), Barro and Sala-i-Martin (1991), and Borts (1960) all document such persistence for various population measures and various time periods for the U.S. states. Glaeser, Scheinkman, and Shleifer (1995) document the persistence of U.S. city population growth over the period 1950 to 1990. And Figure 1 shows the persistence of net migration for U.S. counties between the periods 1950 to 1970 and 1970 to 1990. Regressing net migration from the latter period on the former yields a coefficient β equal to 0.48 with an R-squared value of 0.22. In general, the persistence of population flows at the county level is somewhat less than at the state level. The same regression for state-level net migration yields a β equal to 0.68 with an R-squared value of 0.50.

Table 1, Panel A shows the results from regressing ten-year growth rates of population density on their lagged values for each decade of the twentieth century for both counties and states. For counties, the persistence in population growth begins only around 1930; for states, it is present throughout the century but greatly increases starting around 1930. The persistence in net migration (which can be calculated starting only in 1950) is virtually identical to that for the population density growth rates. Reconciling the state and county results with each other suggests that certain broad trends may be better captured by state rather than county population flows. A structural break in persistence dated somewhere between 1930 and 1940 suggests that prior to this period, the system of localities made up of U.S. counties may have been near a long run spatial steady state. After the structural break, however, the high persistence in population flows is difficult to reconcile with being near such a steady state; rather, the persistence suggests that the system is on an equilibrium transition path to such a long run steady state.[4]

In contrast to population flows, housing median value growth and per capita income growth show zero or even negative persistence across decades (beginning in 1950, the first year for which data is available). For the 1960s and 1970s, regressing growth rates on their lagged value yields an R-squared value which never exceeds 0.01. For the 1980s, doing the same yields a negative, significant coefficient on lagged growth in both regressions (housing growth: $\beta = -0.31, R^2 = 0.06$; income growth: $\beta = -0.27, R^2 = 0.08$).

Local growth theory has no difficulty explaining zero or negative income growth persistence. Following productivity shocks, per capita income tends to adjust very quickly so that one would not expect to see much serial correlation. Both capital shocks and quality-of-life shocks induce a time path of per capita income characterized by negative serial correlation. As for housing price growth, like per capita income this can jump discretely following shocks so that we should expect to see less serial correlation than with population flows; and capital shocks would induce a time path characterized by negative serial correlation. However, the dynamic model suggests that the persistent population flows would induce a persistence in housing price growth as well. One possible explanation why we do not see this in the data is the model's assumption of a fixed supply of housing services; under more elastic supply conditions, housing prices would show less co-movement with population flows. A second possible explanation might lie in treating housing services as an asset subject to price speculation thereby weakening the link to underlying local growth fundamentals.

Together, these results suggest that to identify the correlates of long-term local economic growth, long-term measures of population flows serve as a preferred metric. The

[4] A possible reconciliation is that the system remained constantly in a steady-state that was itself changing across time — for instance, if rising incomes caused individuals to steadily increase their demand for quality of life relative to output consumption. The dynamic model outlined in the appendix shows that with a fixed supply of housing services and if the intertemporal elasticity of substitution for housing services and quality of life are equal, housing prices rise at a rate which exactly offsets any such migration. However, with a non-vertical housing supply curve or if individuals are more willing to substitute intertemporally land service consumption than quality-of-life consumption, such an income-related systematic migration would be expected. What is not clear is why a systematic rise in steady-state demand for quality of life would *begin* to occur in the 1930's rather than earlier. Rather, a structural break (or a series of structural breaks) related to the Great Depression, New Deal federal legislation, and World War II and its aftermath seems a more plausible explanation.

low observed persistence of housing value growth and per capita income growth imply that any correlations with these are likely to be extremely fragile to the time period under observation. Moreover, that housing value growth and per capita income growth show negative serial correlation across some time periods reinforces conventional wisdom that capital shocks (broadly defined) play an important role in local growth. As long as the period under observation is sufficiently long, average population flows should show no response to such capital shocks.

Local Growth Process Fact 1: *County population flows show high persistence across time; however, this persistence extends back only to around 1930. County per capita income growth rates and housing median value growth rates show low — sometimes negative — persistence across time.*

Co-Movement

The dynamic model implies various sorts of co-movements among the growth rates of population, housing prices, and wages.

For both capital and quality-of-life shocks, local growth theory predicts a positive correlation between population flows and housing price growth. For capital shocks, it predicts the same with the important exception of the time period immediately following (but not including) the capital shock, during which population and housing prices move in opposite directions. Table 1, Panel B shows the results from regressing the growth rate of median house value on the rate of net migration for each decade, 1950 through 1990. For all decades, the coefficient, β , is positive and significant at the 0.01 level. Except for the 1950 to 1960 decade, the regressions show the net migration rate to have reasonable explanatory power for the housing value growth rate; the R-squared value ranges from 0.19 to 0.25. But for 1950 to 1960, the R-squared value is only 0.03.

The predicted co-movement between housing value growth and per capita income growth and between per capita income growth and net migration should depend on the type of underlying shock. The dynamic model implies both relationships will show positive co-movement from productivity shocks but either positive or negative co-movement, depending on timing, from capital and quality-of-life shocks. Empirically, there is a moderate positive correlation between housing median value growth and per capita income growth. Regressing the former on the latter yields a β coefficient ranging from 0.32 for the 1960s to 1.20 for the 1980s with a corresponding R-squared value ranging from 0.08 to 0.34. The relationship between per capita income growth and net migration is less consistent. Regressing the former on the latter yields a β coefficient ranging from -0.12 for the 1960s to 0.37 for the 1980s; the corresponding R-squared value ranges from 0.01 to 0.20.

Local Growth Process Fact 2: *The growth rates of housing prices and population and, to a lesser extent, housing prices and per capita income show positive co-movement. These co-movements, along with that between the growth rates of per capita income and population,* *vary considerably depending on time period.*

Following shocks, regardless of type, land sales price jumps discretely but population adjusts only gradually. This suggests that population may flow towards higher land prices (because all else is *not* equal). Table 1, Panel C shows the results from regressing net migration for each of the decades 1950 through 1990 on the log of initial house median value. The coefficient on initial house median value is always positive and significant at the 0.01 level. Explanatory power ranges widely depending on decade. The 1950 to 1960 decade has an R-squared value of 0.27; but the 1970 to 1980 decade, an R-squared value of only 0.02.[5] The gradual response of population also suggests that population flows may show positive co-movement with lagged housing value growth. Regressing net migration rates for each of the decades 1960 through 1990 on the growth rate of median house value for the previous decade always yields a positive, statistically significant coefficient. Except for the 1970 to 1980 decade, which has an R-squared value of 0.14, explanatory power is quite low. (Note that the 1970 to 1980 decade is the one decade for which the regression of net migration on initial house value has very low explanatory power.)

The relationship between net migration and initial levels of per capita income is less strong. For the U.S. states, Barro and Sala-i-Martin (1991) report a positive but weak relationship between net migration and initial per capita income over the period 1900 to 1987; Blanchard and Katz (1992) find no relationship between employment growth and initial relative wages over the period 1950 to 1990. For U.S. counties, regressing net migration rates for each of the decades 1960 through 1990 on the log of initial per capita income yields positive, significant (at the 0.01 level) coefficients for 1960s and the 1980s. For the 1960s, the R-squared value is 0.13; but for the 1980s it is just 0.04. For the 1970 to 1980 decade, the coefficient on initial per capita income is positive but not significant; it remains insignificant even after including an expansive set of control variables (the 73 variables enumerated in Table 3). As in Barro and Sala-i-Martin (1991), including initial log population density and its square admits a positive coefficient on initial income significant at the 0.01 level for all decades. A lack of correlation between population flows and initial income is consistent with the response to a quality-of-life shock. A positive correlation between population flows and initial income is consistent with both productivity and capital shocks.

Local Growth Process Fact 3: *Population flows are positively correlated with initial housing values and initial incomes. The strengths of the relationships vary depending on time period.*

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[5] For both the 1960 to 1970 and 1980 to 1990 decades, the positive coefficient on initial house value is robust to the inclusion of lagged net migration; for the 1970 to 1980 decade, with lagged net migration included, the coefficient on initial house value is negative and significant at the 0.01 level.

Convergence

Local growth theory predicts an ambiguous relationship between initial levels of per capita income and subsequent per capita income growth. Convergence of per capita income characterizes the transitional dynamics following a capital shock as well as the latter stage dynamics following a quality-of-life shock. But divergence of per capita income characterizes the transitional dynamics following a productivity shock as well as the early stages following a quality-of-life shock. Hence it is not surprising that the empirical relationship between initial income and its subsequent growth varies considerably depending on time period and geographic locale. Barro and Sala-i-Martin (1991) document the convergence of per capita income across the U.S. states over the period 1880 to 1988 and Blanchard and Katz (1992) similarly show the convergence of manufacturing wages across states over the period 1950 to 1990. But Glaeser, Scheinkman, and Shleifer (1995) find no evidence of income convergence across 201 U.S. cities over the period 1960 to 1990.

Across U.S. counties, there is convergence of per capita income during some time periods but not during others. Table 1, Panel D shows the results from regressing per capita income growth rates for each of the decades 1959 through 1989 on the log of initial per capita income (and a constant). Convergence is very strong for the decade 1959 to 1969 ($\beta = -0.036, R^2 = 0.60$), moderately strong for the decade 1969 to 1979 ($\beta = -0.026, R^2 = 0.27$), and virtually absent for the decade 1979 to 1989 ($\beta = -0.003, R^2 = 0.00$). When broken out by decade, the Barro and Sala-i-Martin results turn out to closely match these. In particular, for the period 1980 to 1988 they get a positive but statistically insignificant β coefficient and an R-squared value of zero. Breaking the remaining 1880 to 1980 period into eight subperiods, the coefficient on initial income ranges from -0.043 for the period 1940 to 1950 to 0.015 for the period 1920 to 1930; the corresponding R-squared values range from a high of 0.72 for 1940 to 1950 to a low of 0.14 for 1920 to 1930.

The short run variability of per capita income growth along with the long run convergence documented by Barro and Sala-i-Martin together suggest that a large part of income movements across U.S. states and counties is likely to be accounted for by capital-type shocks and the subsequent movement back towards long run steady states. The Civil War, with its widespread destruction of Southern capital, would be a particularly severe such capital shock. More prosaic would be changes in the terms of trade and in technology which disproportionately affect the installed capital stock of some localities relative to others.

Population growth is characterized by weak divergence. For the decades 1950 to 1960, 1960 to 1970, and 1980 to 1990, regressing net migration on the log of initial population density yields a positive coefficient on initial population density significant at the 0.01 level ($\beta_{50} = 0.003, \beta_{60} = 0.003, \beta_{80} = 0.002$); the associated R-square values range from 0.07 to 0.11. For the decade 1970 to 1980, the coefficient on initial population density is not statistically different from zero.

Housing value growth displays strong convergence for the decade 1950 to 1960 ($\beta = -0.029, R^2 = 0.28$), moderate convergence for the decade 1970 to 1980 ($\beta = -0.015, R^2 = 0.10$), and virtually flat behavior for the decades 1960 to 1970 and 1980 to 1990.

Local Growth Process Fact 4: *Per capita income and housing prices display unconditional convergence for some periods but not for others; population densisty displays unconditional divergence for some periods but not for others.*

The convergence behavior discussed so far has been of an unconditional nature. Given that in a spatial equilibrium we expect to see different levels of income, population density, and housing prices across localities, more consistent convergence behavior should be expected after conditioning on various local attributes which together affect local productivity and local quality of life. Table 1, Panel E shows that this is indeed the case. Regressing growth rates on their initial values and the base set of 73 control variables enumerated in Table 3 always gives a negative, statistically significant (at the 0.01 level) coefficient on the initial values. After making an adjustment for the discretely measured growth rates on which they are based (i.e. average growth over 20 years rather than instantaneous growth), the coefficients in Table 1, Panel E correspond to rates of convergence of 0.3 percent, 4.6 percent, and 1.5 percent for population density, per capita income, and housing median value respectively. The convergence rate for per capita income is somewhat larger than the 2 to 3 percent that is usually found when looking across countries. That labor mobility should increase the speed of convergence is intuitive.[6]

Conditional convergence appears less sensitive to time period than unconditional convergence or the other co-movements discussed above. Similar coefficients on the initial levels associated with each of the three growth metric's obtain for both the 1970 to 1980 and 1980 to 1990 subperiods.[7]

Local Growth Process Fact 5: *Population density, per capita income, and housing prices all display conditional convergence.*

4 Empirical Specification

The remainder of this paper focuses on the local attribute correlates of local economic growth. Based on the comparative statics, (4) and (5), — which correspond to the "comparative steady-states" of the dynamic model — I assume an underlying data generating process for the locality-i level of each of population density, per capita income, and housing

[6] Note, however, that local growth theory is ambiguous in its prediction on the relationship between labor mobility and income convergence. While labor mobility always increases the speed of convergence immediately following capital shocks, across a wide range of calibrations its disincentive effect on gross capital formation causes the speed of convergence as measured by the average rate to close 95 percent of an initial gap in income to be inversely correlated with labor mobility. (See Rappaport, 1999)

[7] Prior to 1970, I have only a much sparser set of control variables.

sales price,[8]

$$y_{i,t} = \mathbf{x}'_{i,t}\boldsymbol{\beta}_t + \upsilon_{i,t} \tag{6}$$

First differencing gives

$$\mathrm{d}\,y_{i,t} = \mathrm{d}\mathbf{x}'_{i,t}\boldsymbol{\beta}_t + \mathbf{x}'_{i,t}\mathrm{d}\boldsymbol{\beta}_t + \varepsilon_{i,t} \tag{7}$$

Coefficients on independent variables from regressions of net migration, per capita income growth, and housing value growth will roughly correspond to $\mathrm{d}\boldsymbol{\beta}_t$ in (7) , that is to changes in the coefficient, β, from the level relationship, (6). The correspondence is only "rough", first, because many of the independent variables vary with time (i.e. $\mathrm{d}\mathbf{x}_{i,t}$ does not equal zero); a correlation between such changes in local attributes and their initial levels will bias estimates of $\mathrm{d}\boldsymbol{\beta}_t$. Hence a desirable trait for any included independent variables is that they show a high degree of persistence across time.

The assumption of time-varying coefficients along with persistent independent variables represents a reversal of the assumptions which more commonly identify empirical relationships. For instance, a "natural experiment" approach would assume $\mathrm{d}\boldsymbol{\beta}_t = 0$ and then look for exogenous changes, $\mathrm{d}\mathbf{x}_{i,t}$, to identify the level coefficients, $\boldsymbol{\beta}$. Because the level relationship, (6) , is what we ultimately care about (or so I would argue), regressions which measure $\mathrm{d}\boldsymbol{\beta}_t$ represent only a "second best" approach. The problem, of course, is a dearth of natural experiments.

The mechanism of conditional convergence offers one possible means of using growth regressions to recover the level relationship, (6). If we can linearize around a steady-state, y_t^*, such that $\frac{\mathrm{d}}{\mathrm{d}t}y = -\lambda \cdot (y_0 - y_t^*)$, where $\lambda > 0$, then by including the initial level, y_0, in a regression of $\frac{\mathrm{d}}{\mathrm{d}t}y$ on $\mathbf{x}$, the coefficients on the independent variables $\mathbf{x}$ correspond to $\lambda \cdot \beta$ which has the same sign as β. It turns out, however, that for systems with multiple state (i.e. "non-jumping") variables such as the local growth system sketched herein, it is *not* possible to express growth relationships in such a linear form. (The details are deferred to Appendix D.)

Empirically, including initial levels of population density, per capita income, and housing median value in regressions of the growth rate of these on the base set of control variables

[8] The simultaneous determination of population density, per capita income, and housing sales price suggest that jointly estimating the correlates of their growth rates, for instance with a Seemingly Unrelated Regression structure, will result in an increase in efficiency. Herein I estimate the equations separately adopting econometric methods which address the issue of spatial correlation of the error term as discussed below. There is no theoretical reason why such methods cannot be modified to allow for joint estimation. However in the present case, given the identical set of conditioning variables for each of the three equations, SUR will not increase effeciency.

enumerated in Table 3 almost never causes a change in sign of the coefficients on the control variables; nor does including both linear and quadratic initial value terms. In the absence of a strong reason to believe that the level coefficients, $\boldsymbol{\beta}_t$, and their changes, $\mathrm{d}\boldsymbol{\beta}_t$, should be of the same sign (or of the same magnitude as nearly all coefficients remain substantially unchanged), a tentative conclusion is that local conditional convergence growth regressions are unable to recover level relationships. As will be shown below, comparing coefficients on exogenous natural attributes from decade-by-decade level regressions of population density with corresponding coefficients from regressions of the growth rate of population density similarly highlights the systematic inability of local conditional convergence growth regressions to recover level relationships.[9]

Viewed as measuring $\mathrm{d}\boldsymbol{\beta}$, a first possible interpretation of the coefficients on local attributes from local growth regressions is that they capture changes in tastes and technology that affect the contribution to local productivity and local quality of life of such attributes (or their close correlates). Using the language of Easterly, Kremer, Pritchett, and Summers (1993), the coefficients pick up the correlates of "good luck". A second possible interpretation is that the coefficients pick up a more direct contribution of the local attributes (or their close correlates) to changes in local productivity or quality of life. Analogous to phenomena explored in the endogenous growth literature,[10] a local attribute which contributed to local productivity or to local quality of life via some increasing returns to scale production technology would imply a continually increasing level coefficient, β, in (6) and a positive change coefficient, $\mathrm{d}\beta$, in (7).

Identifying whether the local attributes included in growth regressions are themselves the source of statistically significant correlations or instead are proxying for local attributes not included in the growth regression is problematic. If a local attribute instrument could be found which was itself exogenously determined and which was correlated with the local attribute in question but not otherwise correlated with local growth, two-stage least squares would allow us to identify a causal link. While numerous sources of exogenous local variation exist which predict other local attributes of interest, the difficulty lies in finding one which does not itself directly affect local productivity and local quality of life. Consider rivers, used by Hoxby (1994) to identify local school district boundaries. Rivers may serve as sources of hydroelectric power and of cooling; they require the construction of bridges; when navigable, they serve as a low-cost means for transportation. Rivers also allow for fishing, boating, and other recreational activities; more recently, they have become popular sites on which to float gambling casinos. Hence, an assumption that rivers did not directly contribute to local productivity or to local quality of life would surely be false. Invalidating nearly any other candidate instrument are similarly plausible linkages to local productivity

[9] Note that the inability to recover level relationships applies to persistent local attributes only; as captured by the first term in (7), exogenous changes in local attributes serve as an excellent means for recovering level relationships.

