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THE RISE OF THE SUNBELT

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ABSTRACT

In the last 50 years, population and incomes have increased steadily throughout much of the Sunbelt. This paper assesses the relative contributions of rising productivity, rising demand for Southern amenities and increases in housing supply to the growth of warm areas, using data on income, housing price and population growth. Before 1980, economic productivity increased significantly in warmer areas and drove the population growth in those places. Since 1980, productivity growth has been more modest, but housing supply growth has been enormous. We infer that new construction in warm regions represents a growth in supply, rather than demand, from the fact that prices are generally falling relative to the rest of the country. The relatively slow pace of housing price growth in the Sunbelt, relative to the rest of the country and relative to income growth, also implies that there has been no increase in the willingness to pay for sun-related amenities. As such, it seems that the growth of the Sunbelt has little to do with the sun.

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I. Introduction

In the 1930s, the American South seemed trapped in the poverty and relative decline that had marked that region since the Civil War. The eleven states of the former Confederacy were depicted by Faulkner as quaint remnants of a pre-modern world and by both Nazis and communists as embarrassing evidence of the limits to American freedom and economic opportunity. Since World War II, the South has been a great regional success. Figure 1 shows that the South's share of the U.S. population increased from 24 percent in 1950 to 30 percent today. In 1950, the average Southern county had an income that was 76 percent of the income in all counties. In 2000, the average Southern country's income was 94 percent of the average across all countries. The average housing price in Southern counties grew from 83 percent to 91 percent of the U.S. average between 1950 and 2000.

The rise of the Southern county is part of the general correlation between warmth and growth across the U.S. In this paper, we consider three different proxies for Sunbelt status: January temperature, July temperature and location in one of the states of the old Confederacy. Table 1 gives the cross-county correlations between our three proxies for Sunbelt status and the growth of income and housing values decade by decade. As Table 1 shows, the correlation between growth and January temperature was more than 10 percent in every post-war decade. Figure 2 shows the correlation across counties between population growth between 1950 and today and average January temperature over the period 1970-2000. Figure 3 shows the somewhat weaker relationship between income growth over the same period and mean January temperature. Figure 4 shows the robust relationship between housing price growth and January temperature, although some of that relationship is driven by improving housing quality in the Sunbelt.

While there can be little doubt that the Sunbelt boomed in the decades after World War II, the causes of this boom are less clear. In Section II, we discuss three broad hypotheses about the success of the South and the Sunbelt: increasing productivity, rising demand for Sunbelt amenities and a more flexible housing supply. Many authors from

McDonald (1961) to Caselli and Coleman (2001) have documented the remarkable economic performance of the South during the post-war era, and a strong economic growth should lead to population growth. Other authors have suggested that population growth in the Sunbelt reflects increasing demand for Southern amenities due to sun-biased technological change, such as the rise of air conditioning (Borts and Stein, 1964, Graves, 1980, Meuser and Graves, 1995). Our final hypothesis is that the South has grown not because it is more attractive or more productive, but because its housing supply is far more elastic, mainly due to a pro-development regulatory system (Glaeser, Gyourko and Saks, 2006).

Section III presents a Rosen-Roback framework that uses changes in population, income and housing prices to assess out the potential sources for Southern and Sunbelt growth. The model predicts that rising productivity will cause population, nominal income and housing prices to rise. When productivity increases, income will rise faster than housing prices and real incomes will also surge. Rising amenity levels or an increasing willingness to pay for the amenities of a location will cause population and housing prices to rise, but nominal and real incomes will fall. An increase in housing supply will cause population to rise, and both income and housing prices to fall.

The framework enables us to estimate the relative shocks to productivity, amenities and housing supply in the Sunbelt and the relative contribution of each type of shock to the growth of the region. The most problematic aspect of the model is that we are using a repeated static model to estimate a dynamic process, which ignores the forward looking aspects of housing prices.

In Section IV, we estimate the relationship between our proxies for Sunbelt status and the growth of population, income and housing. Since the quality changes in the housing stock of the South appear to be enormous, we use only those areas for which we have Office of Federal Housing Enterprise Oversight (OFHEO) repeat sales indices from 1980 onward. This limits us to 135 metropolitan areas, and as a result our results differ from the correlations in Table 1 because Table 1 includes all counties. We use Census median housing values for years before 1980.

In univariate regressions across metropolitan areas, each of these variables significantly predicts population growth in every decade since 1950, except for July temperature in the 1960s. Across metropolitan areas, the correlation between population growth and January temperature has, however, declined since the 1970s. The correlation between July temperature and growth has been rising. This change reflects the relative slowdown in the growth of California and the explosion of metropolitan areas like Las Vegas, Houston and Atlanta.

The correlation between income growth and the South dummy is strongly positive between 1950 and 1980, but that relationship has weakened since then. The correlations between income growth and the other two variables are less reliable. The correlation between these variables and housing price growth is generally quite weak, except for the 1970s, when housing price growth strongly rises with mean January temperature and declines with the South dummy.

These basic findings from metropolitan area aggregates are corroborated by Census micro data, which allows us to control for increases in the education level in the Sunbelt. Controlling for individual attributes using the micro data does not change the basic trend of rising real incomes in the South since 1970. When we control for local cost of living using American Chamber of Commerce indices, we also find that real incomes in the South have risen steadily since 1970. There is also an increasing correlation between July temperature and real income, but there is a declining correlation between January temperature and real income. These differences suggest, quite plausibly, that the amenity flows associated with warm Januarys are rising while the amenity flows associated with warm Julys are falling.