[10] See Henderson (1988) and Krugman (1991) for specific models in which increasing returns to scale leads to geographic concentration.

and to local quality of life.

A stated goal of the present paper is to increase our understanding of the linkages between government and growth. Rather than instrumenting, the key to my empirical strategy is to extensively control for local attributes which are likely to be correlated with local government behavior and which may themselves contribute to local productivity and local quality of life. Table 3 enumerates a set of 73 variables which will seve as a "base" specification for the local growth regressions on government below. As it is meant to absorb spurious sources of correlation, the base specification errs towards including more rather than less variables; so for instance, poverty variables include the linear and quadratic rates of individual poverty, the rate of children's poverty, and the rate of family poverty.

Still another interpretation of correlations between local growth measures and local attributes is that the causality runs from growth to the local attribute. Again, the inability to instrument makes ruling out such reverse causality difficult. We can, however, test for a specific version of reverse causality by regressing *changes* in local attributes on local growth (i.e. regressing dx on dy); the finding of a significant coefficient of the same sign as the coefficient on the level of the local attribute in a growth regression would suggest that a reverse causal interpretation may be warranted. While failure to find such coefficient does not rule out the possibility of reverse causality, it would seem to make such an interpretation less likely.

Given the spatial nature of counties as units of observation, an independence assumption on the error term would be difficult to defend. Instead, following Conley (1998), I assume a spatial structure to the underlying error covariance matrix. For county pairs the Euclidean distance between which is beyond a certain cutoff $\overline{d}$, I assume that the covariance between error terms is zero. Within this distance, I impose a declining weighting function, g(distance), on the covariance between errors. In essence, this amounts to allowing for a spatially-based random effect.

$$E(\varepsilon_i) = 0 \tag{8}$$

$$E(\varepsilon_i \varepsilon_j) = g(\text{distance}_{ij})\,\rho_{ij} \tag{9}$$

$$\hat{\rho}_{ij} = e_i e_j \tag{10}$$

$$\begin{aligned} g(\text{distance}_{ij}) &= 1 \quad \text{for distance}_{ij} = 0 \\ g(\text{distance}_{ij}) &= 0 \quad \text{for distance}_{ij} > \overline{d} \\ g'(\text{distance}_{ij}) &\leq 0 \quad \text{for distance}_{ij} \leq \overline{d} \end{aligned} \tag{11}$$

Interpreting distance$_{ij} = 0$ as equivalent to $i = j$, the error specification in (8) through (11) reduces to the Huber White heteroskedastic consistent estimator for standard errors when $\overline{d}$ equals zero; it reduces to a group-based random effect estimator for standard errors with a non-Euclidean distance measure and a one-zero step specification for $g(\cdot)$.[11] For all regressions reported below, I use a quadratic weighting and impose an independence assumption on the error term for counties with centers more than 150 kilometers apart (i.e. $g\,(\text{distance}_{ij}) = 1 - (\text{distance}_{ij}/150)^2$ for $\text{distance}_{ij} \leq 150$, 0 otherwise). All results are robust to alternative weighting schemes.

5 Coastal Proximity, the Weather, and Local Growth

Throughout the 20th-century, population flows display strong correlations with geographical attributes such as coastal proximity and weather. From a locational theory perspective, such correlations suggest changing contributions from geographical attributes to local productivity and local quality of life. Population flows will then pick up changes in the level coefficient, β, linking geography and population density as in (7) above. What is ideal about geographical attributes is that the level relationship, (6), can also be estimated directly.

Focusing first on coastal proximity, Figure 4, Panel A shows the relative population density in counties whose centers are within 80 kilometers of an ocean or Great Lake coast or within 40 kilometers of a navigable river.[12] In 1900, the relative population density of ocean coast and Great Lake coast counties were nearly identical at 2.5 and 2.6 times the population density of the continental United States taken as a whole.[13] The ocean county relative population density steadily rises throughout the century reaching a level 4.2 times the continental U.S. population density in 1990. The Great Lake county relative population density rises to 3.5 in 1930, remains approximately constant at this level through 1970, and then sharply declines to 2.9 in 1990. Relative population density for the navigable river counties steadily declines from 2.1 in 1900 to 1.5 in 1990.

Geography and Local Growth Fact 1: *from 1900 to 1990, population density has been steadily increasing near ocean coasts; it has been increasing, constant, and then decreasing near the Great Lakes; and it has been steadily decreasing near navigable rivers.*

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[11] Equivalent to the "cluster" option in Stata.

[12] "Navigability" of rivers is in 1968 and is based on a 1968 academic study of inland waterway commercial traffic (Southern Illinois University at Carbondale, 1968). The need to date navigability as well as its method of classification (rivers which were physically navigable but on which there was no commercial traffic in 1968 are excluded) together suggest an upward bias in the partial correlation between population density and navigable river proximity, particularly circa 1968.

[13] County coverage for the early 20th-century is incomplete compared to 1990: in 1990 there are 3,070 continental U.S. counties based on the adjustments discussed in the data appendix; population data covers 2,799 counties in 1900, 2,923 in 1910, 3,033 in 1920, 3,064 in 1930-40, 3,065 in 1950-60, 3,069 in 1970, and the full 3,070 in 1980. The relative population density figures are based the land area of counties for which contemporary population data exist.

A somewhat different time trend emerges from the coefficients of a level regression of log(1+population density) on dummies for each of the ocean, Great Lake, and navigable river coastal proximity measures along with variables controlling for weather and topography as enumerated in Table 3. As shown in Panel B of Figure 4, the coefficients on all three coastal categories steadily rise throughout the century. The result suggests that the contribution from coastal proximity to either productivity or quality of life or both has been steadily increasing throughout the 20th-century. By including coastal proximity measures which *a priori* should absorb any quality-of-life effects (for instance, shoreline per unit area), Rappaport and Sachs (1999) argue that the positive correlation between population density and coastal proximity is primarily due to a productivity effect.

One alternative interpretation of increasing coastal population densities is that these pickup the trend throughout the 20th-century towards larger, more concentrated urban areas (Black and Henderson, 1997). The regressions corresponding to the coefficients graphed in Figure 4, Panel B include a constant term which steadily increases throughout the century reflecting the general rise in population density; but given the large number of counties which remain sparsely populated in 1990, the coastal proximity dummies may better proxy for increases in population density due to increasing returns to scale spillovers (Henderson, 1988, 1995; Glaeser, Kallal, Scheinkman, and Shleifer, 1992). One way to check for this is to include in growth regressions a dummy equal to one for any county with initial population density above some cutoff. Including such a variable (using mean county population density in 1900 as the cutoff), the coefficients on the coastal proximity variables remain qualitatively unchanged; a positive significant coefficient on the population density dummy, however, is consistent with the hypothesis of increasing returns to scale. Similar results obtain from using higher cutoffs for the initial population density.

A second alternative interpretation of the changing coastal densities is that they capture shifts in U.S. industrial composition from agriculture to manufacturing and from manufacturing to services. Given the interior location of vast tracts of productive U.S. farmland, and the Great Lake proximate location of the U.S. "manufacturing belt", industrial shifts are likely to account for at least a portion of the trends. Even so, it does not necessarily follow that such shifts will favor areas proximate to ocean coasts. An increasing returns to scale technology in manufacturing and services along with their initial location near coasts would imply the increasing concentration of population near the coasts; so too would a higher advantage to manufacturing and services *relative* to agriculture from lower transportation costs. Regressing net migration over the period 1970 to 1990 on the coastal proximity dummies along with nine 1970 industry share and eleven 1970 occupation share variables admits a positive, significant coefficient on the ocean coast dummy and negative, significant coefficients on the Great Lake and navigable river dummies. (The same pattern is found for the growth rates of per capita income and housing median price.) So at least over this latter period, the flow of population towards the ocean coasts seems to be capturing more than a shift in industrial composition.

The failure of conditional convergence growth specifications to recover level relationships can be seen by comparing coefficients from level and growth regressions of population density on coastal proximity. For each of the decades 1900 through 1990, regressing the growth rate of population density on its initial value along with the three coastal proximity dummies and the weather and topography conditioning variables, in no case does the coefficient on any of the coastal proximity dummies correspond to its value in the associated level regression. The same result obtains from including both linear and quadratic initial population density. In contrast, it is an accounting identity that for a time invariant set of conditioning variables, growth regressions (excluding any initial-level conditioning variables) will capture changes in level coefficients (i.e. (7) with $d\mathbf{x}_{i,t} = 0$; the actual "accounting identity" property follows from the linearity of ordinary least squares). Panel C of Figure 4 illustrates that the growth coefficient on the ocean coast proximity dummy just measures the time derivative of the corresponding level coefficient shown in Panel B. The growth coefficient value of zero in 1980, for instance, captures that the level coefficient remains constant from 1970 to 1980.

Geography and Local Growth Fact 2: *From 1900 to 1990, after controlling for the weather, increases in population density are positively correlated with proximity to each of ocean coasts, the Great Lakes, and navigable rivers.*

Long-term population flows also show strong correlations with measures of weather. Using mean temperature and precipitation variables derived by Mendelsohn, Nordhaus, and Shaw (1994) based on observations from 5,511 meteorological stations over the period 1951 through 1980, Figure 5 documents the flow of population across the century towards more moderate July and January temperatures and drier July precipitations. The movement towards more moderate temperatures is consistent with an increase in the marginal utility of quality of life relative to output consumption (i.e. due to the effect of rising productivity on output consumption).

The movement towards localities with lower levels of July precipitation in part probably reflects an increasing diversion of water, particularly in the western states, such that sufficient *local* sources of water no longer are a prerequisite for local development. The growth in the arid Southwest of cities such as Los Angeles, Phoenix, and Las Vegas illustrates the point. Their growth also illustrates the possible productivity and quality-of-life shock associated with the invention of air conditioning (circa 1900) and its later widespread diffusion (beginning around 1930).

Geography and Local Growth Fact 3: *From 1900 to 1990, after controlling for coastal proximity, increases in population density are positively correlated with warmer January and cooler July temperatures and with lower levels of July precipitation.*

A more detailed understanding of the underlying processes driving the long-term population flows just discussed is a priority for future research.

6 Urbanization, Skills, Poverty, Crime, and Local Growth

This and the following section focus on the correlates of local growth as measured by the annual average rates of net migration, per capita income growth, and housing median value growth over the period 1970 to 1990. Regressions using each of these three growth metrics as dependent variables often yield same-signed coefficients on the various included local attributes. This by no means necessarily follows from co-linearity of the growth metrics: the highest pair-wise correlation between them is just 0.55 (Supplemental Table 1).

Urbanization/Suburbanization

Over the period 1970 to 1990, local growth in the United States has been highest in suburban counties of metropolitan areas. As shown in the top rows of Table 4, net migration, per capita income growth, and housing median value growth are all positively correlated with a one-zero indicator of counties which are part of a metropolitan area in 1970; the latter two of these correlations are both significant at the 0.01 level while the partial correlation with net migration is significant at the 0.10 level. Net migration, per capita income growth, and housing median value growth are all negatively correlated with a one-zero indicator of the subset of these metropolitan area counties which contain a center city; here, only the first of these correlations is statistically significant (at the 0.01 level). Together the coefficients on the metropolitan area and center city dummies account for variations on the order of ten to twenty percent of the standard deviations of the three growth measures.

Focusing first on net migration, not conditioning on any additional variables yields statistically-significant coefficients on the metropolitan and suburban dummies approximately four times and two times their respective values when the full base specification of controls enumerated in Table 3 is included. (See also Supplemental Table 2.) Hence the flow of population to metropolitan suburban areas is stronger than is suggested by the partial correlations reported in Table 4. Also the coefficient on the center city dummy in the unconditional regression is smaller in absolute value than the coefficient on the metropolitan area dummy suggesting that the partial correlations in Table 4 may overstate the unattractiveness of metropolitan center city counties *relative* to rural counties.

Focusing on per capita income growth and housing median value growth, the negative coefficients on the metropolitan center city dummy are smaller in absolute value than the positive coefficients on the metropolitan area dummy; moreover they are not statistically different from zero. So it is *not* that incomes and housing values are growing slower in metropolitan center cities than elsewhere; rather they are growing faster than non-metropolitan areas though perhaps slower than in metropolitan suburban counties. The main effect from not including additional conditioning variables is to cause a large increase in the (absolute) value of the negative coefficient on the center city dummy in the income growth regression. This becomes significant at the 0.01 level and exceeds in absolute value the coefficient on the metropolitan area dummy. So not controlling for other local attributes, per capita income is growing slower in metropolitan center cities than elsewhere. The coefficient on the center city dummy in the housing value regression, however, is less than half the absolute value of the coefficient on the metropolitan area dummy and is not statistically significant.

Urbanization/Suburbanization and Local Growth Fact: *From 1970 to 1990, county economic growth is positively correlated with being located within a metropolitan area and especially with being located within a suburban metropolitan area.*

Skills

The regressions in Table 4 reveal a strong positive correlation between growth and high initial levels of human capital as measured by the percentage of adults with four-year college degrees or higher. A one standard deviation increase in the percentage of adults with college degrees (holding constant the percentage of adults with high school degrees or higher) increases the rate of net migration by 30 percent of its standard deviation, per capita income growth by 28 percent of its standard deviation, and housing median value growth by 20 percent of it standard deviation.[14] Increasing a county's percentage of adults with college degrees by five percent (equivalent to 1.3 standard deviations) would raise its net migration rate by one-half a percentage point, and both its per capita income growth rate and housing median value growth rate by more than one-quarter a percentage point. All three coefficients are significant at the 0.01 level.

In contrast, medium initial levels of human capital as measured by the percentage of adults with high school degrees or higher is negatively correlated with growth. All three coefficients are again significant at the 0.01 level; their magnitudes range from one-quarter (net migration and income growth) to one-half (housing median value growth) that of the coefficient on college education.

The finding of a positive effect on high skill levels but a negative effect on medium skill levels is extremely robust to various sets of conditioning variables and holds also unconditionally (i.e. not including any additional conditioning variables). Glaeser, Scheinkman, and Shleifer (1995), in contrast, comparing growth rates across 203 cities over the period 1960-1990 find a positive effect from medium skill levels but a negative effect from high skill levels. Reconciling the two results lies either in the different geographical unit of observation (cities versus counties) or, more likely, in the different time periods (1960-1990 versus 1970-1990). In particular it may be that going into the 1960s there had been an increase in the return to high school (but not college) education and that some time during the 1970s there was an increase in the return to college education and a fall in the return to high school education. Such an interpretation is consistent with the finding in Henderson, Kuncoro, and Turner (1995) of positive coefficients on college education but negative coefficients on high school education in probit regressions of the presence in 1987 of three high technology industries across 224 U.S. cities.

The percent of the population with four-year college degrees and the percent of the

[14]The percentage of adults with high school degrees or higher includes those adults with college degrees or higher; hence the coefficient on the percentage of adults with college degrees measures the *marginal* increase in growth associated with high relative to medium levels of initial human capital.

population with high school degrees but not four-year college degrees is highly persistent; the correlations between 1970 and 1990 are 0.88 and 0.81, respectively (Supplemental Table 6, Panels A and B). For both of these, regressing their changes on contemporaneous net migration for the decades 1970 to 1980 and 1980 to 1990 yields a statistically significant coefficient on net migration the same sign as the coefficient on their starting levels from the net migration regression (the one exception is the change in percent of adults with high school degrees on net migration from 1980 to 1990 which has an oppositely-signed coefficient statistically not significantly different from zero). Such results are consistent with positive spillovers among individuals with high levels of human capital (Rauch, 1993) and also with findings that educational attainment is positively correlated with an individual's inclination to relocate (Bowles, 1970; Schwartz, 1973).

Education and Local Growth Fact: *From 1970 to 1990, county economic growth is strongly positively correlated with high initial levels of human capital as measured by the percentage of adults who are college graduates; it is negatively correlated with medium initial levels of human capital as measured by the percentage of adults who are high school but not college graduates.*

Local economic growth shows a strong negative partial correlation with starting levels of unemployment. As shown by the next two rows of Table 4, this negative relationship is especially strong at starting unemployment rates less than 7.5 percent. Here, a one standard deviation increase in the rate of unemployment (that is, a 2.3 percentage point increase in the rate of unemployment while staying below an unemployment rate of 7.5 percent) is associated with decreases in net migration, per capita income growth, and housing median value growth equivalent to 17 percent, 20 percent, and 15 percent of their respective standard deviations. The inclusion of a spline variable measuring unemployment rates for counties with unemployment rates greater than or equal to 7.5 percent (the variable equals zero for counties with lower unemployment rates) indicates that the negative relationship is weaker at higher rates of unemployment. Starting from rates of unemployment above 7.5 percent, a one standard deviation increase in the rate of unemployment results in decreases in net migration, per capita income growth, and housing median value growth equivalent to 6 percent, 15 percent, and 7 percent of their respective standard deviations.

Unemployment rates show moderate persistence across time; the raw correlation between 1970 and 1990 of the percent of the workforce unemployed during the week individuals filled out census questionnaires is 0.64.[15] Regressing the *change* in unemployment on con-

[15]The persistence of county unemployment is somewhat higher than the persistence of state unemployment reported in Blanchard and Katz (1991). Their comparable figure over the same time period is 0.48 and they find an even lower correlation over the time period 1975 to 1985. One possible reconciliation is the different source of unemployment data. The Blanchard and Katz data is based on the Bureau of Labor Statistics Current Population Survey; in addition, data for 40 states and the District of Columbia are based on estimates for the period 1970 to 1975.

temporaneous net migration for each of the decades 1970 to 1980 and 1980 to 1990 yields a significant negative coefficient on net migration for the latter decade (Supplemental Table 6, Panel C). More likely than reverse causality is that low initial unemployment rates proxy for unobserved county attributes which are causing both growth and low (possibly declining) unemployment. Specifically, the negative correlation between growth and initial unemployment may be driven by shocks correlated with the local industry mix (analogous to capital or productivity shocks in the dynamic growth model). The initial industry and occupation shares included in the regressions herein may not be fine enough to control for such capital shocks. Glaeser, Scheinkman, and Shleifer (1995), who also find a negative (linear) correlation between city growth and initial unemployment, suggest that unemployment rates proxy for omitted human capital variables.