In Section V, we use the parameter estimates from these regressions to estimate the shocks to productivity, amenities and housing supply. We estimate strong positive shocks to productivity in the South between 1960 and 1980 and somewhat weaker shocks after then. The association between productivity growth and January temperature is strong between 1950 and 1990, and only disappears in the 1990s. The association between productivity and July temperature is strong between 1950 and 1980 and weaker after then.

The biggest surprise in this paper is that we estimate declining amenity flows in the South and in places with high July temperatures throughout the entire post-war period. A central insight of the Rosen-Roback model is that higher amenity levels must be offset by lower real wages in a spatial equilibrium. Declining amenity flows are therefore implied by rising real incomes. One objection to this inference is that real incomes may be rising because of improvements in human capital, but over much of the recent period, rising real incomes reflect low housing price growth more than strong income growth. While the amenity flows associated with the South and with July temperatures have uniformly fallen, the amenity value of a warm January rose in the 1960s and 1970s. California, for example, appears to have had robust amenity flow increases as its real wages have generally fallen since 1970. However, most of the Sunbelt is not California, and in most areas housing prices have increased far more modestly than income.

We estimate dramatic relative housing supply growth in the South and in places with warm Julys between 1970 and 1990. We infer housing supply increases between the stock of housing rose dramatically but prices did not. Putting these estimates together, we find that population growth in the Sunbelt was driven primarily by productivity increases between 1950 and 1980, but since then, housing supply has played an increasingly important role in the growth of the Sunbelt.

The rise of Southern productivity has been well studied, but there has been far too little attention paid to the fact that housing supply is growing so quickly in the South. In the penultimate section of the paper, we attempt unsuccessfully to explain the high level of Southern construction with factors like lower initial land density and governmental fragmentation. Section VII concludes.

II. Why Did the South Rise Again?

There are three natural explanations for the population growth of the South since 1950. First, the region may have become more economically productive. Second, the region may have become a more attractive place to live. Third, the region might be particularly good at producing new housing. We first discuss these three hypotheses and in the next section, we present an empirical methodology that will allow us to apportion credit for the South's success to various factors.

Many economists have offered different explanations for the rise in Southern income levels. Barro and Sala-I-Martin (1992) emphasize the greater accumulation of capital in once-backward places. As late as 1940, the South was certainly still backward. Caselli and Coleman (2001) present a related theory focused on the structural transformation out of agriculture into industry. Since the South was much more agricultural in 1940, it transformed more quickly. Another view is that the northern productivity edge came from access to waterways and a dense railroad network which became increasingly irrelevant as transportation costs plummeted during the 20th century (Glaeser and Kohlhase, 2004).[1]

Other authors connect the improvements in the Southern economy to changing political institutions. Besley, Persson and Sturm (2005) emphasize the rise of political competition that followed the end of the Jim Crow South. Cobb (1982) also points to the end of the Jim Crow South, but emphasizes the switch from leaders who cared about white supremacy to leaders who cared about subsidizing industry. Holmes (1997) presents particularly compelling evidence on the importance of Southern Right-to-Work laws. Olson (1983) suggests that Southern pro-growth policies reflect a lack of anti-growth interest groups in the South.

[1] The long and distinguished literature on the economic development of the post-war South includes Borts and Stein (1964), Chinitz (1986), Garrett (1968), Hulton and Schwab (1984), McDonald (1961), Newman (1982) and Wright (1987).

We will not try to distinguish between the many different theories of Southern economic development, but we will assess the relative importance of economic development and an alternative view that emphasizes consumption and amenities more than production. According to this view, Southern cities were relatively unpleasant places to live at the start of 20th century. High levels of heat made summers oppressive and helped the spread of disease. The South also lagged the north in the provision of clean water. Improvements in public health and technological change, such as the introduction of air conditioning, have made the South a far more attractive place to live. Southern cities, since they are newer, may also have an advantage at adapting to the automobile. It is also possible that as society got richer, people were willing to sacrifice more to live in more pleasant, sunnier climes (Meuser and Graves, 1995). According to this view, the South's growth has been driven by improved consumer amenities, not by productivity.

The third hypothesis is that the increases in Southern population reflect neither increases in Southern productivity nor Southern amenities but rather a greater Southern tolerance for new construction (Glaeser, Gyourko and Saks, 2005). Permitting is certainly abundant in some Southern metropolitan areas; in 2005, three of the five metropolitan areas that had the most permits were Atlanta, Dallas and Houston. In an extreme version of this view, all of America experienced rising housing demand but the supply of housing was much more elastic in the South. Since housing supply was more flexible, more homes were built and more people came to live in the South.

More elastic housing supply could, in principle, come from either a greater availability of land or a more permissive regulatory environment. Southern cities might have more land because they began with less density or because they have fewer natural barriers, like rivers, that limit development. Alternatively, the difference in permitting behavior could be the result of different regulatory environments. Houston, for example, famously lacks zoning. Stringent regulatory environments appear to have played a major role restricting growth in many areas outside of the South (Glaeser, Gyourko and Saks, 2005). One view is that the same political forces that gave the South a political regime that favored economic growth also gave the South a regime that favored new construction.

This discussion has emphasized the growth of the South, but the same three basic hypotheses can also explain the growth of places with high January and July temperatures. Since the colder regions of the country developed first, productivity increases could have been faster in warmer places. There could certainly be an increased demand for the amenities of January or July temperature and it is certainly plausible that housing supply increased disproportionately in warm areas. It is, of course, more plausible that people developed a stronger taste for high January temperatures than for July temperatures. Our three measures of the Sunbelt status are not identical, and for that reason we estimate our decomposition for each measure separately.

III. A Decomposition of the Sources of Sunbelt Growth

We now turn to a formal framework that will enable us to assess the relative importance of productivity growth, amenity growth and housing supply growth to the expansion of the Sunbelt. We start with a simple spatial equilibrium model that assumes that firms and workers are indifferent across space at all points in time. As opposed to Meuser and Graves (1995), we simplify and do not worry about forward looking behavior or forward looking housing prices.

Every location in the U.S. is characterized by a location specific productivity level of A and firm output equals $AN^{\beta}K^{\gamma}Z^{1-\beta-\gamma}$, where A represents a city specific productivity level, N represents the number of workers, K is traded capital, and Z is non-traded capital. Traded capital can be purchased anywhere for a price of one. The location has a fixed supply of non-traded capital equal to $\overline{Z}$. Firms behave competitively which delivers a labor curve from the firms' first order conditions:

$$\beta A^{\frac{1}{1-\gamma}}\gamma^{\frac{\gamma}{1-\gamma}}N^{\frac{\beta+\gamma-1}{1-\gamma}}\overline{Z}^{\frac{1-\beta-\gamma}{1-\gamma}}=W .$$

Consumers have Cobb-Douglas utility functions defined over tradable goods (sold at a fixed price of one) and a non-traded housing, denoted H, or $\theta C^{1-\alpha} H^{\alpha}$. Optimizing behavior yields the indirect utility function $\alpha^{\alpha}(1-\alpha)^{1-\alpha}\theta W p_H^{-\alpha}$. We assume that a spatial equilibrium must hold at all points in time, which implies that this welfare level must equal a reservation utility level, denoted U.

Housing is produced competitively with height, denoted h, and land, denoted L. The total quantity of housing supplied equals hL. There is a fixed quantity of land in the location which is denoted, $\overline{L}$, which will determine an endogenous price for land, denoted p_L, and housing, denoted p_H. The cost of producing hL units of structure on top of L units of land is $c_0 h^{\delta} L$. Given these assumptions, the profits to a developer of producing hL units of housing is $p_H hL - c_0 h^{\delta} L - p_L L$, where $\delta > 1$. The first order condition for height, $p_H = \delta c_0 h^{\delta-1}$, implies a total housing supply equation of $h\underline{L} = \left(p_H / \delta c_0\right)^{\frac{1}{\delta-1}} \underline{L}$. Free entry of developers implies that $p_H h = c_0 h^{\delta} + p_L$, which delivers housing prices as a function of population and income: $p_H = \delta^{\frac{1}{\delta}} c_0^{\frac{1}{\delta}} \left(\frac{\alpha N W}{\overline{L}}\right)^{\frac{\delta-1}{\delta}}$.

Together the firms' labor demand equation, the equality between indirect utility in the town and reservation utility, and the housing price equation, are three equations with three unknowns (population, income and housing prices). Solving these equations for the unknowns gives us:

$$(1)\ \ Log(N) = K_N + \frac{(\delta + \alpha - \alpha\delta)Log(A) + (1-\gamma)\left(\delta Log(\theta) + \alpha(\delta - 1)Log(\overline{L})\right)}{\delta(1-\beta-\gamma) + \alpha\beta(\delta-1)}$$

$$(2)\ \ Log(W) = K_W + \frac{(\delta-1)\alpha Log(A) - (1-\beta-\gamma)\left(\delta Log(\theta) + \alpha(\delta-1)Log(\overline{L})\right)}{\delta(1-\beta-\gamma) + \alpha\beta(\delta-1)} \text{ and}$$

$$(3)\ \ Log(p_H) = K_P + \frac{(\delta-1)\left(Log(A) + \beta Log(\theta) - (1-\beta-\gamma)Log(\overline{L})\right)}{\left(\delta(1-\beta-\gamma) + \alpha\beta(\delta-1)\right)}$$

where K_N, K_W and K_P are constant terms that differ across cities but not within a city over time. Innovations to productivity, amenities and housing supply are characterized by the growth equations $Log(A_{t+1}/A_t) = K_A + \lambda_A S + \mu_A$, $Log(\theta_{t+1}/\theta_t) = K_\theta + \lambda_\theta S + \mu_\theta$, and $Log(\overline{L}_{t+1}/\overline{L}_t) = K_L + \lambda_L S + \mu_L$, where K_A, K_θ and K_L are constants, λ_A, λ_θ and λ_L are coefficients, μ_A, μ_θ and μ_L are error terms, and S is a variable reflecting Sunbelt status. Equations (1) –(3) then imply:

$$(4)\ \ Log\left(\frac{N_{t+1}}{N_t}\right) = K_{\Delta N} + \chi^{-1}\left((\delta + \alpha - \alpha\delta)\lambda_A + (1-\gamma)(\delta\lambda_\theta + \alpha(\delta-1)\lambda_L)\right)S + \mu_N$$

$$(5)\ \ Log\left(\frac{W_{t+1}}{W_t}\right) = K_{\Delta W} + \chi^{-1}\left((\delta-1)\alpha\lambda_A - (1-\beta-\gamma)(\delta\lambda_\theta + \alpha(\delta-1)\lambda_L)\right)S + \mu_W$$

$$(6)\ \ Log\left(\frac{P_{t+1}}{P_t}\right) = K_{\Delta P} + \chi^{-1}(\delta-1)(\lambda_A + \beta\lambda_\theta - (1-\beta-\gamma)\lambda_L)S + \mu_P$$