Unemployment and Local Growth Fact: *From 1970 to 1990, county economic growth is negatively correlated with unemployment, especially at low levels.*

Poverty

Table 4 shows there to be a strong negative quadratic relationship between poverty and economic growth as measured by net migration; excluding the quadratic poverty term yields a statistically insignificant coefficient on linear poverty. Including quadratic poverty, on the other hand, yields a negative quadratic coefficient significant at the 0.01 level. Quadratic poverty has had its mean subtracted prior to squaring so that the linear coefficient measures the marginal effect of increases in the rate of poverty from its mean level of 21 percent. The linear and quadratic coefficients together imply that net migration will be highest at a poverty rate of 27 percent. At lower levels, poverty is positively correlated with the rate of net migration; at higher levels, poverty is negatively correlated with the rate of net migration. But as the linear coefficient is not statistically significant, we cannot reject that poverty is negatively correlated with net migration regardless of level.

A nonlinear relationship between poverty and net migration actually has some intuitive appeal. Increases in poverty from low levels represent an increase in opportunity for local growth. That is that the lower wages and lower housing prices correlated with poverty serve to attract individuals and firms to a locality. A second possible interpretation suggested by the dynamic model is that poverty is proxying for low-wage levels and that population has been flowing from high productivity to high quality-of-life localities. Regressing net migration on linear and quadratic (log) initial income plus the base specification described in Table 3 is consistent with either interpretation. The linear coefficient is negative but statistically insignificant; the quadratic coefficient is negative and significant at the 0.01 level. Including only linear initial income yields a statistically insignificant coefficient. So in fact there is a negative, non-linear partial correlation between net migration and initial income. Including linear and quadratic initial income in the net migration regression reported in Table 4, the coefficient on quadratic poverty is significant only at the 0.10 level; with just linear initial income, it remains significant at the 0.01 level.

The partial relationship between net migration and initial housing prices also displays some nonlinearity. But in this case the positive correlation between net migration and initial housing price dominates; the level of median house price above which the coefficients imply a negative correlation with net migration is \$643,000, which is higher than the sample maximum house median value of \$537,000. With linear and quadratic housing prices included, the coefficient on quadratic poverty remains negative and significant at the 0.01 level while the coefficient on linear poverty remains positive and becomes significant at the 0.01 level. So, controlling for housing prices, poverty at low levels is positively correlated with net migration. This latter relationship casts some doubt on the interpretation that increases in poverty represent an increase in opportunity for growth as one would expect housing prices to serve as a main mediating mechanism.

Regardless of the exact conditioning set of variables used (including an empty set), the data strongly support a negative quadratic relationship between net migration and poverty. Such a nonlinear relationship is consistent with theoretical models which imply threshold effects such as in Brock and Durlauf (1995).

The cross-sectional distribution of poverty across counties shows high persistence; the correlation between 1970 and 1990 is 0.84. Regressing the change in poverty on net migration for each of the decades 1970 to 1980 and 1980 to 1990 yields a negative coefficient on net migration significant at the 0.01 level (Supplemental Table 6, Panel D). While a reverse causal interpretation does not seem to make sense, the result does suggest that non-poor individuals may be more likely to relocate than poor individuals; to the extent that the negative partial correlation from the quadratic relationship between net migration and poverty dominates the positive partial correlation, a flow of non-poor individuals away from concentrations of poverty will induce a negative correlation between the change in local poverty and net migration.

For both per capita income growth and housing median value growth, the partial correlation with poverty is linear positive with coefficients that are significant at the 0.01 level. These positive partial correlations are consistent with the idea that poverty, at least in limited concentrations, represents an opportunity for local growth. Also possible is that poverty is picking up conditional convergence. Including the log of initial income in the per capita income regression (and excluding quadratic poverty) causes the coefficient on linear poverty to become negative (significant at the 0.01 level). In contrast, including the log of initial median house value in the median house value growth regression, the coefficient on poverty remains positive and significant at the 0.01 level.

Poverty and Local Growth Fact: *From 1970 to 1990, at low levels, poverty is positively correlated with net migration; at high levels, poverty is negatively correlated with net migration. Poverty, regardless of level, is positively correlated with per capita income growth and housing median value growth.*

Crime

Unsurprisingly, violent crime is negatively correlated with local growth. The Federal Bureau of Investigation compiles a crime index of seven serious offenses: murder and nonnegligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, and motor vehicle theft. The first four of these are considered violent crimes; the latter three, property crimes. The violent crime rate used herein actually consists just of robbery and aggravated assault and is for the year 1975. As shown in Table 4, the coefficient on the violent crime rate in each of the three growth regressions is negative and significant at the 0.01 level (for net migration and income growth) or the 0.05 level (for housing median house value growth). A one standard deviation increase in the rate of violent crime is associated with declines in net migration, per capita income growth, and housing median value growth equivalent to 7.5 percent, 6.5 percent, and 4.5 percent of their respective standard deviations.

Controlling for the rate of violent crime, the correlation between the rate of property crime and local growth is either not statistically different from zero (per capita income growth) or positive (net migration and housing value growth). For these latter positive correlations, it would seem likely that they are spurious or that any causality runs from growth to property crime.

Crime and Local Growth Fact: *From 1970 to 1990, county economic growth is negatively correlated with violent crime.*

Other Non-Government Correlates of Local Growth

A number of other local attributes show strong correlations with county economic growth. This is especially true of the nine industry and eleven occupation share variables included in the base specification. A detailed discussion of these is beyond the scope of this paper. Worth noting, however, are findings of large, statistically significant positive coefficients on, for instance, the share of initial employment in the finance, insurance, and real estate industries, the share of initial employment in the precision production, craft, and repair occupations, and the share of initial employment in technical and related support occupations. (See Supplemental Table 2.) Such findings are consistent with dynamic scale economies as discussed in Glaeser, Kallal, Scheinkman, and Shleifer (1992), Henderson (1995), and Henderson, Kuncoro, and Turner (1995).

7 Local Government Fiscal Policy and Growth

Compared with either cross-country studies or previous local studies, the present paper finds much stronger linkages between government fiscal policy and economic growth. Based on regressions of net migration, per capita income growth, and housing median value growth on measures of local government fiscal policy in 1972, Table 5 documents four main findings: economic growth is negatively correlated with government financial size; controlling for size, it is positively correlated with spending on elementary and secondary education and negatively correlated with personal income taxes and with selective sales taxes. I examine each result in turn.

Local Government Size

Over the period 1970 to 1990, there is a strong negative correlation between local government financial size and economic growth. This negative correlation is robust across a number of different specifications in terms of the conditioning set of variables and across a number of various definitions of government size.

The first row of Table 5 shows the negative correlation between net migration, per capita income growth, and housing median value growth and government size as measured by per capita general direct expenditures by all local governments in a county (including the county government if any). The negative coefficient on government size is significant at the 0.01 level in the net migration regression and at the 0.05 level in the income growth regression. Its magnitude implies that a one standard deviation increase in government size is associated with declines equivalent to 7.4 percent and 7.2 percent of the standard deviations of net migration and per capita income growth, respectively. A more intuitive sense of magnitude comes from comparing the lower growth associated with increases in government size with the lower growth associated with center city locations. A 10 percent increase in general direct expenditures is associated with a lower rate of net migration equivalent to 12 percent of such a "center city effect".[16]

Not controlling for expenditure and tax composition (as in Table 5) substantially increases the negative correlation between government size and growth. The negative coefficient in the housing median value growth regression becomes significant at the 0.05 level. An increase of one standard deviation in government size results in decreases in growth equivalent to 12.2 percent, 11.2 percent, and 6.0 percent of the respective standard deviations of net migration, per capita income growth, and housing median value growth. More intuitively, a 10 percent increase in general direct expenditures is associated with a lower rate of net migration equivalent to 17 percent of the decrease in net migration associated with center city locations.

The negative correlation between local growth and government financial size is extremely robust to variations in the set of conditioning variables and to alternative measures of government financial size. "General direct expenditures" includes all local government expenditures *other than* intergovernmental transfers, public utility expenditures (e.g. water, gas, electric, and transit), and insurance trust expenditures (e.g. employee retirement, unemployment compensation, and workers compensation). Alternative definitions which yield qualitatively similar results (i.e. the strong negative correlation with local growth measures) include using total direct expenditures (which exclude only the intergovernmental

[16]Here and below, the "center city effect" is measured by the negative coefficient on the center city dummy from the regression yielding the coefficient whose magnitude is being compared.

transfers); total taxes; total revenue raised from taxes, charges, and miscellaneous sources (but not including intergovernmental revenue); and total revenue. The negative correlation also holds with government size measured as a percentage of local income rather than on a per capita basis.[17] (See Table 6.)

A first interpretation of the negative correlation between local growth and government size is that the causality runs from growth to the size of government. For instance, if total government expenditures remained constant regardless of population, increases in population would cause per capita expenditures to fall; persistent population flows would then induce a negative correlation between initial government size and net migration. The hypothesis that net migration is negatively correlated with changes in government size can be tested directly. Regressing the change in general direct government expenditures from 1972 to 1977 on the net migration rate from 1970 to 1980 yields a statistically insignificant coefficient; regressing the change in general direct government expenditures from 1982 to 1987 on the net migration rate from 1980 to 1990 yields a positive coefficient significant at the 0.01 level (Supplemental Table 7, Panel A).

So rather than causing government size to fall, net migration may actually cause it to increase. This makes sense, for instance, if localities with large population inflows incur large public capital outlays in addition to their ongoing current expenditures. Preliminary analysis is consistent with such an explanation. The Census of Governments from which the underlying data is drawn classifies all expenditures into five "types": current, construction, equipment, land, and interest payments. Regressing the change in the percent of general direct expenditures classified as current for the same years as above yields a negative coefficient significant at the 0.01 level for both periods; explanatory power is relatively high for such a sparse specification with an R-squared value of 0.014 and 0.027 for the 1970 to 1980 and the 1980 to 1990 periods, respectively (Supplemental Table 7, Panel B).

The presence of what seems to be a reverse causal link from growth to the percent of expenditures classified as current suggests that including the breakdown of general direct expenditures by type in the regression of local growth on government size should absorb any reverse linkages. Doing so increases the magnitude of the negative correlation between growth and government size (consistent with a *positive* reverse linkage) (Table 6, fourth row).

More salient than reverse causality is the possibility that the negative correlation is spurious in origin. The base specification set of 73 control variables enumerated in Table 3 along with dummies for each of the U.S. states eliminates many of the most obvious spurious correlation interpretations. The conditioning variables include proxies for many characteristics that might be expected to affect government size including metropolitan and center city location, unemployment, poverty, immigrants, crime, and age distribution. A possibility not covered by the base specification is that high levels of government spending reflect a public sector response to natural disasters such as floods, hurricanes, earthquakes,

[17] With government size measured as a percentage of local income, the negative correlation is not statistically significant for per capita income growth.

etc. Presumably if this were the case, local governments would be the recipients of high levels of state and federal financial assistance; the negative correlation of local growth with government size is robust to the inclusion of such intergovernmental revenue. (Table 6, seventh row.)

Lacking an instrument to identify the linkage from government size to local growth, that government size is proxying for some other local attribute which is the actual mechanism dampening growth remains a possible interpretation for the negative correlation.

Another interpretation is that the marginal benefits and marginal costs of local government have shifted. If the services provided by local governments have come to be valued less than they were previously by local residents (for instance due to competition from the private sector) or if local governments have become less proficient in the production of the services they provide (for instance, if they were less able to attract talented managers), then it would be as if a marginal benefit curve from government services had shifted down and a marginal cost curve for providing such services had shifted up. Figure 6 sketches such a situation. The level of government service provision across localities is assumed to be normally distributed around a mean corresponding to the optimal level prior to the shifts in marginal benefits and marginal costs, g_0^* . If government service provision is slow to adjust downward towards its new optimal level, g_1^*, the shifts will induce a negative correlation between local growth and the level of local government service provision.

Non-optimal local government service provision underpins the preceding story. In fact there are numerous reasons to suppose that this would be so. For instance, Cutler, Elmendorf, and Zeckhauser (1993), Alesina, Baqir, and Easterly (1997), and Poterba (1998) all document how various sorts of ethnic and age fragmentation affect the level of local government service provision.[18] Alternatively, Romer and Rosenthal (1979) suggest a principal-agent relationship between voters, who desire optimal service provision, and local public bureaucrats, who desire maximal service provision. Still another possible source of non-optimal government service provision is the empirical difficulty of estimating the actual benefits from such services. Local decision-makers may have only a noisy estimate of optimal government service levels; if so, a cross-section of service levels by welfare maximizing local governments is likely to be distributed around some "true" optimum as in Figure 6.

A second element to the story is the slow adjustment of the level of government service provision to changes in external conditions affecting marginal benefits and marginal costs. Government service levels chosen based on ethnic or generational cleavages or by budget-maximizing bureaucrats may indeed be completely orthogonal to such shifts. From a practical standpoint, it is likely that most local government budgeting processes start with the previous year's budget as a baseline. Empirically there is moderate persistence in government size. The raw correlation of government size as measured by real per capita general direct expenditures between 1972 and 1987 is 0.73.

[18] Of course it is possible that such fragmentation affects the level of service provision via affecting the optimal level of service provision. Further discussion on this point is limited by the need to agree upon a "reasonable" social welfare function.

A weakness of the present paper is the failure to better account for the sources of variation in local government behavior. Understanding the linkages from the local characteristics measured by the base set of explanatory variables enumerated in Table 3 to local fiscal policy is a priority for ongoing research; so too is identifying the institutional and other characteristics which underlie the residual variation in local fiscal policy. A clearer picture of the linkages from local government to economic growth can help to guide such research. The negative correlation between local growth and local government financial size, for instance, can be interpreted as a rejection of a null hypothesis of optimal government behavior.[19]

Returning to the interpretation that the marginal benefits from local government service provision have shifted down and/or the marginal costs to government service provision have shifted up, it does *not* follow that local government is "too big". Defining "too big" local government as a level of local government service provision in which marginal costs exceed marginal benefits, if on average local governments are too big, this should show up as a negative β coefficient in the level relationship (6) above.

The present interpretation, instead, is just that $\mathrm{d}\beta$ is negative. As in Figure 6, if the mean level of local government services provided was optimal prior to such a shift, then indeed local government, for a time anyway, would be too big (on average). But analogous to the zero coefficient from regressing the growth in population density on an ocean coast proximity dummy, it is possible that even after the shift in marginal benefits and marginal costs, local government is actually "too small" — that on average the marginal benefits from increasing local government services exceed marginal costs. A negative $\mathrm{d}\beta$ is perfectly consistent with a positive β. This would be the case, for instance, if the distribution of government services shown in Figure 6 had a mean lower than g_1^*, the optimal level after the shift.

Suppose — suspending disbelief for a moment — that previous to the shift, the marginal benefits from increases in local government services wildly exceed the associated marginal costs. Then a shift occurs such that the marginal benefits from increases in government services now only moderately exceed marginal costs. Prior to the shift, individuals are willing to pay a considerable premium, either due to high housing prices or via some other congestion mechanism, to live in localities with high levels of government services. After the shift, they would still like to locate in high government service localities; but they are willing to pay only a smaller premium for the chance to do so. A new long run spatial steady state will be reached only after an outflow of population from high government service localities.

If in fact the marginal benefits and marginal costs to local government service provi-

[19] To be sure, numerous caveats attach to such an interpretation. In particular, it would need to be motivated by a model which implies a zero total derivative of local growth with respect to deviations of government size from some "optimal" level (analogous to the result in, e.g., Barro (1990) and Barro and Sala-i-Martin (1995) Chapter 4). Even so, the negative correlation between local growth and government financial size could be interpreted as a rejection of the specific model rather than optimal government per se.

sion have shifted, several factors may underlie this. One possibility is the aging of the U.S. population along with the premise that the elderly derive lower benefits from local government services and experience higher costs from local government taxes than the population at large. Life-cycle considerations imply that labor wealth should account for a relatively low proportion of elderly total wealth; hence the elderly may place a lower value on local government services which contribute to local productivity. Estate tax considerations are also likely to be particularly salient to the elderly.

Direct tests, however, reject that it is the elderly who are driving the negative correlation between local growth and local government size. Population age composition at each of the decades along with annual age-specific mortality figures allow the construction of cohort net migration rates over the period 1970 to 1990. In particular, I calculate the net migration rate by individuals aged 24 to 44 at the beginning of each of these decades; I then use this to partition the sample based on the absolute value of the difference between "working age" net migration and total net migration.[20] The negative correlation between net migration and local government size is actually stronger for the subsample in which total net migration is reflective of working age net migration.

Another possible cause for a shift in the marginal benefits and marginal costs of local government service provision is increasing private sector competition to local government. Housing associations, business improvement districts, the local mall: each offer several of the same services provided by local governments; and each has become increasingly popular since 1970. Similarly, the growing opportunities to improve the efficiency of local government service provision through privatization could cause a downward shift in the marginal benefits from local government service *inputs* (i.e. expenditures and employment). (See Lopez-de-Silanes, Shleifer, and Vishny, 1997.)

An interpretation of the negative correlation between local growth and local government size as implying a shift in marginal benefits and marginal costs is less satisfying than an interpretation on the relative level of marginal benefits to marginal costs; it also cautions against drawing policy implications. Even so, as the levels of marginal benefits and marginal costs are ultimately the cumulative sum of the changes in these, identifying such changes should be seen as a step towards identifying the levels.

A story which does allow for a level interpretation of the negative correlation between local growth and government size is that the U.S. system of localities experienced a shock which increased overall mobility. A first element of such a story would be the introduction of a fixed friction to the dynamic model of local growth (i.e. in addition to the labor mobility friction which is proportional to net population flows); such a fixed friction would allow

[20] That is, based on whether $\left|\frac{\text{working age net migration rate}_i - \text{total net migration rate}_i}{\text{total net migration rate}_i}\right| \gtrless$ the median value of this across all localities. Directly regressing cohort net migration rates on local attributes is also possible though caution must be used in interpreting such results. A high rate of cohort net migration is perfectly consistent with a zero total rate of net migration; hence cohort net migration is likely to capture both changes in underlying productivity and quality of life as well as Tiebout-type sorting.

for utility and profit differentials across localities even in the system's steady state. With a fixed friction, budget maximizing local bureaucrats are able to extract rents from local residents and firms. A decrease in the fixed friction would then likely cause an outflow of residents and firms from localities with the most zealous budget maximizers.[21] A possible shock corresponding to such an increase in mobility is the construction of the interstate highway system; the main enabling legislation for this was passed in 1956, and the system was mostly complete by the late 1970s.

Local Government Fiscal Policy and Growth Fact 1: *From 1970 to 1990, county economic growth is negatively correlated with local government financial size. This negative correlation is extremely robust across alternative specifications; it does not stem from any obvious omitted variable bias; there is no indication of reverse causality; and it is not driven by the elderly.*

Local Government Expenditures

In addition to the negative partial correlation between local growth and local government financial size, there exist a number of strong partial correlations between local growth and the components of local government fiscal policy. On the expenditure side these include partial correlations which are obvious candidates for a reverse causal interpretation (e.g. a negative partial correlation between local growth and the percent of general direct expenditures classified as current) or for a spurious interpretation (e.g. a negative partial correlation between local growth and the percent of general direct expenditures devoted to police and correctional facilities — even after the six crime variables included in the base specification.)

Among the strongest partial correlations, and one where a causal interpretation may not be unwarranted, is a positive partial correlation between local growth and local expenditures on elementary and secondary education. Regressions of net migration, per capita income growth, and housing median value growth yield a positive, significant coefficient on the percent of general direct expenditures devoted to elementary and secondary school education. Its magnitude is reasonably large: a one standard deviation increase in the percent of expenditures devoted to elementary and secondary school education is associated with increases in growth rates equivalent to 7.0 percent, 6.1 percent, and 4.6 percent of the respective standard deviations of net migration, per capita income growth, and housing median value growth. A 10 percentage point increase in elementary and secondary school expenditures (which is less than one standard deviation) is associated with an increase in

[21] An important question here is how the increase in resident mobility affects local bureaucrat behavior. Increases in mobility lower the cost of "exit" relative to "voice"; rather than contest inefficient local policies, individuals and firms may just choose to move elsewhere. Whether rent seeking increases or decreases will then depend on the effectiveness of exit in tempering bureaucrats' behavior (Hirschman, 1970).

net migration equivalent to 35 percent of the decrease in net migration associated with center city locations.

Controlling for government size, qualitatively similar results follow from entering elementary and secondary school expenditures in log level form or as a percent of local income. A one standard deviation increase in the log of elementary and secondary school expenditures is associated with increases in growth rates equivalent to 10.6 percent, 11.7 percent, and 6.3 percent of the respective standard deviations of net migration, per capita income growth, and housing median value growth. A 10 percent increase in such expenditures is associated with an increase in net migration equivalent to 15 percent of the center city effect. Not controlling for government size admits statistically insignificant coefficients on education spending when entered in either log level or percent of income forms.

Expenditures on elementary and secondary school education are moderately persistent across time. The raw correlation across counties of percent of general direct expenditures devoted to elementary and secondary school education for the years 1972 and 1987 is 0.65. Similar measures of persistence obtain from comparing the per capita levels of spending in the two years. Regressing the change in the percentage of general direct expenditures devoted to elementary and secondary education on contemporaneous net migration shows no indication of reverse causality (Supplemental Table 7, Panel C).

Partitioning the sample based on the difference between net migration by all versus working age individuals, the positive correlation of net migration with elementary and secondary school expenditures appears to be driven by non-working age individuals. That is, the coefficient on elementary and secondary school expenditures (in either percentage or log level form) is positive significant for the half sample in which working age net migration most differs from overall net migration but is not statistically significant for the half sample in which working age net migration is most similar to overall net migration. As non-working age individuals include both children and the elderly, it is likely that it is net migration by the former which is driving the result. The failure to find a significant coefficient between (total) net migration and elementary and secondary school expenditures for the working age half sample suggests that any causal link from such expenditures to local growth is likely to occur via a quality-of-life effect.

Paralleling the discussion on interpreting the negative correlation between local growth and government size above, a possible interpretation of the positive correlation between growth and elementary and secondary school expenditures is that the marginal benefits from these have shifted up and/or the marginal costs from these have shifted down. A shift upwards in the marginal benefits from elementary and secondary education, in particular, is consistent with the finding shown in Table 4 of a strong positive correlation between local growth and the percent of the adult population with a four-year college degree; the one caveat would be that the higher elementary and secondary school expenditures be seen as contributing to students' eventually pursuing college educations given the negative coefficients on percent of the adult population with high school degrees. Local spending on actual higher education, primarily on community colleges, shows no significant correlation with any of the three growth measures (Supplemental Table 4). Note that *not* included in such higher education expenditures are state expenditures on higher education.

Local Government Fiscal Policy and Growth Fact 2: *Controlling for local government size, county economic growth over the period 1970 to 1990 is positively correlated with local expenditures on elementary and secondary school education.*

Local Government Taxes

Personal income taxes and selective sales taxes are both strongly negatively correlated with local economic growth. Focusing first on personal income taxes, regressions of net migration and housing median value growth yield a negative, significant (at 0.01 level) coefficient on the percent of tax revenue derived from personal income taxes (Table 5). (The analogous coefficient from a regression of per capita income growth is negative but not significant.) The magnitudes imply that a one standard deviation increase in the percent of taxes derived from personal income taxes is associated with decreases in growth equivalent to 4.8 percent and 4.3 percent of the standard deviations of net migration and housing median value growth, respectively. A 10 percentage point increase in the percent of tax revenue derived from personal income taxes is associated with a decrease in net migration equivalent to 84 percent of the lower net migration associated with center city locations. Controlling for government size, similar magnitudes derive from using log level and percent of local income measures of income tax revenue.

As with the size and expenditure measures above, personal income taxes are measured by aggregating behavior across all local governments in each county. Local personal income taxes are less rare than is commonly believed: 238 counties in 14 states had positive personal income tax revenue in 1972. A negative, significant (at the 0.05 level) coefficient obtains from regressing net migration on a dummy equal to one for these counties. Its magnitude implies that going from zero to positive local personal income tax revenue is associated with a decrease in the rate of net migration equivalent to 16.3 percent of its standard deviation (or 96 percent of the center city effect). The equivalent regressions for per capita income growth and housing value growth yield coefficients which are not statistically significant.

Personal income tax revenue shows high persistence across time. In level form, the raw correlation across counties of personal income tax revenue in 1972 and 1987 is 0.94; as a percent of tax revenue, the correlation is 0.81. Regressing the change in percent of tax revenue derived from personal income taxes for each of 1972 to 1977 and 1982 to 1987 on contemporaneous net migration does admit a negative, statistically significant coefficient in the first of these. However, the regression's low R-squared value, the positive point estimate of the coefficient on net migration in the second of these regressions, and the high persistence just discussed together suggest that a reverse causal interpretation is probably unwarranted (Supplemental Table 7, Panel D).

Partitioning the sample based on the net migration rate of working age individuals shows that the negative correlation between net migration and personal income taxes is driven primarily by such working age individuals. For the half sample in which total and working age net migration rates most differ, the coefficient on personal income taxes (regardless of specification) does not statistically differ from zero.

As with the size and expenditure results above, the negative correlation between local growth and personal income taxes can be given either a change or a level interpretation. Under the change interpretation, the "marginal cost" — the distortionary effect — of personal taxes have shifted upward; under the level interpretation, average local personal income taxes exceed their optimal level. An attractive feature of the level interpretation is that it can explain the dichotomy between the strong negative correlation between net migration and income taxes in the working age half sample but the lack of a such a correlation in the non-working age half sample (i.e. that labor income relative to total wealth tends to be highest for working age individuals).[22]

What is less clear is why individuals (working age or otherwise) have shifted their preference towards (under the change interpretation) or prefer absolutely (under the level interpretation) property taxes over income taxes. While individuals with incomes above the locality mean bear a disproportionate burden of personal income taxes, the relevant question is whether this burden is more disproportionate than that associated with property taxes. Comparing Gini coefficients of 1969 family income with 1970 owner occupied median housing value, income inequality indeed exceeds housing value inequality in 2,363 of 3,055 counties.[23] Even so, one might expect the the main result from increasing local personal income taxes would be the finer sorting by income of individuals among localities. Nechyba (1997) presents a computable general equilibrium model that shows that greater reliance on personal income taxes indeed leads to greater income stratification; he also shows that in the presence of tax competition among localities, the movement from sole reliance on property taxes to sole reliance on personal income taxes by a single community causes declines in several measures of the community's welfare and an outmigration of its residents.

The negative correlation between local growth and revenue derived from personal income taxes is robust to the inclusion of any of several measures of income and wealth inequality.

Local Government Fiscal Policy and Growth Fact 3: *Controlling for local government size, county economic growth over the period 1970 to 1990 is negatively correlated with local personal income taxes.*

The last two rows of Table 5 show the negative correlation between local growth and the percent of tax revenue derived from selective sales taxes. The negative coefficient in

[22]The dichotomy is harder to explain under the change interpretation. In particular, with a constant level of mobility, if working age individuals' preferences shifted such that they found personal income taxes more onerous than previously but non-working age individuals' preferences remained unchanged, the out-migration by working age individuals from high personal income tax localities would presumably induce an in-migration (by depressing housing prices) of non-working age individuals.

[23]This result likely would be tempered by the inclusion of the values of rental housing.

the net migration regression is significant at the 0.01 level; those in the per capita income growth and housing median value growth regressions are significant at the 0.05 level. The coefficient magnitudes imply that a one standard deviation increase in the percent of taxes derived from selective sales taxes is associated with declines in the rates of net migration, per capita income growth, and housing median value growth equivalent to 7.6 percent, 6.0 percent, and 4.7 percent of their respective standard deviations. A 10 percentage point increase in the percent of tax revenue derived from selective sales taxes (more than 3 times its standard deviation) is associated with a lower rate of net migration equivalent to 145 percent of the center city effect. Partioning the sample based on net migration by working age individuals shows the negative correlation between net migration and selective sales taxes holds for both half samples.

In contrast to general sales taxes, selective sales taxes target specific consumption items. The most lucrative targets of such taxes in 1972 are alcohol, tobacco, and motor fuel which on average account for 24 percent, 10 percent, and 7 percent of total selective sales tax revenue. The remaining 59 percent covers a panoply of products including amusements, insurance premiums, marriage, and public utilities. Including separate measures of alcohol, tobacco, and motor fuel selective sales tax revenues along with overall selective sales tax revenue in the growth regressions suggest that it is the overall measure rather than any of these individual components which is associated with the lower growth rates.[24]

Local Government Fiscal Policy and Growth Fact 4: *Controlling for local government size, county economic growth over the period 1970 to 1990 is negatively correlated with local selective sales taxes.*

8 Conclusions

With an explicitly dynamic model of local growth to help interpret them, this paper has sketched four sets of empirical facts on U.S. county economic growth.

Population flows among counties show considerable persistence since around 1930; such persistence is consistent with local growth theory's prediction of the population response to shifts in local levels of productivity and quality of life. Regressions of population flows on local attributes serve to identify the correlates of shifts in productivity and quality of life; however they are not able to recover structural relationships on local attribute contributions to productivity and quality of life.

Across the 20th-century, population has been steadily moving towards ocean coastal

[24] Running these regressions without the overall selective sales tax revenue measure, the net migration regression admits a negative coefficient on tobacco sales taxes significant at the 0.05 level; the per capita income regression admits a negative coefficient on alcohol sales taxes significant at the 0.10 level; and the housing median value growth regression admits a negative coefficient on motor fuel sales taxes significant at the 0.05 level. But none of these is robust to the inclusion of total selective sales taxes.

areas and towards areas with moderate winter and summer temperatures and low levels of precipitation. In addition, partial correlations show the increasing productivity and quality-of-life effect from location near the Great Lakes and near navigable rivers.

Local growth is positively correlated with suburban metropolitan locations and negatively correlated with high levels of violent crime. It is positively correlated with high levels of human capital as measured by the percentage of adults with college degrees but negatively correlated with medium levels of human capital as measured by the percentage of adults with high school degrees; these partial correlations with education suggest an increase in the benefits of high relative to medium levels of human capital. Local economic growth shows a strong negative partial correlation with unemployment at low levels and a more moderate negative partial correlation with unemployment at high levels. Both per capita income and median house value growth show a negative linear relationship with poverty whereas net migration shows a strong negative quadratic relationship with poverty. Multiple interpretations are consistent with the unemployment and poverty results.

Local growth shows a strong negative partial correlation with any of several measures of local government financial size. The result is extremely robust to alternative specifications. An extensive set of control variables eliminates any obvious omitted variable bias and there is no indication of reverse causality. A possible interpretation is that the marginal benefits of local government service provision have shifted down relative to marginal costs. Such an interpretation does not imply that average local government service provision exceeds its optimal level; rather it implies only that the optimal level of government service provision is lower than it was previously. An alternative "level" interpretation is that an overall increase in mobility has led to exit by population and capital from localities with high levels of bureaucratic rent seeking. Controlling for government size, local growth shows a strong positive partial correlation with expenditures on elementary and secondary school education; it shows strong negative partial correlations with personal income and selective sales taxes.

Interpreting the partial correlations between local growth and local attributes as pertaining to changes in local attribute contributions to productivity and quality of life represents a "second best" to identifying the level contributions of local attributes to productivity and quality of life. With respect to the partial correlations of local growth with local government fiscal behavior in particular, sound policy advice derives only from an understanding of the level contributions from local government services. That is, we need to identify the levels of government service provision at which marginal costs come to exceed marginal benefits. Identifying shifts in marginal costs and marginal benefits represents a step towards this ultimate goal.

More generally, the question remains to what extent the correlates of local growth are the correlates of cross-country growth. Interpreting local growth as being driven by increases in productivity and quality of life but cross-country growth as being driven by increases in productivity and capital accumulation, the two sets of correlates may in fact have only a small intersection. Such a view is too pessimistic. To the extent that "growth" is ultimately about utility maximization, there is no good theoretical reason to exclude quality-of-life considerations from cross-country growth analysis. To be sure, developing nations in the short run might reasonably consider quality of life to be a luxury good they cannot afford; but certainly in the long run, sound policy should seek to achieve high levels of both income and quality of life.

With regards to capital accumulation: fluctuations in the terms of trade, technological innovations which impact geographically clustered industries, asynchronous regional business cycles — all are akin to local capital shocks. Local attributes which allow for smoother responses to such shocks may suggest strategies relevant to developing nations. Conversely, to the extent that cross-country growth empirics seeks to identify the correlates of high steady-state incomes, the study of localities offers the chance to study a system in which high levels of labor mobility cause incomes to remain relatively close to their steady-state levels.

Appendices

1.1 Data

The paper draws on working versions of two data panels, Rappaport (1998) and Rappaport and Sachs (1998). The former covers a panoply of local labor force, housing stock, and government attributes. It is based largely on the 1970, 1980, and 1990 decennial census summary tape files, the 1972, 1977, 1982, and 1987 Census of Governments, the Bureau of Economic Analysis Regional Economic Information System data series, and various years of the Census Bureau's City and County Data Book. The latter data panel covers county proximity to a range of local geography, transportation infrastructure, and civic culture attributes. It draws on a range of sources and calculates proximity using geographic information system software. In addition, weather variables are drawn from Mendelsohn, Nordhaus, and Shaw (1994).

U.S. county data offers several advantages over cross-country data. First is the accuracy of the data. Often, it is collected by a single agency and repeated at numerous points in time. There are no exchange rates for which to account and regional price variations, while important, are nevertheless much smaller than those found across nations. Second is the fineness of the data. Detailed surveys and censuses reported with numerous cross tabulations allow for an expansive set of narrowly defined variables. The Census of Governments, for instance, breaks out government expenditures into several hundred categories. Third is the number of observations. The 3,000 plus U.S. counties allow for much greater statistical power than the 100 or so countries typically used in cross-country studies.

Certain counties, particularly in the state of Virginia, contain within them "independent cities" which are formally considered county equivalents. For the present analysis, such independent cities have been merged into their surrounding counties. In several other cases, two or more counties have been merged in order to preserve continuity in borders across time (i.e. due to secession or annexation).

For regressions which include government finance variables, the five New York City borroughs, which are formally considered as separate counties, have been excluded given an inability to partition expenditures and revenue among them. In its next revision, Rappaport (1998) will include a subset of counties which have been merged due to the presence of municipal places which cross county boundaries. In fact, excluding the five New York City counties, there are an additional 68 counties with places of greater than 50,000 population which cross county borders. While these observations are included in the government regressions herein, all results are robust to their exclusion.

The dynamic theory focuses on three key observables: population density, wages, and housing prices. Within this context, several measures are available for each. The growth rate of population density (or equivalently, the growth rate of population) can also be measured by the growth rate of civilian (or total) employment and by the rate net migration. In general, I will focus on net migration. As shown in Supplemental Table 1, high correlations across the three population measures suggest that results will not be especially sensitive to the particular one chosen. A possible exception is the correlation between the rate of net migration and the rate of employment growth. For the period 1970 to 1990, the correlation between net migration and employment growth is relatively high ($\rho = 0.81$). But for other time periods, the correlation between the two is somewhat lower. In particular, for 1960 to 1970, $\rho = 0.44$.

For wages, the Bureau of Economic Analysis constructs a per capita income time series from 1969 to the present. Because this relies on strong assumptions on cross border income flows, I choose instead to focus on per capita income growth derived from self reported incomes in the decennial censuses. Land price growth can be measured either based on median house sales or rental prices (again drawing on self reported values in the decennial censuses — the sales prices are owners' estimate of the price at which their house would sell). For sales prices, it is also possible to look at the growth rate based on residuals after controlling for the median number of bedrooms of owner occupied housing; for rental prices, median values can be estimated separately based on the number of bedrooms. Because the mean homeownership rate across counties averages above 70 percent over the period 1970 to 1990, I will focus on the growth rate of median house sales price.

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Table 1: The Local Growth Process

A. Persistence of Population Flows: Population density growth rate by decade, 1910-1990, for continental U.S. states and counties regressed on lagged value.

		1910-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
States:	β	0.23	0.44	0.38	0.96	1.09	0.60	0.71	0.55
	R^2	0.19	0.24	0.21	0.46	0.70	0.73	0.35	0.52
Counties:	β	0.10	0.13	0.08	0.47	0.74	0.45	0.52	0.55
	R^2	0.03	0.01	0.02	0.12	0.46	0.32	0.27	0.42

B. Positive Correlation of Housing Price Growth and Net Migration: Housing median value growth rate by decade, 1950-1990, for continental U.S. counties regressed on contemporary net migration rate.