where $\chi = \left(\delta(1-\beta-\gamma) + \alpha\beta(\delta-1)\right)$. The coefficients on the Sunbelt variable give us three equations which imply three values for λ_A, λ_θ and λ_L given values α, β, γ and δ. Specifically if $\hat{B}_N$, $\hat{B}_W$ and $\hat{B}_P$ represented the estimated coefficients on the South dummy for the population, wage and price change regressions, then

$$\lambda_A = \left((1-\beta-\gamma)\hat{B}_N + (1-\gamma)\hat{B}_W\right),\ \lambda_\theta = \alpha\hat{B}_P - \hat{B}_W \text{ , and } \lambda_L = \hat{B}_N + \hat{B}_W - \frac{\delta\hat{B}_P}{\delta-1}.$$

The equation for λ_A tells us that the estimated productivity change combines labor and land's share of output times the coefficient in the wage regression with land's share of output times the coefficient in the population regression. The coefficient for λ_θ tells us that this equals housing's share of consumption times the coefficient in the housing price regression minus the coefficient in the income regression. This coefficient should also equal the coefficient in a real wage regression, since real wages essentially equal $\alpha^\alpha(1-\alpha)^{1-\alpha}\theta W p_H^{-\alpha}$. The coefficient on labor supply equals the coefficient in the population regression plus the coefficient in the income regression minus $\frac{\delta}{\delta-1}$ times the coefficient in the price regression.

In the next section, we present our estimates of $\hat{B}_N$, $\hat{B}_W$ and $\hat{B}_P$. Section V then uses these estimates to estimate λ_A, λ_θ and λ_L, and the relative contribution of productivity, amenity and housing supply to the population growth of the Sunbelt.

IV. Population, Housing Price and Income Growth in the Sunbelt

We now turn to the correlations between our three different proxies for Sunbelt status and population, housing price and income growth. We restrict our attention to a set of 135 metropolitan areas for which OFHEO price indices are available since 1980. Changes in Southern housing quality are large enough so that we believe that it is necessary to use these indices which allegedly correct for changes in housing quality. Our results on population and income changes are robust to including more metropolitan areas. Including more non-metropolitan area counties does reduce the correlation between July temperature and growth, which can be seen by comparing Table 1 to our regression tables.

When we turn to income and housing price growth, we use data from the Census Individual Public Use Micro Sample (IPUMS). With the aggregate data, we will be able to consider the entire post-war period from 1950 to 2000. With individual data, we will only consider the period between 1970 and 2000.

Population Growth

Table 2 examines population growth in the Sunbelt. The table follows a basic structure that we will repeat in Tables 3 and 5. Each column refers to a separate decade-level regression where the change in the logarithm of population is regressed on our proxies for Sunbelt status. The rows of the table represent results from four different regressions for each decade. The first regression includes only an intercept and a dummy variable that takes on a value of one if the metropolitan area is located in one of the states of the old Confederacy. The second regression includes an intercept and a continuous variable capturing the average January temperature. The units of temperature are hundreds of degrees. The third regression includes an intercept and a continuous variable capturing the average July temperature. The fourth regression includes all three proxies for Sunbelt status simultaneously. We will use the first three regressions in our decomposition. The fourth regression helps us to recognize the differences between the different proxies for location in the Sunbelt.

The first column of the table characterizes population growth in the 1950s. During this period, January temperature predicts population growth much more strongly than either of the other two Sunbelt proxies. The first regression shows that metropolitan areas in the South grew .041 log points faster than non-Southern metropolitan areas in the 1950s. This coefficient is positive, small and statistically insignificant. The second regression shows that in the 1950s, ten extra degrees of January temperature are associated with a .084 log point increase in population growth. Mean January temperatures explain more than one-fifth of the variation in metropolitan area growth rates in the 1950s. The third regression shows that a ten degree increase in July temperatures is associated with an increase in the growth rate of about five percent. The relationship is not statistically significant and explains only two percent of the variation in metropolitan area growth.

The final regression combines all three variables. The estimated coefficients on January and July temperatures both increase in magnitude. The estimated coefficient on location in the South switches sign and becomes both significant and negative. This regression suggests that the immediate post-war growth of the South was really associated with the success of warm places generally. If anything, the South substantially underperformed relative to other warm places.

The second column gives results for the 1960s. All three proxies for Sunbelt status become weaker during this decade. The coefficient on July temperature flips signs. Only the mean January temperature variable remains robustly positive and continues to explain about 15 percent of the variation in population growth, but even the impact of this variable is only about 50% of its value in the 1950s. In the multivariate regression, July temperature and the South dummy have a negative effect.

The impact of the South dummy on population growth gets substantially stronger after 1970. The estimated coefficient in the third regression is .086, which implies that Southern areas grew almost 9 percent faster than their northern equivalents during the 1970s. In columns (4) and (5), the South dummy variable has a significant coefficient of approximately .06 in the 1980s and .065 in the 1990s. The growth of the South is particularly a post-1970 phenomenon, which seems to support the idea that the Civil Rights era was a watershed in the history of the South.

The effect of mean January temperature is strong in both the 1970s and 1980s, explaining 34 percent of the variation in population growth in the 1970s and 38 percent of the variation in population growth in the 1980s. The coefficients of .73 and .64 tell us that a ten degree increase in January temperature is associated with population increasing by about seven percent more in each decade. In the 1990s, the coefficient on January temperature declined to .31 and the r-squared of the regression declined to fourteen percent. January temperature became a less potent predictor of population after 1990.