1950-60	1960-70	1970-80	1980-90
β = 0.20	β = 0.56	β = 0.47	β = 0.84
R^2 = 0.03	R^2 = 0.25	R^2 = 0.19	R^2 = 0.25

C. Positive Correlation of Net Migration and Initial Housing Price: Net migration rate by decade, 1950-1990, for continental U.S. counties regressed on the log of the initial median house value.

1950-60	1960-70	1970-80	1980-90
β = 0.021	β = 0.018	β = 0.007	β = 0.014
R^2 = 0.27	R^2 = 0.13	R^2 = 0.02	R^2 = 0.14

D. Unconditional Convergence of Income: Per capita income growth rate by decade, 1960-1990, for continental U.S. counties regressed on log of initial per capita income.

1959-69	1969-79	1979-89
β = -0.036	β = -0.026	β = -0.003
R^2 = 0.60	R^2 = 0.27	R^2 = 0.00

E. Conditional Convergence: Net migration rate, per capita income growth rate, and housing median value growth rate over the period 1970-1990 for continental U.S. counties regressed on log of initial value and an expansive set of control variables.

Net Migration Rate	Per Capita Income Growth Rate	Housing Median Value Growth Rate
β = -0.003	β = -0.030	β = -0.013
R^2 = 0.61	R^2 = 0.57	R^2 = 0.61

All regressions include a constant. All coefficients are significant at the 0.01 level.

Table 2: Summary Statistics

Variable	Obs	Mean	Std Dev	Min	Max
Growth Rates:					
(Avg. Annual Rates, 1970-90; 1969-'89 for Income)					
Net Migration Rate	3039	0.002	0.014	-0.037	0.094
Per Capita Income Growth Rate	3061	0.018	0.007	-0.017	0.048
Housing Median Value Growth Rate	3059	0.019	0.013	-0.029	0.083
Initial Levels (1970)					
Population	3062	65,966	231,062	566	7,036,463
Land Area (km^2)	3063	2,498	3,406	40	51,961
Population Density (Persons per km^2)	3062	73	600	0.1	20,943
Per Capita Income	3062	8,697	2,009	3,448	19,049
Owner Occupied Housing Median Value	3064	56,769	35,062	9,840	537,141
Geography:					
Mean Daily Temperature, January (°C)	3063	-0.2	6.8	-18.1	20.3
Mean Daily Temperature, July (°C)	3063	24.3	2.9	13.9	33.9
Mean Precipitation, July (cm)	3063	9.2	3.9	0.0	23.3
Ocean Coast Dummy (1 if distance ≤ 80 km)	3063	0.128	0.334	0	1
Great Lake Coast Dummy (1 if distance ≤ 80 km)	3063	0.055	0.228	0	1
Navigable River Dummy (1 if distance ≤ 40 km)	3063	0.167	0.373	0	1
Non-Government Correlates of Growth:					
Metropolitan Area Dummy	3066	0.151	0.358	0	1
Center City Dummy	3066	0.092	0.289	0	1
Violent Crime Rate (per 100,000 pop.)	2805	168	191	0	1,879
Unemployment Rate	3062	0.045	0.023	0.000	0.180
Unemployment Rate Spline (if ≥ 7.5% Rate)	3062	0.009	0.029	0.000	0.180
Poverty Rate	3062	0.210	0.112	0.022	0.672
Poverty Rate Squared (de-meaned)	3062	0.012	0.022	0.000	0.214
Percent of Adults High School Graduate or More	3062	0.446	0.127	0.116	0.882
Percent of Adults Bachelors Degree or More	3062	0.073	0.038	0.011	0.386
Goverment Correlates of Growth:					
Per Capita General Direct Expenditures	3037	1,161	474	91	8,757
Log(Per Capita General Direct Expenditures)	3037	6.99	0.38	4.51	9.08
General Direct Expenditures as % of Local Income	3036	0.142	0.055	0.011	1.423
Elementary & Secondary Expenditures (Percent)	3037	0.559	0.124	0.000	0.994
Revenue from Income Taxes (Percent)	3037	0.008	0.036	0.000	0.490
Dummy if Income Taxes	3037	0.071	0.257	0	1
Revenue from Selective Sales Taxes (Percent)	3037	0.018	0.033	0.000	0.328
Dummy if Selective Sales Taxes	3037	0.646	0.478	0	1

Weather variables are from Mendelsohn, Nordhaus, and Shaw (1994) and are based on 30-year averages over the period 1951 to 1980. Distances to coasts are measured from county centers. The metropolitan area dummy is 1 if county is part of a 1970 Metropolitan Statistical Area, 0 otherwise. The center city dummy is 1 of the county contains a center city of a 1970 Metropolitan Statistical Area, 0 otherwise. The unemployment rate spline is the unemployment rate for counties with an unemployment rate of 7.5% or greater, 0 otherwise. The quadratic poverty rate has had its mean removed prior to squaring so that linear coeficients measure the marginal effect of an increase in poverty from its mean level of 21%. The government variables are based on all local governments located within a county including the county government, school districts, and any other special districts. The income and selective sales tax dummies equal 1 if any local government with the county had positive tax revenue from the respective taxes, 0 otherwise.

Table 3: Control Variables

Control Category	No. of Variables	Variables
Weather	16	{Mean Daily Temperature, Mean Precipitation for Month} x {January, April, July, October} x {Linear, Quadratic}
Topography	3	Slope Percent, Altitude, Altitude Squared
Coastal Proximity	3	Log(1+distance from County Center to Nearest...) x {Ocean Coast, Great Lake Coast, Navigable River}
Urbanization/Suburbanization	2	Dummy if County is within a 1970 Metropolitan Area Dummy if County Contains a Center City of a 1970 Metropolitan Area
Industry Shares (BEA)	9	9 Industry Shares, Bureau of Economic Analysis
Occupation Shares	11	11 Occupation Shares, Census Bureau
Educational Attainment	2	Percent of Adults, High School Graduate or More Percent of Adults, Bachelors Degree or More
Unemployment	2	Unemployment Rate Unemployment Rate * 1/0 Dummy if Unemployment Rate ≥ 0.075
Poverty	4	Poverty, Poverty Squared, Children's Poverty, Family Poverty
Ethnicity	5	{Percent Black, Percent Hispanic} x {Linear, Quadratic} Percent Non-Black Non-Hispanic Squared
Immigrants	4	{Percent of Population Not Native U.S. Citizen, Years since Entry} x {0 to 10, 11 to 25, 26 to 45, 46 or More}
Crime	6	{Serious Crime Rate, Property Crime Rate, Violent Crime Rate} x {Linear, Quadratic}
Age Distribution	6	{Percent of Population Aged} x {0-4, 5-13, 14-17, 18-21, 65+, 75+}

Work and demographic variables are measured in 1970. Crime rates are measured in 1975 and represent the number of incidences per 100,000 population. Serious crime covers murder and nonnegligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, and motor vehicle theft. Violent crime covers robbery and aggravated assault only. Property crime covers burglary and motor vehicle theft only. For government regressions, which include state fixed effects, presence dummies rather than distance measures are used to control for coastal proximity. Weather variables and altitude are from Mendelsohn, Nordhaus, and Shaw (1994); the weather variables are based on 30-year averages over the period 1951 to 1980.

TABLE 4: Urbanization, Skills, Poverty, Crime, and Growth

RHS Variables:	(1) Net Migration 1970 - 1990	(2) Per Capita Income Growth 1969 - 1989	(3) Housing Median Value Growth 1970 - 1990
Urbanization/Suburbanization:			
Metropolitan Area Dummy	0.0015	0.0016	0.0028
	(0.0009)	(0.0004)	(0.0008)
Center City Dummy	-0.0025	-0.0006	-0.0009
	(0.0010)	(0.0005)	(0.0009)
Skills:			
Percent of Adult Population with High School or More	-0.0248	-0.0122	-0.0326
	(0.0054)	(0.0035)	(0.0054)
Percent of Adult Population with Bachelors Degree or More	0.1026	0.0508	0.0650
	(0.0160)	(0.0086)	(0.0162)
Unemployment Rate	-0.0981	-0.0610	-0.0831
	(0.0166)	(0.0106)	(0.0175)
Unemployment Rate if ≥ 7.5%	0.0615	0.0159	0.0470
	(0.0109)	(0.0060)	(0.0110)
Poverty:			
Percent of Persons in Poverty	0.0096	0.0206	0.0143
	(0.0066)	(0.0037)	(0.0060)
Percent of Persons in Poverty Squar	-0.0825	0.0018	0.0121
	(0.0169)	(0.0110)	(0.0162)
Crime:			
Violent Crime Rate (per 100,000 pop	-5.48E-06	-2.43E-06	-3.16E-06
	(1.33E-06)	(7.72E-07)	(1.32E-06)
N	2388	2388	2388
R^2	0.591	0.488	0.581
Adjusted R^2	0.580	0.474	0.569
Sum of Squared Residuals	0.167	0.051	0.157
Number of Independent Variables	66	66	66

Dependent variables are average annual rates over the 20-year period listed. Independent variables are measured in 1970 except for the violent crime rate which is measured in 1975. Quadratic poverty has had its mean removed prior to squaring so linear poverty coefficient measures the marginal effect of increase in poverty from its mean level of 21%. All regressions include a constant and the weather, coastal, proximity, ethnicity, immigrant, industry, and occupation independent variables listed in Table 3. Standard Errors in parantheses are robust to spatial correlation using the Conley spatial estimator discussed in the text and a quadratic weighting scheme which imposes independence for counties whose centers are more than 150 km apart.

TABLE 5: Local Government Fiscal Policy and Growth

RHS Variables:	(1) Net Migration 1970 - 1990	(2) Per Capita Income Growth 1969 - 1989	(3) Housing Median Value Growth 1970 - 1990
Size:			
Log(1+ Per Capita General Direct Expenditures for All Local Governments in County)	-0.0027	-0.0013	-0.0009
	(0.0010)	(0.0006)	(0.0009)
Elementary and Secondary Education:			
Percent of General Direct Expenditures Devoted to Elementary and Secondary Education	0.0076	0.0034	0.0047
	(0.0024)	(0.0013)	(0.0020)
Income Taxes:			
Percent of Taxes Collected by Governments in County that are from Personal Income Taxes	-0.0182	-0.0018	-0.0152
	(0.0053)	(0.0033)	(0.0053)
Selective Sales Taxes:			
Percent of Taxes Collected by Governments in County that are from Selective Sales Taxes	-0.0308	-0.0125	-0.0177
	(0.0099)	(0.0052)	(0.0082)
N	2388	2388	2388
R^2	0.658	0.567	0.663
Adjusted R^2	0.639	0.543	0.645
Sum of Squared Residuals	0.140	0.043	0.126
Number of Independent Variables	124	124	124

Dependent variables are average annual rates over the 20-year period listed. Government finance variables aggregate all local governments within a county and are based on the fiscal year which ends during calendar year 1972. All regressions include a constant, dummies for each U.S. state, and the base control set of 73 independent variables enumerated in Table 3. Standard Errors in parantheses are robust to spatial correlation using the Conley spatial estimator discussed in the text and a quadratic weighting scheme which imposes independence for counties whose centers are more than 150 km apart.

Table 6: Robustness of Negative Correlation between Net Migration and Government Financial Size

Control Variables	Government Financial Size Measure			
	Log of General Direct Expenditures	Log of Own-Souced Revenue	General Direct Expenditures as % of Income	Own-Souced Revenue as % of Income
Metropolitan, Suburban, and State Dummies Only (K = 50, N = 3034)	-0.0088 (0.0013)	-0.0042 (0.0008)	-0.0528 (0.0116)	-0.0816 (0.0103)
Base Specification Minus Crime Variables (K = 114, N = 2551)	-0.0046 (0.0009)	-0.0031 (0.0007)	-0.0158 (0.0053)	-0.0288 (0.0076)
Base Specification (K = 120 , N = 2388)	-0.0044 (0.0009)	-0.0031 (0.0007)	-0.0158 (0.0052)	-0.0296 (0.0073)
Base Specification Plus Type of Expenditures (K = 124, N = 2388)	-0.0064 (0.0009)	-0.0035 (0.0007)	-0.0232 (0.0057)	-0.0325 (0.0077)
Base Specification Plus Category of Expenditures (K = 138, N = 2388)	-0.0057 (0.0010)	-0.0031 (0.0008)	-0.0190 (0.0061)	-0.0301 (0.0078)
Base Specification Plus Type of Taxes (K = 125, N = 2388)	-0.0042 (0.0009)	-0.0029 (0.0007)	-0.0154 (0.0050)	-0.0282 (0.0071)
Base Specification Plus Intergovernmental Revenue (K = 122, N = 2388)	-0.0038 (0.0010)	-0.0029 (0.0007)	-0.0124 (0.0048)	-0.0279 (0.0072)
Base Specification Plus Initial Levels (K = 126, N = 2388)	-0.0035 (0.0009)	-0.0031 (0.0007)	-0.0118 (0.0046)	-0.0273 (0.0072)

Table reports the coefficient and standard error on the specified government size measure for each of the various control variable specifications. Standard errors are robust to spatial correlation using the Conley spatial estimator discussed in the text; counties whose centers are more than 150 km apart are assumed to have independent error terms; for counties within 150 km of each other, spatial correlation of the error term is assumed to decline quadratically. K is the number of independent control variables; it includes 47 dummies for individual states but neither the government size measure nor the included constant. N is the number of observations associated with each specification.

"General Direct Expenditures" is the aggregate of all expenditures by local governments within a county excluding intergovernmental, utility, and insurance trust expenditures.

"Own-Sourced Revenue" is the aggregate of all tax, general charge, and miscellaneous revenues received by local governments within a county excluding intergovernmental, utility, and insurance trust revenue.

"Type of Expenditures" is the percentage of general direct expenditures devoted to each of construction, equipment, land, and interest payments; current expenditures is the excluded type.

"Category of Expenditures" is the percentage of general direct expenditures devoted to each of higher education, public safety, corrections, police, public health, general health, housing, genreral public welfare, categorical welfare, cash assistance welfare, government operations, highways, other transportation, sewerage, solid waste management, natural resources, libraries, and parks and recreation; elementary and secondary schools is the excluded category.

"Type of Taxes" is the percentage of tax revenue from each of general sales taxes, selective sales taxes, license taxes, and individual income taxes; property taxes is the excluded type.

"Intergovernmental Revenue" is log(1+ per capita state intergovernmental revenue) and log(1+ per capita federal intergovernmental revenue).

"Initial Levels" is linear and quadratic log(initial population density), linear and quadratic log(initial income), and linear and quadratic log(initial median house price).

Supplemental Table 1: Raw Correlations

A. Correlations among Local Growth Measures, 1970-1990
(3041 U.S. counties)(Per Capita Income Growth is for 1969-1989)

	net migration	per capita income growth	median house value growth
net migration	1		
per capita income growth	0.38	1	
median house value growth	0.55	0.54	1

B. Correlation of Net Migration with Population and Employment Growth, 1970-1990
(3041 U.S. counties)

	net migration	population growth	civilian employment growth
net migration	1		
population growth	0.95	1	
civilian employment growth	0.81	0.88	1

C. Correlation of Net Migration Rate by Decade, 1950-1990
(3044 U.S. counties)

	1950-60	1960-70	1970-80	1980-90
1950-60	1			
1960-70	0.46	1		
1970-80	0.14	0.49	1	
1980-90	0.29	0.58	0.66	1

Net migration and all growth measures are average annual rates.

Supplemental Table 2: Base Specification (part 1 of 3)

	(1)	(2)	(3)	(4)	(5)	(6)
RHS Variables:	**Net Migration**		**Per Capita Income Growth**		**House Median Value Grwth**	
State Dummies	no	yes	no	yes	no	yes
center city dummy	-0.0030	-0.0025	-0.0008	-0.0008	-0.0011	-0.0010
	(0.0011)	(0.0011)	(0.0005)	(0.0005)	(0.0009)	(0.0008)
metro area dummy	0.0014	0.0019	0.0017	0.0017	0.0026	0.0027
	(0.0009)	(0.0009)	(0.0004)	(0.0004)	(0.0008)	(0.0007)
unemployment rate	-0.1035	-0.0650	-0.0623	-0.0376	-0.0799	-0.0469
	(0.0163)	(0.0151)	(0.0106)	(0.0098)	(0.0173)	(0.0170)
unemployment rate if >= 0.075	0.0579	0.0409	0.0158	0.0065	0.0451	0.0382
	(0.0105)	(0.0095)	(0.0059)	(0.0054)	(0.0107)	(0.0097)
% persons in poverty (linear)	0.0505	0.0560	-0.0221	-0.0088	0.0240	0.0186
	(0.0236)	(0.0231)	(0.0166)	(0.0149)	(0.0255)	(0.0224)
% persons in poverty (quadratic)	-0.0765	-0.0745	-0.0056	-0.0010	0.0174	0.0161
	(0.0163)	(0.0156)	(0.0101)	(0.0100)	(0.0157)	(0.0146)
% families in poverty	-0.0081	-0.0160	0.0646	0.0540	0.0172	0.0322
	(0.0181)	(0.0178)	(0.0129)	(0.0116)	(0.0190)	(0.0176)
% children in poverty	-0.0279	-0.0285	-0.0087	-0.0132	-0.0205	-0.0282
	(0.0114)	(0.0105)	(0.0074)	(0.0067)	(0.0122)	(0.0109)
% adults w/ high school education	-0.0244	-0.0136	-0.0100	-0.0035	-0.0302	-0.0171
	(0.0053)	(0.0051)	(0.0035)	(0.0036)	(0.0053)	(0.0051)
% adults w/ college education	0.0941	0.0855	0.0493	0.0414	0.0687	0.0488
	(0.0156)	(0.0154)	(0.0087)	(0.0083)	(0.0162)	(0.0149)
% persons 0 to 4 years old	-0.0130	0.0170	-0.0280	-0.0051	-0.0910	-0.0460
	(0.0400)	(0.0396)	(0.0225)	(0.0224)	(0.0364)	(0.0365)
% persons 5 to 13 years old	0.0532	0.0752	0.0297	0.0409	0.0186	0.0017
	(0.0256)	(0.0247)	(0.0161)	(0.0157)	(0.0250)	(0.0236)
% persons 14 to 17 years old	-0.0918	-0.0557	-0.0044	0.0094	-0.0126	0.0287
	(0.0322)	(0.0295)	(0.0185)	(0.0181)	(0.0310)	(0.0294)
% persons 18 to 21 years old	-0.0123	0.0029	-0.0150	-0.0126	-0.0026	0.0015
	(0.0136)	(0.0139)	(0.0075)	(0.0076)	(0.0127)	(0.0123)
% persons 65 or more years old	0.0991	0.1099	-0.0113	-0.0086	0.0129	-0.0018
	(0.0285)	(0.0279)	(0.0146)	(0.0148)	(0.0259)	(0.0246)
% persons 75 or more years old	-0.1561	-0.1250	0.0121	0.0251	-0.0120	0.0090
	(0.0442)	(0.0416)	(0.0217)	(0.0216)	(0.0414)	(0.0395)
% persons black (linear)	-0.0126	-0.0150	0.0042	0.0039	-0.0075	0.0087
	(0.0069)	(0.0068)	(0.0039)	(0.0038)	(0.0064)	(0.0060)
% persons hispanic (linear)	-0.0350	-0.0437	0.0021	0.0047	0.0078	-0.0008
	(0.0128)	(0.0132)	(0.0059)	(0.0057)	(0.0098)	(0.0090)
% persons black (quadratic)	-0.0270	-0.0445	-0.0028	-0.0178	0.0736	0.0085
	(0.0559)	(0.0551)	(0.0281)	(0.0252)	(0.0451)	(0.0364)
% persons hispanic (quadratic)	0.0046	-0.0070	-0.0015	-0.0161	0.0605	0.0294
	(0.0530)	(0.0525)	(0.0262)	(0.0234)	(0.0404)	(0.0322)
% persons, non-black, non-hispanic (quadratic)	0.0422	0.0626	-0.0048	0.0080	-0.0920	-0.0354
	(0.0581)	(0.0573)	(0.0289)	(0.0259)	(0.0463)	(0.0372)
% foreign born, 0 to 10 years	-0.0835	-0.0795	-0.0624	-0.0799	-0.0423	-0.0629
	(0.0349)	(0.0331)	(0.0240)	(0.0231)	(0.0374)	(0.0335)
% foreign born, 11 to 25 years	0.1097	0.1107	0.0479	0.0473	0.2113	0.1460
	(0.0685)	(0.0650)	(0.0342)	(0.0327)	(0.0618)	(0.0524)
% foreign born, 26 to 45 years	0.1145	0.1341	0.0028	0.0383	0.0401	-0.0266
	(0.1071)	(0.1030)	(0.0530)	(0.0503)	(0.1222)	(0.1072)
% foreign born, 46 or more years	-0.0356	0.0185	0.0208	0.0367	0.0178	0.0097
	(0.0346)	(0.0343)	(0.0197)	(0.0212)	(0.0420)	(0.0426)

Dependent variables are average annual rates over the 20-year period 1970 to 1990 (1969 to 1989 for income). Standard Errors in parantheses are robust to spatial correlation using the Conley spatial estimator discussed in the text and a quadratic weighting scheme which imposes independence for counties whose centers are more than 150 km apart. Quadratic variables have had mean removed prior to squaring.

Supplemental Table 2: Base Specification (continued, part 2 of 3)

	(1)	(2)	(3)	(4)	(5)	(6)
RHS Variables:	Net Migration		Per Capita Income Growth		House Median Value Grwth	
State Dummies	no	yes	no	yes	no	yes
% indus farming	-0.0086	-0.0111	0.0036	0.0029	-0.0035	-0.0037
	(0.0056)	(0.0054)	(0.0031)	(0.0034)	(0.0051)	(0.0052)
% indus non-farm agriculture	0.0693	0.0716	0.0185	0.0133	0.0414	0.0529
	(0.0192)	(0.0190)	(0.0107)	(0.0108)	(0.0179)	(0.0179)
% indus mining	-0.0498	-0.0459	-0.0148	-0.0104	-0.0021	0.0005
	(0.0064)	(0.0061)	(0.0030)	(0.0027)	(0.0057)	(0.0052)
% indus manufacturing	-0.0210	-0.0212	-0.0063	-0.0071	-0.0144	-0.0161
	(0.0042)	(0.0040)	(0.0022)	(0.0022)	(0.0041)	(0.0039)
% indus transportation and public utilities	-0.0522	-0.0463	-0.0217	-0.0174	-0.0299	-0.0273
	(0.0165)	(0.0143)	(0.0057)	(0.0054)	(0.0084)	(0.0077)
% indus wholesale trade	-0.0966	-0.0908	-0.0089	-0.0063	-0.0287	-0.0198
	(0.0148)	(0.0148)	(0.0078)	(0.0078)	(0.0143)	(0.0134)
% indus retail trade	-0.0248	-0.0276	-0.0212	-0.0222	-0.0084	-0.0180
	(0.0097)	(0.0094)	(0.0051)	(0.0051)	(0.0091)	(0.0083)
% indus finance, insurance, real estate	0.1350	0.1266	0.0323	0.0310	0.0144	0.0134
	(0.0166)	(0.0167)	(0.0083)	(0.0087)	(0.0149)	(0.0142)
% indus services	0.0194	0.0131	0.0054	0.0024	0.0126	0.0122
	(0.0081)	(0.0071)	(0.0039)	(0.0037)	(0.0072)	(0.0059)
% occup executive, admin, managerial	0.0767	0.0676	0.0163	0.0133	0.0256	0.0364
	(0.0159)	(0.0161)	(0.0090)	(0.0090)	(0.0157)	(0.0155)
% occup professional specialty	-0.0478	-0.0472	-0.0165	-0.0161	-0.0219	-0.0236
	(0.0173)	(0.0161)	(0.0098)	(0.0092)	(0.0168)	(0.0156)
% occup technicians and related support	0.2060	0.1795	0.1001	0.1021	0.1800	0.1651
	(0.0527)	(0.0507)	(0.0281)	(0.0269)	(0.0465)	(0.0447)
% occup sales	-0.0189	-0.0120	0.0074	0.0009	-0.0433	-0.0400
	(0.0186)	(0.0177)	(0.0107)	(0.0107)	(0.0191)	(0.0188)
% occup admin support, clerical	0.0227	0.0194	0.0059	0.0051	0.0357	0.0138
	(0.0131)	(0.0127)	(0.0072)	(0.0072)	(0.0124)	(0.0115)
% occup private household	-0.0695	-0.0691	0.0336	0.0345	-0.0188	-0.0298
	(0.0327)	(0.0310)	(0.0219)	(0.0203)	(0.0315)	(0.0302)
% occup protective service	0.0754	0.0632	0.0974	0.0965	0.1016	0.0473
	(0.0411)	(0.0392)	(0.0290)	(0.0292)	(0.0468)	(0.0465)
% occup other service	0.0279	0.0296	0.0273	0.0366	0.0251	0.0276
	(0.0117)	(0.0112)	(0.0069)	(0.0069)	(0.0124)	(0.0119)
% occup precision production, craft, repair	0.1134	0.1069	0.0337	0.0305	0.0557	0.0595
	(0.0113)	(0.0116)	(0.0066)	(0.0066)	(0.0111)	(0.0106)
% occup machine oprtrs, assmblrs, inspctrs	0.0325	0.0236	0.0147	0.0072	0.0366	0.0195
	(0.0081)	(0.0076)	(0.0047)	(0.0044)	(0.0081)	(0.0079)
% occup transportation and material moving	0.1016	0.0840	0.0284	0.0316	0.0962	0.1047
	(0.0201)	(0.0190)	(0.0116)	(0.0114)	(0.0179)	(0.0176)
serious crime rate (linear)	5.3E-08	-2.1E-07	6.5E-10	5.2E-08	-2.4E-06	-1.8E-06
	(3.9E-07)	(3.8E-07)	(2.1E-07)	(2.0E-07)	(3.9E-07)	(3.7E-07)
property crime rate (linear)	2.9E-06	2.9E-06	4.4E-07	4.1E-08	6.5E-06	4.6E-06
	(8.7E-07)	(8.6E-07)	(4.5E-07)	(4.3E-07)	(8.5E-07)	(8.0E-07)
violent crime rate (linear)	-9.8E-06	-9.1E-06	-2.8E-06	-3.0E-06	-2.0E-06	-2.1E-06
	(2.3E-06)	(2.2E-06)	(1.3E-06)	(1.2E-06)	(2.3E-06)	(2.1E-06)
serious crime rate (quadratic)	-3.1E-11	-5.5E-11	7.4E-12	-8.0E-12	1.2E-10	8.6E-11
	(6.4E-11)	(6.3E-11)	(2.7E-11)	(2.8E-11)	(5.3E-11)	(4.7E-11)
property crime rate (quadratic)	-2.3E-10	-1.5E-10	-1.7E-10	-8.0E-11	-9.6E-10	-6.8E-10
	(2.0E-10)	(1.9E-10)	(9.8E-11)	(9.1E-11)	(1.9E-10)	(1.6E-10)
violent crime rate (quadratic)	3.0E-10	-4.0E-10	3.4E-11	2.6E-10	-6.5E-11	-2.5E-10
	(2.1E-09)	(2.0E-09)	(1.5E-09)	(1.4E-09)	(2.3E-09)	(2.0E-09)

Dependent variables are average annual rates over the 20-year period 1970 to 1990 (1969 to 1989 for income). Standard Errors in parantheses are robust to spatial correlation using the Conley spatial estimator discussed in the text and a quadratic weighting scheme which imposes independence for counties whose centers are more than 150 km apart. Quadratic variables have had mean removed prior to squaring.

Excluded industries are construction and goverment (local, state, and federal). Excluded occupations are farming, forestry, fishing, and handlers, equipment cleaners, helpers, laborers.

Supplemental Table 2: Base Specification (continued, part 3 of 3)

	(1)	(2)	(3)	(4)	(5)	(6)
RHS Variables:	**Net Migration**		**Per Capita Income Growth**		**House Median Value Grwth**	
State Dummies	no	yes	no	yes	no	yes
ocean coast (log dist | presence)	1.8E-03	-4.3E-03	-9.0E-04	5.7E-04	-2.9E-03	3.0E-03
	(4.7E-04)	(1.2E-03)	(2.5E-04)	(6.0E-04)	(5.2E-04)	(1.1E-03)
great lake (log dist | presence)	-1.3E-04	-4.8E-03	5.5E-04	-1.1E-03	2.5E-03	-3.8E-03
	(4.6E-04)	(1.1E-03)	(2.4E-04)	(5.6E-04)	(5.3E-04)	(1.2E-03)
navigable river (log dist | presence)	1.1E-03	-2.1E-03	2.3E-04	-3.0E-04	8.0E-04	-1.9E-03
	(2.7E-04)	(5.2E-04)	(1.4E-04)	(3.0E-04)	(2.7E-04)	(6.0E-04)
january temperature (linear)	1.2E-03	1.2E-03	2.6E-04	3.1E-04	4.3E-04	7.7E-04
	(4.2E-04)	(4.3E-04)	(2.3E-04)	(2.3E-04)	(4.6E-04)	(4.4E-04)
april temperature (linear)	-1.4E-03	-1.7E-03	-4.6E-04	-5.3E-04	-4.1E-03	-1.0E-03
	(6.0E-04)	(6.7E-04)	(3.0E-04)	(3.3E-04)	(5.9E-04)	(6.6E-04)
july temperature (linear)	1.4E-03	1.5E-03	3.4E-04	-4.4E-05	6.7E-04	1.5E-04
	(5.5E-04)	(6.3E-04)	(3.0E-04)	(3.1E-04)	(6.7E-04)	(6.4E-04)
october temperature (linear)	-5.2E-04	-7.2E-04	-4.3E-04	-8.4E-05	2.9E-03	-3.0E-04
	(9.2E-04)	(1.0E-03)	(4.9E-04)	(5.1E-04)	(1.0E-03)	(9.6E-04)
january temperature (quadratic)	4.8E-05	5.9E-06	3.0E-05	8.0E-06	5.0E-05	4.2E-05
	(1.8E-05)	(1.9E-05)	(9.6E-06)	(1.1E-05)	(2.0E-05)	(2.0E-05)
april temperature (quadratic)	-1.5E-04	-2.5E-05	-6.1E-05	-4.0E-05	-5.9E-05	-2.9E-05
	(4.6E-05)	(5.4E-05)	(2.2E-05)	(2.5E-05)	(4.2E-05)	(4.6E-05)
july temperature (quadratic)	-8.2E-05	-8.0E-05	-1.7E-05	-1.2E-05	3.4E-05	7.2E-05
	(4.6E-05)	(4.5E-05)	(2.2E-05)	(2.0E-05)	(4.9E-05)	(3.7E-05)
october temperature (quadratic)	1.7E-04	9.5E-05	1.0E-05	3.9E-05	-8.6E-05	-1.1E-04
	(6.3E-05)	(6.7E-05)	(3.3E-05)	(3.5E-05)	(6.8E-05)	(6.4E-05)
january precipitation (linear)	6.6E-04	2.5E-04	2.2E-04	-8.1E-06	5.2E-04	1.5E-04
	(2.3E-04)	(2.7E-04)	(1.1E-04)	(1.4E-04)	(2.2E-04)	(2.6E-04)
april precipitation (linear)	-4.8E-04	-1.6E-04	6.4E-05	3.8E-04	2.6E-04	3.8E-04
	(2.7E-04)	(3.0E-04)	(1.3E-04)	(1.4E-04)	(2.6E-04)	(2.8E-04)
july precipitation (linear)	-4.6E-04	-8.2E-04	9.1E-05	-2.4E-04	-3.8E-04	-6.3E-04
	(1.3E-04)	(2.0E-04)	(6.4E-05)	(9.8E-05)	(1.3E-04)	(1.8E-04)
october precipitation (linear)	1.0E-03	1.3E-03	2.8E-04	2.1E-04	7.1E-04	1.0E-03
	(2.4E-04)	(3.1E-04)	(1.2E-04)	(1.6E-04)	(2.6E-04)	(3.1E-04)
january precipitation (quadratic)	-2.2E-05	-2.0E-05	-1.6E-05	-9.7E-06	-5.2E-05	-3.3E-05
	(9.7E-06)	(1.0E-05)	(5.7E-06)	(5.8E-06)	(1.2E-05)	(1.1E-05)
april precipitation (quadratic)	1.1E-05	5.9E-05	-4.1E-05	-1.4E-05	7.1E-06	9.8E-05
	(3.2E-05)	(4.2E-05)	(1.7E-05)	(2.1E-05)	(3.4E-05)	(3.8E-05)
july precipitation (quadratic)	8.1E-05	9.8E-05	-3.0E-05	-7.5E-09	-9.9E-06	5.0E-05
	(2.3E-05)	(2.6E-05)	(1.0E-05)	(1.3E-05)	(2.0E-05)	(2.3E-05)
october precipitation (quadratic)	-3.1E-05	-2.4E-05	-6.2E-06	2.6E-06	-3.4E-05	-3.5E-05
	(3.5E-05)	(4.0E-05)	(2.2E-05)	(2.3E-05)	(4.4E-05)	(3.9E-05)
slope percent	1.7E-04	9.4E-05	1.6E-04	1.5E-04	3.2E-04	4.0E-04
	(1.3E-04)	(1.2E-04)	(6.4E-05)	(6.1E-05)	(1.3E-04)	(1.2E-04)
altitude (linear)	-5.7E-06	-7.3E-06	-3.8E-07	-3.4E-06	-1.7E-06	-7.0E-06
	(2.4E-06)	(2.6E-06)	(1.3E-06)	(1.3E-06)	(2.5E-06)	(2.4E-06)
altitude (quadratic)	6.3E-09	5.1E-09	1.7E-09	2.7E-09	3.9E-09	5.9E-09
	(1.4E-09)	(1.7E-09)	(6.5E-10)	(7.8E-10)	(1.5E-09)	(1.5E-09)
N	2388	2388	2388	2388	2388	2388
R^2	0.600	0.649	0.500	0.559	0.593	0.660
Adjusted R^2	0.588	0.631	0.485	0.535	0.580	0.642
Sum of Squared Residuals	0.163	0.143	0.050	0.044	0.152	0.127
# of Independent Variables	73	120	73	120	73	120

Dependent variables are average annual rates over the 20-year period 1970 to 1990 (1969 to 1989 for income). Standard Errors in parantheses are robust to spatial correlation using the Conley spatial estimator discussed in the text and a quadratic weighting scheme which imposes independence for counties whose centers are more than 150 km apart. Quadratic variables have had mean removed prior to squaring.

Ocean coast, Great Lake, and navigable river variables are measured by log distance to the nearest of these from county centers when state dummies are not included (columns 1, 3, 5) and by a one/zero presence dummy when state dummies are included (columns 2, 4, 6).

Supplemental Table 3: Summary Statistics for Components of Government Expenditures and Revenue

Variable	Obs	Mean	Std Dev	Min	Max
Real Per Capita 1972 Expenditure Components ($1992)					
General Direct Expenditures	3037	1,161	474	91	8,757
Elementary and Secondary Education	3037	619	203	0	2,689
Higher Education	3037	14	75	0	2,232
Public Safety	3037	50	38	0	545
Public Health	3037	81	114	0	1,582
Public Housing	3037	15	46	0	685
Welfare, Total	3037	49	85	0	663
Welfare, Federal Categorical Programs	3037	22	55	0	580
Government Operations	3037	59	39	0	656
Highways	3037	124	105	0	1,248
Other Transportation	3037	5	17	0	343
Sewers	3037	19	38	0	770
Solid Waste Management	3037	9	10	0	126
Natural Resources	3037	12	28	0	523
Libraries	3037	5	8	0	174
Parks	3037	10	15	0	209
1972 Expenditure Components as % of General Direct Expenditures					
Elementary and Secondary Education	3037	0.56	0.12	0.00	0.99
Higher Education	3037	0.01	0.04	0.00	0.67
Public Safety	3037	0.04	0.02	0.00	0.30
Public Health	3037	0.07	0.08	0.00	0.60
Public Housing	3037	0.01	0.03	0.00	0.35
Welfare, Total	3037	0.04	0.05	0.00	0.37
Welfare, Federal Categorical Programs	3037	0.02	0.04	0.00	0.33
Government Operations	3037	0.05	0.02	0.00	0.46
Highways	3037	0.10	0.07	0.00	0.67
Other Transportation	3037	0.00	0.01	0.00	0.21
Sewers	3037	0.02	0.03	0.00	0.40
Solid Waste Management	3037	0.01	0.01	0.00	0.06
Natural Resources	3037	0.01	0.02	0.00	0.44
Libraries	3037	0.00	0.01	0.00	0.10
Parks	3037	0.01	0.01	0.00	0.19
Real Per Capita 1972 Revenue Components ($1992)					
Own-Sourced Revenue	3037	703	380	36	4,355
Tax Revenue	3037	502	317	23	4,248
Charges Revenue	3037	140	114	0	1,073
Miscellaneous Revenue	3037	61	80	0	1,859
Property Taxes	3037	458	310	18	4,212
General Sales Taxes	3037	14	30	0	364
Selective Sales Taxes	3037	7	15	0	281
License Taxes	3037	5	13	0	187
Income Taxes	3037	4	22	0	551
1972 Revenue Components as % of Own Revenue					
Tax Revenue	3037	0.70	0.14	0.12	0.99
Charges Revenue	3037	0.21	0.14	0.00	0.70
Miscellaneous Revenue	3037	0.09	0.07	0.00	0.85
1972 Tax Components as % of Total Taxes					
Property Taxes	3037	0.89	0.11	0.31	1.00
General Sales Taxes	3037	0.04	0.07	0.00	0.47
Selective Sales Taxes	3037	0.02	0.03	0.00	0.33
License Taxes	3037	0.01	0.03	0.00	0.39
Income Taxes	3037	0.01	0.04	0.00	0.49

Variables aggregate expenditures by and revenues from all local governments located within a county including the county government (if any), school districts, and any other special districts.