The opposite pattern holds for July temperature which became a more significant predictor of growth in the 1990s than it had been before then. A ten degree increase in July temperature was associated with about four percentage points increase in growth in the 1970s and 1980s, but about five percentage points increase in growth in the 1990s. The r-squared of July temperature increased between 1980s and 1990s. July temperature remains a less important predictor of population growth than January temperature but the gap between the two variables is closing.

The fourth multivariate regression shows that the South never grows particularly quickly when we control for the other temperature variables. As such, we can ask what explains the disproportionate growth of the South, but not what explains the growth of the South, holding warmth constant. The coefficients on January and July temperature show the same patterns as the univariate regressions. January temperature becomes much less significant in the 1990s. July temperature becomes more significant over time. We will look for this pattern when we turn to other variables.

Income Growth

To examine the correlation between income growth and location in the Sunbelt, we use two related methodologies. First, using the same sample of metropolitan areas as we did in the population growth regressions, we regress the difference in the logarithm of median income on our three measures of Sunbelt status decade-by-decade. While these regressions enable us to look at the entire post-war period, they do not enable us to control for the changes in the human capital of the South, or changes in the returns to human capital.

To control for observable measures of human capital, we also run regressions of the form:

(7) Log(Annual Income)=Year Dummies + Sunbelt Status + Sunbelt Status*Year Dummies + Human Capital Measures + Human Capital Measures* Year Dummies

By controlling for human capital measures, which include age and race dummies, and a fourth order polynomial in years of schooling we can control for human capital differences across the U.S. The interactions between these variables and the year dummies allow the returns to human capital to change over time. We run regressions including only males between 25 and 55 years of age who work more than 40 weeks per year, 35 hours per week and who have earnings above 50 percent of the earnings of someone who works full time over the year and earns the minimum wage. We have also run a set of regressions using a more restricted set of metropolitan areas where we have American Chamber of Commerce Research Assocation (ACCRA) indices of local costs of living.

Table 3 presents our basic income growth regressions. Just as in the case of Table 2, the columns give results for an independent regression for each decade. The rows give results for our different proxies for Sunbelt status. In the 1950s, income in the South grew by almost three percent more than income in the rest of the country. In the 1960s and 1970s, Southern incomes truly soared, growing by almost eight percent and more than six percent in the two decades respectively. During these decades, the South dummy explains between 19 and 27 percent of the variation income growth across metropolitan areas. In the 1980s and 1990s, income growth in the South was far more modest. In the 1980s, there is almost no significant correlation between the South dummy and growth. In the 1990s there was about 1.8 percent higher growth in the South.

The temporal pattern for income growth is almost the exact opposite of the temporal pattern for population growth. The connection between population growth and location in the South increased after 1980. The connection between income growth and location in the South decreased after that date. Only in the 1970s did Southern location strongly predict both income and population growth. This timing mismatch is a clue that different processes might have been driving Southern success in the early post-war period and in the more modern period.

The second set of regressions in Table 3 look at the generally weak correlation between income growth and mean January temperature. In the 1950s, 1970s and 1980s, a 10 degree increase in January temperature is associated with income growth between .01 and .014 log points. In the 1960s and the 1990s, higher January temperature is negatively associated with income growth. These findings suggest that the strong correlation between January temperature and population growth is probably not the result of a connection between January temperature and productivity growth.

The third set of regressions use July temperature as the proxy for Sunbelt status. The pattern for this variable is similar to the pattern for the South dummy. Between 1950 and 1980, July temperature positively predicts income growth. A ten degree increase in July temperature is associated with an income growth of about two percent in each decade. After 1980, there is small and negative correlation between July temperature and growth. Since the correlation between population growth and July temperature is strongest for the later period when the correlation between income growth and July temperature is weakest, we are again led to the view that different forces may be driving the early and late time periods in our data.

The last set of regressions includes all three variables. In these regressions, the partial effect of location in the South is always positive, but much smaller in the 1950s and 1980s, than it is in the other three decades. The South's strongest decade was the 1960s where incomes grow about 12 percent more than the rest of the country. The effects of January temperature and July temperature follow a similar pattern to the univariate regressions.

Table 4 produces our results for the individual income regressions. The first regression uses MSA data for the 86 MSAs that appear in the IPUMS data for all four decades. The first regression shows the coefficient on location in the South and then how that correlation changes over time. The coefficient on Southern location of -.107 implies that incomes were .107 log points lower in the South than in the rest of the country in 1970, even controlling for education, age and race variables. The interaction between Southern location and a post-1980 dummy variable tells us that Southern incomes rose by .041 log points in the 1970s. During the 1970s, over one third of the wage difference between the South and the rest of the U.S. disappeared. After that point, wage gains for the South were uneven. The South closed ground with the rest of the U.S. in the 1970s, but has essentially stayed flat since then, suggesting that productivity growth in the South may have tapered off after 1980.

A comparison of these regressions with the previous income change regressions suggests that controlling for human capital measures does not change our results substantially. The individual level regressions suggest somewhat less income growth than the straight income change regressions in the 1970s and somewhat more income growth in the 1990s. Both approaches show little income growth in the 1980s.

The next two regressions show results for real wage changes. In the second regression, we include results for the entire four decade period. In this case, we are restricted to the 22 metropolitan areas for which we have local price data for the entire period. In the third regression, we provide results only for 1990 and 2000, which allows us to increase the sample to 68 metropolitan areas.