Supplemental Table 4: Local Growth and Components of Government Expenditure

RHS Variables:	(1) Net Migration	(2)	(3) Per Capita Income Growth	(4)	(5) Housing Median Value Growth	(6)
Controls For Government Size	no	yes	no	yes	no	yes
Percent Gen. Direct Expenditures on						
Higher Education	-0.0144	-0.0083	-0.0018	0.0001	-0.0093	-0.0081
	(0.0037)	(0.0039)	(0.0025)	(0.0026)	(0.0035)	(0.0037)
Public Safety	-0.0891	-0.1073	-0.0211	-0.0257	-0.0348	-0.0358
	(0.0162)	(0.0169)	(0.0086)	(0.0089)	(0.0136)	(0.0141)
Public Health	-0.0098	-0.0050	-0.0056	-0.0023	-0.0059	-0.0037
	(0.0025)	(0.0028)	(0.0013)	(0.0016)	(0.0020)	(0.0024)
Public Housing	-0.0192	-0.0128	-0.0080	-0.0045	-0.0204	-0.0204
	(0.0045)	(0.0046)	(0.0026)	(0.0027)	(0.0045)	(0.0047)
Welfare Total	-0.0077	-0.0090	-0.0055	-0.0050	0.0076	0.0071
	(0.0090)	(0.0089)	(0.0054)	(0.0053)	(0.0093)	(0.0093)
Welfare, Fed. Categorical Prgrms	-0.0060	-0.0051	-0.0151	-0.0138	-0.0326	-0.0338
	(0.0142)	(0.0143)	(0.0081)	(0.0081)	(0.0141)	(0.0140)
Government Operations	0.0035	-0.0022	0.0071	0.0031	0.0124	0.0133
	(0.0098)	(0.0091)	(0.0051)	(0.0057)	(0.0111)	(0.0118)
Highways	0.0015	0.0005	-0.0019	-0.0018	0.0119	0.0121
	(0.0049)	(0.0048)	(0.0028)	(0.0029)	(0.0047)	(0.0047)
Other Transportation	-0.0197	-0.0131	-0.0126	-0.0073	-0.0106	-0.0103
	(0.0147)	(0.0146)	(0.0075)	(0.0074)	(0.0140)	(0.0140)
Sewers	-0.0098	-0.0050	-0.0036	0.0003	-0.0102	-0.0102
	(0.0112)	(0.0110)	(0.0054)	(0.0053)	(0.0066)	(0.0068)
Solid Waste Management	-0.0782	-0.0857	-0.0456	-0.0483	-0.0936	-0.0935
	(0.0276)	(0.0276)	(0.0146)	(0.0147)	(0.0244)	(0.0244)
Natural Resources	0.0131	0.0181	-0.0117	-0.0103	-0.0246	-0.0222
	(0.0112)	(0.0112)	(0.0069)	(0.0069)	(0.0117)	(0.0117)
Libraries	-0.0311	-0.0367	-0.0271	-0.0292	-0.0730	-0.0732
	(0.0237)	(0.0232)	(0.0130)	(0.0132)	(0.0241)	(0.0241)
Parks	-0.0376	-0.0269	0.0110	0.0163	-0.0145	-0.0114
	(0.0195)	(0.0193)	(0.0095)	(0.0093)	(0.0175)	(0.0176)
N	2388	2388	2388	2388	2388	2388
R^2	0.665	0.670	0.570	0.582	0.672	0.673
Adjusted R^2	0.645	0.650	0.545	0.556	0.653	0.653
Sum of Squared Residuals	0.137	0.135	0.043	0.042	0.123	0.122
# of Independent Variables	134	138	134	138	134	138

Dependent variables are average annual rates over the 20-year period 1970 to 1990 (1969 to 1989 for income). Percent spending on elementary and secondary education is the excluded expenditure category. Variables included to control for government size (columns 2, 4, 6) are general direct expenditres and own-sourced revenue in log level and percent of income form. All regressions include a constant, dummies for each U.S. state, and the base control set of 73 independent variables enumerated in Table 3. Standard Errors in parantheses are robust to spatial correlation using the Conley spatial estimator discussed in the text and a quadratic weighting scheme which imposes independence for counties whose centers are more than 150 km apart.

Supplemental Table 5: Local Growth and Components of Government Revenue

	(1)	(2)	(3)	(4)	(5)	(6)
RHS Variables:	Net Migration		Per Capita Income Growth		Housing Median Value Growth	
Controls For Government Size	no	yes	no	yes	no	yes
Percent Tax Revenue from						
General Sales Taxes	-0.0037	-0.0041	-0.0026	-0.0025	-0.0108	-0.0112
	(0.0039)	(0.0038)	(0.0024)	(0.0023)	(0.0039)	(0.0040)
Selective Sales Taxes	-0.0320	-0.0318	-0.0125	-0.0125	-0.0171	-0.0167
	(0.0100)	(0.0100)	(0.0055)	(0.0053)	(0.0083)	(0.0082)
License Taxes	0.0026	-0.0089	0.0247	0.0229	0.0165	0.0094
	(0.0165)	(0.0165)	(0.0078)	(0.0078)	(0.0121)	(0.0122)
Income Taxes	-0.0220	-0.0177	-0.0041	-0.0015	-0.0176	-0.0154
	(0.0052)	(0.0053)	(0.0035)	(0.0036)	(0.0054)	(0.0055)
Percent Own Revenue from						
Charges	-0.0028	0.0018	-0.0027	-0.0005	-0.0022	0.0003
	(0.0018)	(0.0021)	(0.0009)	(0.0011)	(0.0015)	(0.0019)
Miscellaneous Revenue	0.0008	0.0059	0.0015	0.0017	0.0058	0.0083
	(0.0029)	(0.0032)	(0.0015)	(0.0018)	(0.0026)	(0.0030)
N	2388	2388	2388	2388	2388	2388
R^2	0.654	0.658	0.565	0.577	0.664	0.666
Adjusted R^2	0.635	0.639	0.541	0.552	0.646	0.647
Sum of Squared Residuals	0.141	0.140	0.043	0.042	0.126	0.125
# of Independent Variables	126	130	126	130	126	130

Dependent variables are average annual rates over the 20-year period 1970 to 1990 (1969 to 1989 for income). Percent revenue from property taxes and percent revenue from total taxes are the excluded categories from percent of taxes and percent of own revenue, respectively. Variables included to control for government size (columns 2, 4, 6) are general direct expenditres and own-sourced revenue in log level and percent of income form. All regressions include a constant, dummies for each U.S. state, and the base control set of 73 independent variables enumerated in Table 3. Standard Errors in parantheses are robust to spatial correlation using the Conley spatial estimator discussed in the text and a quadratic weighting scheme which imposes independence for counties whose centers are more than 150 km apart.

Supplemental Table 6: The Possibility of Reverse Causality from Net Migration to Local Attributes

A. Percent of Adults with High School Degree but No 4-Year College Degree

	1970	1980	1990
1970	1		
1980	0.94	1	
1990	0.81	0.90	1

	dx(70-80)	dx(80-90)
Intercept	-0.101	0.082
	(0.001)	(0.002)
Net Migration	-0.541	0.030
(70-80) | (80-90)	(0.059)	(0.092)
N	3,038	3,039
R^2	0.060	0.000

B. Percent of Adults with 4-Year College Degree

	1970	1980	1990
1970	1		
1980	0.92	1	
1990	0.88	0.96	1

	dx(70-80)	dx(80-90)
Intercept	0.039	0.021
	(0.001)	(0.001)
Net Migration	0.284	0.439
(70-80) | (80-90)	(0.051)	(0.042)
N	3,038	3,039
R^2	0.039	0.089

C. Percent of Workforce Unemployed

	1970	1980	1990
1970	1		
1980	0.70	1	
1990	0.64	0.67	1

	dx(70-80)	dx(80-90)
Intercept	0.023	-0.002
	(0.001)	(0.001)
Net Migration	0.017	-0.348
(70-80) | (80-90)	(0.034)	(0.057)
N	3,038	3,039
R^2	0.000	0.032

D. Percent of Population Classified as in Poverty

	1970	1980	1990
1970	1		
1980	0.89	1	
1990	0.84	0.89	1

	dx(70-80)	dx(80-90)
Intercept	-0.047	0.007
	(0.002)	(0.001)
Net Migration	-0.590	-0.655
(70-80) | (80-90)	(0.092)	(0.070)
N	3,038	3,039
R^2	0.028	0.059

Left hand side of table shows raw correlations by decade of the four local attributes. Right hand side shows the results from regressing the change in the local attribute (value at end of decade minus value at beginning of decade) on contemporaneous net migration (and a constant.) Standard errors in parentheses are robust to spatial correlation using the Conley spatial estimator discussed in the text with a weighting that declines quadratically to zero for counties whose centers are 150 km apart.

Supplemental Table 7: The Possibility of Reverse Causality from Net Migration to Government Fiscal Policy

A. General Direct Expenditures (per Capita, Real $)

	1972	1977	1982	1987
1972	1			
1977	0.76	1		
1982	0.77	0.79	1	
1987	0.73	0.74	0.86	1

	dG(72-77)	dG(82-87)
Intercept	-0.604	0.164
	(0.006)	(0.003)
Net Migration	-0.219	0.995
(70-80) | (80-90)	(0.334)	(0.243)
N	3,021	3,021
R^2	0.000	0.006

B. Current Expenditure As Percent of General Direct Expenditures

	1972	1977	1982	1987
1972	1			
1977	0.18	1		
1982	0.14	0.29	1	
1987	0.17	0.29	0.39	1

	dG(72-77)	dG(82-87)
Intercept	-0.155	-0.002
	(0.003)	(0.002)
Net Migration	-1.041	-1.146
(70-80) | (80-90)	(0.161)	(0.126)
N	3,021	3,021
R^2	0.014	0.027

C. Elementary and Secondary School Expenditures As Percent of General Direct Expenditures

	1972	1977	1982	1987
1972	1			
1977	0.58	1		
1982	0.70	0.62	1	
1987	0.65	0.58	0.80	1

	dG(72-77)	dG(82-87)
Intercept	-0.149	0.006
	(0.002)	(0.001)
Net Migration	0.145	0.086
(70-80) | (80-90)	(0.136)	(0.104)
N	3,021	3,021
R^2	0.000	0.000

D. Income Tax Revenue as Percent of Total Tax Revenue

	1972	1977	1982	1987
1972	1			
1977	0.88	1		
1982	0.83	0.92	1	
1987	0.81	0.94	0.95	1

	dG(72-77)	dG(82-87)
Intercept	0.006	0.003
	(0.000)	(0.000)
Net Migration	-0.081	0.022
(70-80) | (80-90)	(0.027)	(0.024)
N	3,021	3,021
R^2	0.003	0.000

E. Selective Sales Tax Revenue as Percent of Total Tax Revenue

	1972	1977	1982	1987
1972	1			
1977	0.79	1		
1982	0.66	0.82	1	
1987	0.59	0.72	0.85	1

	dG(72-77)	dG(82-87)
Intercept	0.008	0.005
	(0.000)	(0.001)
Net Migration	-0.014	0.058
(70-80) | (80-90)	(0.027)	(0.038)
N	3,021	3,021
R^2	0.000	0.001

Left hand side of table shows raw correlations of various government measures. Right hand side shows the results from regressing the change in government behaviour on contemporaneous net migration (and a constant.)

Figure 1: Persistence and Variability of Net Migration, 1950-1990

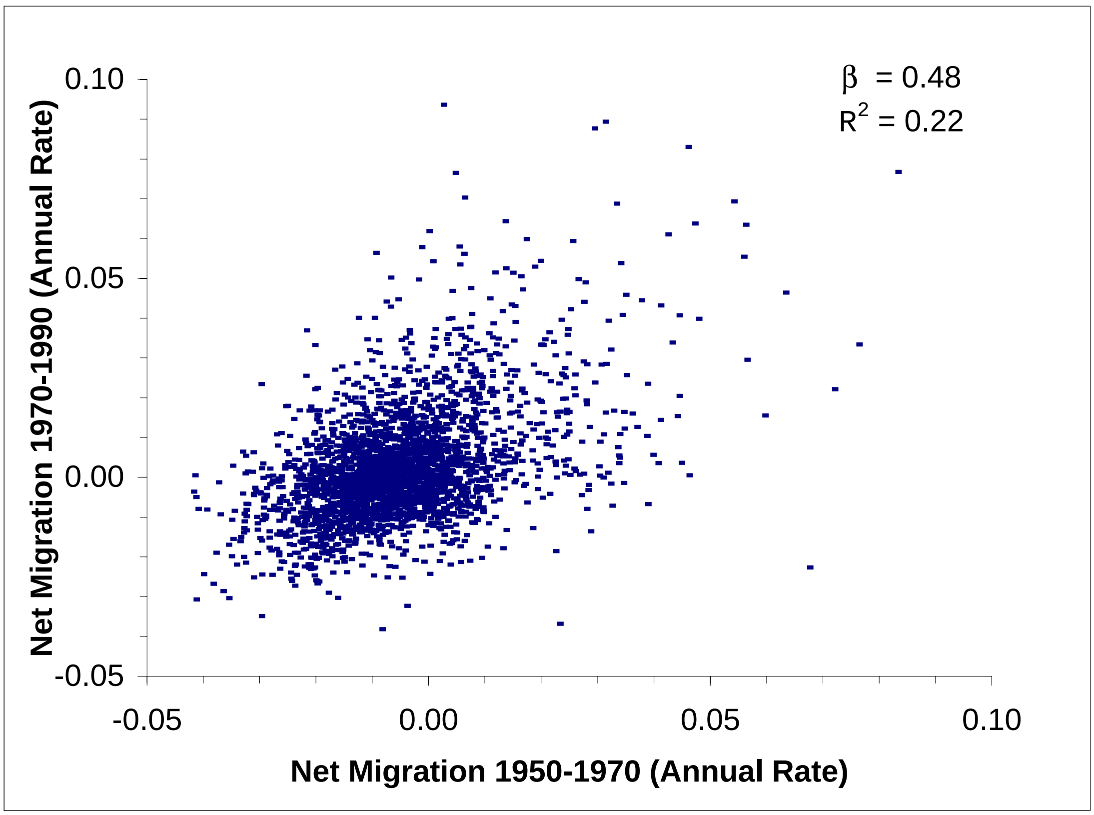
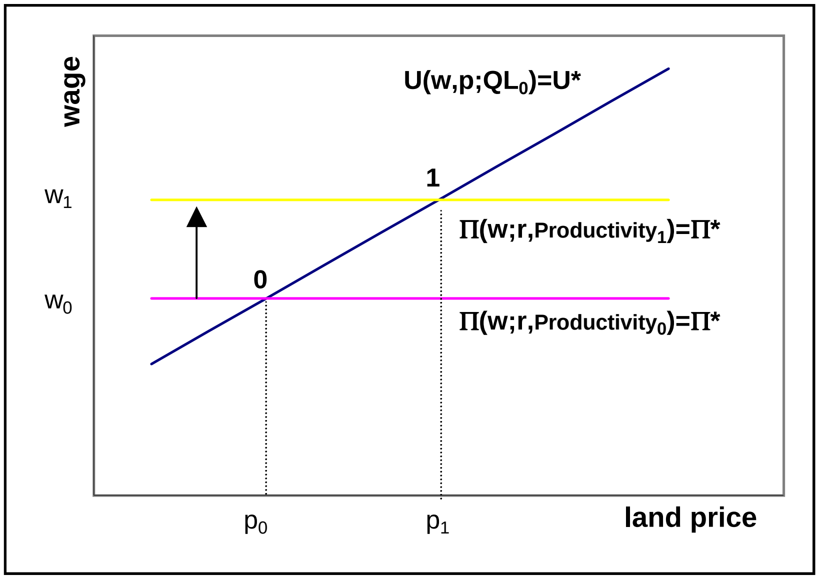


Figure 2: Compensating Wage and Land Price Differentials

A. Positive Change in Productivity



B. Positive Change in Quality of Life

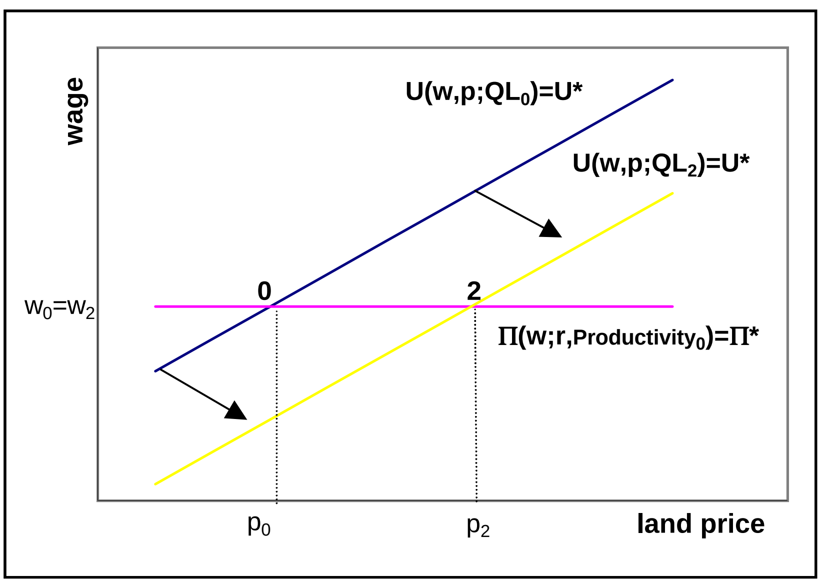


Figure 3: Dynamic Response to Shocks

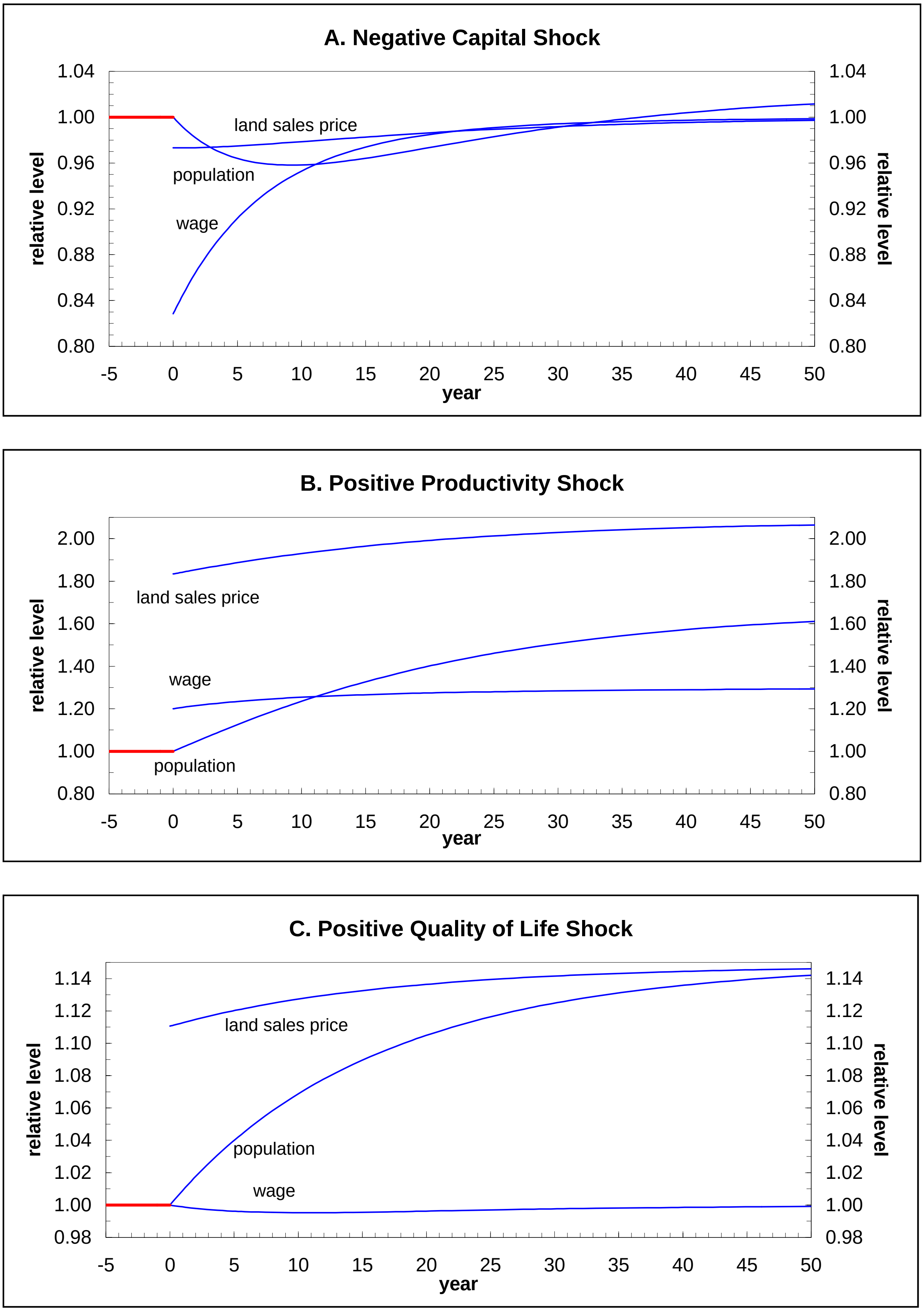
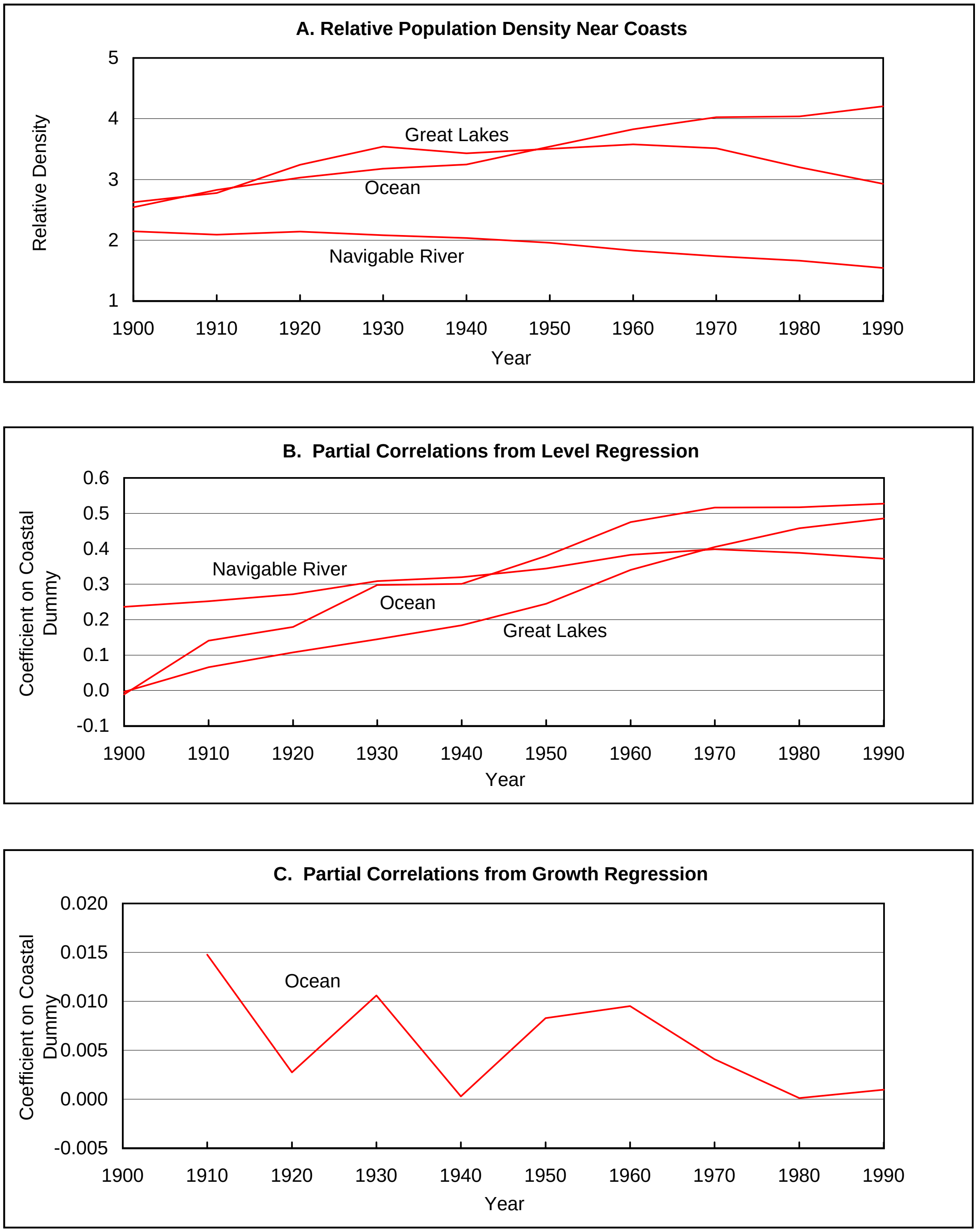


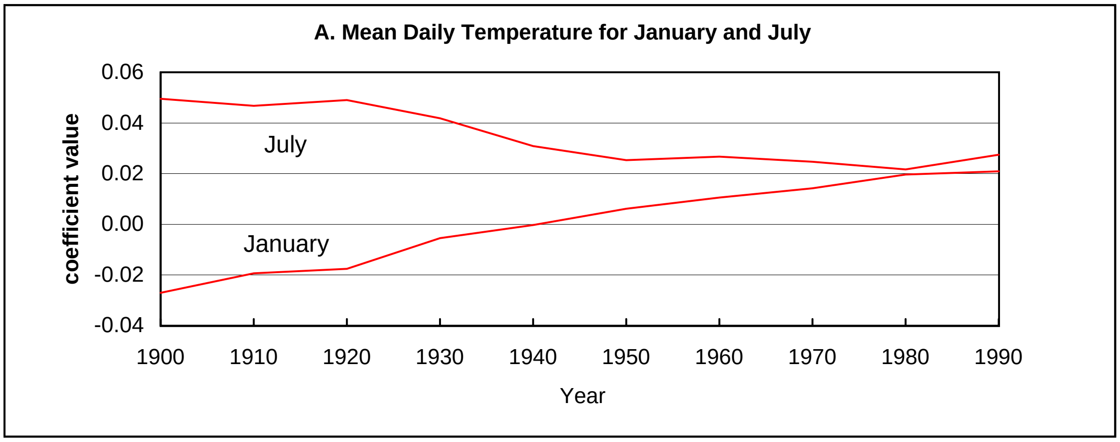
Figure 4: Population Density and Coastal Proximity, 1900 - 1990

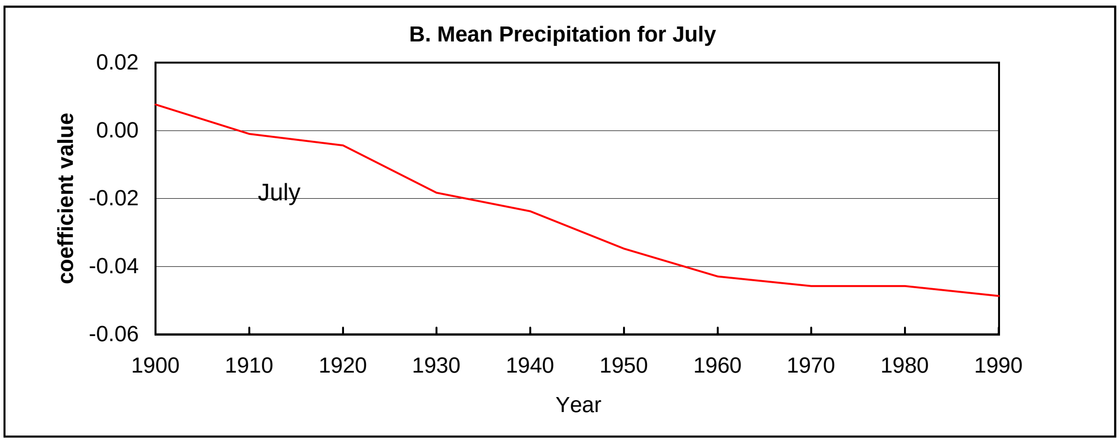


Regressions control for weather and topography as listed in Table 3. Ocean costal dummy is 1 if county center is within 80 km of ocean coast, 0 otherwise. Great Lake coastal dummy is 1 if county center is within 80 km of a Great Lake Coast, 0 otherwise. Navigable river coastal dummy is 1 if county center is within 40 km of a river navigable in 1970, 0 otherwise.

Figure 5: Population Density and Weather, 1900 - 1990

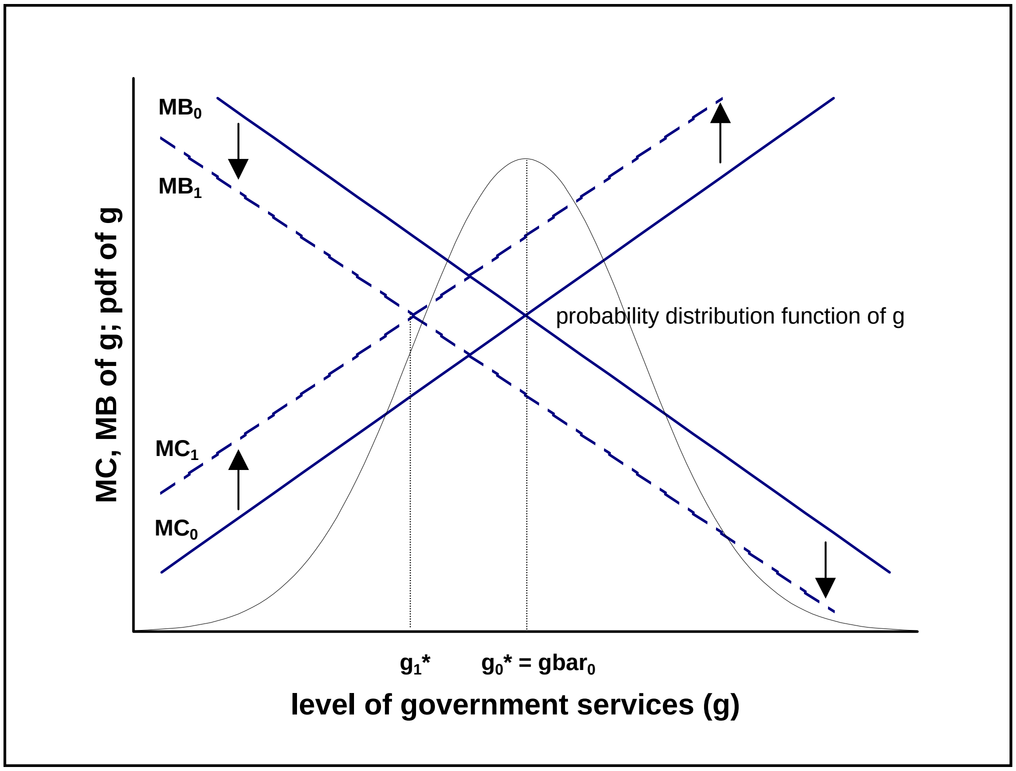
Partial Correlations from Level Regressions





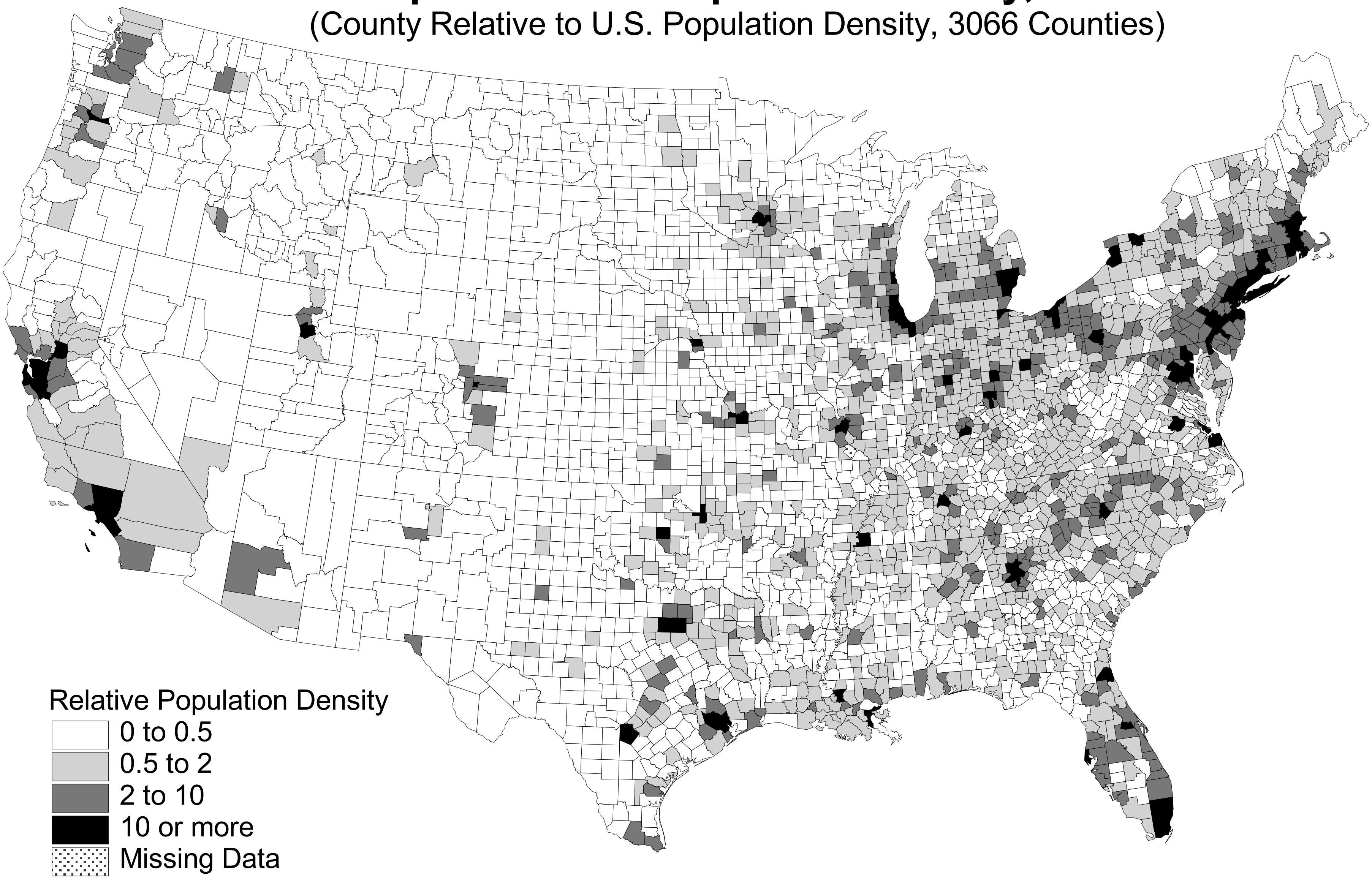
Regressions control for coastal proximity and topography as listed in Table 3. Panel A controls for linear and quadratic precipitation in January, April, July, and October. Panel B controls for linear and quadratic temperature in these same months. Weather variables are from Mendelsohn, Nordhaus, and Shaw (1994).

Figure 6: Shifts in Marginal Costs and Marginal Benefits of Local Government Service Provision



Map 1: Relative Population Density, 1990

(County Relative to U.S. Population Density, 3066 Counties)



Map 2: Net Migration 1970 to 1990

(Annual Rate of Net Migration; 3039 Counties)