The second regression suggests that real incomes, controlling for human capital, were actually higher in the South than in the non-South in 1970. Lower Southern wages were more than offset by lower Southern prices. The Rosen-Roback framework infers from this fact that the South had lower amenities in 1970, which is certainly plausible. The coefficient on the interaction between the South dummy and the dummy for years after 1980 is .028, which suggests a modest rise in real income in the South in the 1970s. The coefficient on the interaction between the South dummy and the dummy for years after 1990 is slightly lower at .020. The interaction between the South dummy and the year 2000 is .081 which suggests that real incomes rose even more steeply in the 1990s.

In the third regression, with its much larger sample, we estimate a basic coefficient on Southern location of .032. This means that the real wage gap between South and non-South was smaller in this more inclusive sample than in the more restricted sample. The coefficient on the interaction between the South dummy and the year 2000 dummy is .087, which is quite similar to the .081 coefficient estimated in the second regression. Both specifications suggest that real incomes soared in the South in the 1990s, driven both by rising nominal incomes and declining price levels relative to the non-South.

These regressions imply that the rise of the South has been accompanied by declining, not rising, amenity levels. Higher real wages in the South in 1970 suggest that amenities were initially lower. The continuing rise in real wages must mean that the willingness to pay for Southern amenities declined relative to the willingness to pay for amenities in the non-South. There may certainly be infra-marginal migrants who are drawn to the South for its amenities, but the marginal migrant is presumably drawn by something else. These results are quite compatible with the view of Mueser and Graves (1995) that rising incomes made paid willing to pay more for more attractive locales, since the South started off as a low amenity area.

The middle panel of Table 4 examines the relationship between January temperature and wages. The first regression in this panel shows the coefficient on January temperature and its interactions with three time dummies. The coefficient on January temperature itself, -0.188, indicates that in 1970, as temperature increased by 10 degrees, wages fell by about 2 percent. Thirty years ago, places with warm winters had slightly lower wages.

The coefficient on the interaction between January temperature and the post-1980 dummy variable shows a coefficient of -.014, which means that as the January temperature increased by 10 degrees, wages fell by .1 percent. This wage change is very small and negative, and is quite different from the income growth associated with January temperature in the 1970s in Table 3. The best explanation for this discrepancy is that income growth in places with warm Januarys in the 1970s reflected significant human capital upgrading. The coefficient on January temperature and the post-1990 dummy variable is .039, which means that as the January temperature increased by 10 degrees, wages increased by .3 percent. The coefficient on January temperature on the year 2000 dummy is negative, but small and insignificant. These regressions show that lower incomes are no longer associated with warmer January temperatures.

The second regression in the middle panel gives our income results for the 22 metropolitan areas for which we have cost of living indices since 1970. The raw coefficient on January temperature is positive, suggesting that real wages were slightly higher in these warmer places in 1970. A ten degree increase in January temperature was associated with a 1.25 percent increase in wages. The interaction between January temperature and the post-1980 variable is .138 with a ten degree increase in January temperature increasing wages by 1.38 percent, suggesting that the positive connection between real wages and mean January temperature actually rose in the 1970s.

The interaction between January temperature and the post 1990 dummy is -.377, which means that real wages in places with warm Januaries declined substantially in the 1980s. The interaction between the January temperature variable and the year 2000 dummy is -.383. Real wages were relatively declining in places with warm winters between 1980 and 2000, which suggests that the value placed on January temperature rose substantially over the past 20 years.

The third regression in the middle panel includes those 68 metropolitan areas for which we have cost of living data in 1990 and 2000. The baseline coefficient on January temperature indicates that a ten degree increase in January temperature in 1990 was associated with a 1.89 percent decrease in real incomes during that year. The interaction between January temperature and the post-2000 dummy indicates that a ten degree increase in January temperature is associated with 1.83 percent slower real income growth during the 1990s. This regression confirms the results of regression two that real wages have been declining in places with warmer Januarys. The Rosen-Roback model then implies that the amenity flows associated with warm Januaries have been rising.

The bottom panel in Table 4 looks at income and July temperature. The first regression examines income corrected for national, but not local, price levels. The coefficient on July temperature of -.685 suggests that a ten degree increase in July temperature was associated with almost a seven percent reduction in wages in 1970. The interaction between July temperature and the post-1980 dummy is .184, which suggests that about one-fourth of the connection between July temperature and low incomes disappeared during the 1970s. This coefficient is lower than the coefficient on July temperature in the 1970s income growth regression reported in Table 3, which implies that the income growth in places with hot summers, like those with warm winters, had something to do with human capital upgrading.

The interactions between July temperature and both the year 2000 dummy and the post 1990 dummy are small and statistically insignificant. There has been little change in incomes, holding human capital constant, in places with high July temperatures over the past 20 years. Places with hot summers continue to have lower wages than the rest of the country.

The second regression in the bottom panel controls for local price levels for those 22 metropolitan areas for which we have ACCRA indices for four decades. The basic coefficient on July temperature is .777, which suggests that a ten degree increase in July temperature is associated with almost an eight percent increase in real incomes. Places with hot summers in 1970 had low nominal incomes but high real incomes, as low housing costs more than offset the low wages in that decade.

The coefficient on the interaction of July temperature and the post 1980 dummy is small and positive. A ten degree increase in July temperature is associated with an approximately two percent increase in real wages during the 1970s. The interaction between July temperature and the post 1990 dummy is much larger. In the 1980s, a ten degree increase in July temperature was associated with a six percent increase in real wages. The interaction between July temperature and the year 2000 dummy is stronger yet. A ten degree increase in July temperature was associated with more than an 11 percent real income growth in the 1990s.

The third regression in the bottom panel looks at the 68 metropolitan areas for which we have ACCRA price levels in 1990 and 2000. In this broader sample, the baseline coefficient on July temperature is .404 which suggests that people needed 4 percent higher real wages in 1990 to compensate them for July temperatures that were hotter by ten degrees. In this sample, the interaction between July temperature and the year 2000 dummy is .614, which suggests that by 2000, people required 6 percent higher real wages to compensate them for living in places where Julys where hotter by ten degrees.

Our real income data shows striking differences between different measures of Sunbelt status. Warm Januarys were associated with lower real wages in 1990 and that effect just got stronger in the 1990s. Warm Julys and location in the states of the old Confederacy were associated with higher real wages in 1990 and those effects also got stronger in the 1990s. This pattern is quite understandable. High incomes in society as a whole should make us willing to pay more for mild climates. This implies both that the real wage premium required to live through hot summers is rising and the real wage premium required to live through cold winters is also rising.

Housing Price Growth

We have already begun to address housing prices, because the ACCRA price levels include housing costs, but in this sub-section we turn directly to the correlations between housing prices and our proxies for Sunbelt status. In Table 5, we repeat the basic structure of Tables 2 and 3, and regress housing price growth on our three proxies for location in the Sunbelt. In the first three decades, we use median housing prices from the U.S. Census. These prices do not control for housing quality which is changing dramatically in the South during this time period. For the 1980s and 1990s, we use Office of Federal Housing Enterprise Oversight price indices which are meant to correct for changes in housing quality.

The top rows of the table show the correlation between location in the South and housing price growth. The first two columns show small positive correlations between location in the South and housing price growth. Location in the South was associated with a four percent added increase in housing prices in the 1950s and .6 percent increase in price growth in the 1960s. If we think that housing quality was rising faster in the South during this period, then real prices might have been falling in the South even during these early decades. In the 1970s, housing prices in the South fell by 3.5 percent relative to the rest of the nation.

Using the OFHEO real price index for the 1980s and 1990s, we see that real prices declined spectacularly in the South in the 1980s. Southern location was associated with about 17 percent lower housing price appreciation between 1980 and 1990. In the 1990s, there was no correlation between Southern location and faster price growth.

The second set of regressions in Table 5 show the correlation between housing price growth and January temperature. In four out of five decades, this warmth variable is almost uncorrelated with housing price growth. In the 1950s, 1960s, and 1980s, a ten degree increase in January temperatures was associated with extra housing price growth of between one and two percent. In the 1990s, a ten degree increase in January temperature was associated with almost one half of a percent less housing price growth. Only in the 1970s did January temperature strongly predict faster housing price appreciation. In that decade, when California became far more expensive, a ten degree increase in January temperatures was associated with 8.3 percent faster price growth. January temperature explained almost 30 percent of the variation across metropolitan areas in price growth in the 1970s.

The third set of regressions look at July temperature. In the 1950s, there was almost no correlation between July temperature and housing price growth. In the 1960s, a ten degree increase in July temperature was associated with an approximately four and a half percent decrease in housing price appreciation. In the 1970s, a ten degree increase in

July temperature was associated with an approximately five percent decrease in housing price appreciation. If housing quality was also increasing more quickly in places with hot summers during this time period, then the cost of housing was dropping even more quickly during these decades.

Our results in the fourth column, where we use OFHEO price indices for the 1980s, show an even more spectacular relative decline in housing prices in the 1980s. A ten degree increase in July temperature is associated with about 17 percent lower housing price growth between 1980 and 1990. This is part of the large rise in real incomes in places with hot summers during that decade. The last column shows that high July temperatures continued to be associated with lower housing price appreciation in the 1990s, but the estimated coefficient is much smaller.

The final set of regressions includes all three proxies for Sunbelt status in each regression. The patterns are quite similar to the other regressions. January temperature is positively associated with price growth for every decade except for the 1990s, when housing prices in California fell significantly. The connection between January temperature and price growth was extremely strong in the 1970s and still quite robust in the 1980s. July temperature is always negatively associated with housing price growth, and the effect is strongest in the 1980s. The South dummy positively predicts price growth in the 1950s, 1960s and 1990s and negatively predicts price growth in the 1970s and the 1980s. Holding temperature constant, prices in the South appear to have declined in most of the post-war period.

Table 6 returns to the IPUMS to look at housing price growth controlling for observable housing characteristics. We are able to control for basic features of the house, such as number of rooms and age, but we are not able to control for more subtle aspects of housing quality. As such, we consider these price regressions to have worse quality controls than those that are based on the OFHEO price indices, but better quality controls than those using raw median housing values.

In the first column of Table 6, we look at the South dummy and its interaction with different year dummies. The raw coefficient on the South dummy is -.318, which suggests that Southern housing costs about 30 percent less than non-Southern housing in 1970. Assuredly, some portion of this gap reflects unmeasured quality differences between the South and the rest of the nation. The interaction between South and the 1980 dummy suggests that this difference did not change at all in the 1970s. The interaction between the South dummy and the 1990 year dummy is -.147 which suggests that Southern prices continued to fall relative to the non-South in the 1980s. Finally, the interaction between the South dummy and the year 2000 dummy is .02, which suggests that Southern prices increased quite modestly in the 1990s.

In the middle panel of Table 6, we look at January temperature. The raw coefficient on January temperature is slightly and insignificantly negative, suggesting that in 1970, places with warm winters were not more expensive than places with cold winters. The interaction between January temperature and the year 1980 dummy is positive and suggests that a 10 degrees increase in January temperatures was associated with an eight percent increase in prices in the 1970s.

In Table 6, the interaction between January temperature and the year 1990 is positive but insignificant and the interaction between January temperature and the year 2000 is negative and insignificant. The IPUMS confirms the basic fact that on average, housing prices were not rising faster in places with warm winters over the last 20 years.

The last regression in the bottom panel of Table 6 looks at July temperature. The raw impact of July temperature is negative, but insignificant. None of the interactions with year dummies are significant, although they are reasonably precisely estimated. In this case, there is a slight divergence between Table 5 and Table 6. The OFHEO indices suggest that housing prices are getting significantly cheaper in places with hot Julys in the 1970s; the IPUMS result suggest a somewhat smaller decrease in price. We are prone to put more weight on the OFHEO measures since quality levels were increasing significantly in places with hot Julys. The IPUMS and OFHEO results are somewhat similar for the 1980s in that they both show decline prices, but the IPUMS decline is smaller.

V. Productivity, Amenity and Housing Supply Changes

We take our regression estimates from Section IV and estimate the productivity, amenity and housing supply shocks that hit the Sunbelt. We return to the model and its predictions about the link between regression coefficients and the underlying parameters of the model. We start by discussing the results for the South and then we turn to our two temperature measures.

The South

The model suggests that productivity growth equals $(1-\beta-\gamma)\hat{B}_N + (1-\gamma)\hat{B}_W$, or a weighted sum of the coefficients in the population growth and the income regressions. The weight on the population regression is the share of production associated with immobile capital. The weight on the income regression is the share of production associated with labor plus immobile inputs. We take .6 for labor's share of input costs (β) and .3 for the share of mobile capital in inputs (γ). Our estimates do change with different parameter estimates, but the changes are modest.

Each column in Table 7 shows results for different decades. For the first two decades, we can only use the income change regressions for our estimates of $\hat{B}_W$. For the 1970s, 1980s and 1990s, we also show results using the coefficients estimated in the individual income regressions. We give results for the correlation between productivity growth and location in the South, January temperature and July temperature separately. As such, we provide six estimates of productivity shocks for later two decades. In all cases, we provide bootstrapped standard errors for the estimates.

The first two rows give the results for the correlation between location in the South and productivity growth. In the 1950s, 1960s and 1970s, productivity growth in the South was dramatic. We estimate that productivity grew by three percent more in the South than in the north in the 1950s. In the 1960s, the Southern edge in productivity growth was over six percent. These results confirm the findings of writers like Hulton and Schwab (1984), Chinitz (1986) and Wright (1987) who document the post-war productivity increases in the South. They do not confirm the view that rising Southern wages during this period rose because of Southern emigration.

These estimates do not control for individual characteristics and will confuse the upgrading of human capital with increases in actual productivity. In the 1970s, we are able to compare results estimated from mean income data with results estimated from individual data controlling for human capital levels. Using the mean income data, we estimate a productivity increase of .068 log points in the South in the 1970s. Using the IPUMS data, we estimate a smaller productivity increase of .05. Controlling for human capital does decrease the estimated productivity surge, but the South still seems like it was becoming significantly more productive in the 1970s.

In the 1980s, we estimate little productivity improvement in the South relative to the rest of the nation. The IPUMS estimates show a slight productivity decrease. The aggregate data shows a slight productivity increase. In the 1990s, the South again appears to be gaining productivity, but the effect is smaller than in the 1970s or 1980s. The IPUMS and metropolitan area data suggest a productivity increase of approximately three percent.

In the third and fourth rows of the Table, we look at our estimates of λ_θ which equals $\alpha\hat{B}_P - \hat{B}_W$, or the decrease in real wages. We assume that α, the share of expenditure going on housing, equals .3, which is based loosely on the Consumer Expenditure Survey. Our results are not particularly sensitive to this assumption. In the 1950s, we estimate a slight negative amenity decline of -.017 log points. In the 1960s, the amenity decline is far more severe: -.076 log points. This pattern of declining amenity levels appears over the next three decades as well. The metropolitan area level data suggests values of -.07, -.05 and -.02 for the 1970s, 1980s and 1990s respectively. The IPUMS regressions suggest values of -.05, -.02 and -.03 for the three decades.

These estimates corroborate the real income results shown in Table 4. Over the past 30 years, real incomes have been rising in the South, even controlling for individual characteristics. Real incomes also appear to have been rising between 1950 and 1970, although we do not control for individual human capital levels in our estimates. These results are not compatible with the view that the amenity flow in the South has been increasing relative to the rest of the country over the past 50 years. If amenities had been booming then prices should have been going up more quickly than incomes in the South, but they are not.

To us, this result may be the biggest surprise of our empirical work. Despite all of the obvious improvements in Southern amenities, including air conditioning and the reduction of disease, on the margin, people appear to have valued Southern amenities less in 2000 than they did in 1950. This result does not mean that air-conditioning didn't matter. Without it, Southern amenity levels would surely have fallen further. It does mean that Southern growth does not seem to be caused by Southern amenity levels rising faster than the rest of the nation.

In the final rows of Table 7, we look at the estimated shocks to housing supply, λ_L which equals $\hat{B}_N + \hat{B}_W - \frac{\delta \hat{B}_P}{\delta - 1}$. Our estimates will depend on the value of δ which reflects the elasticity of housing supply. We use values of 1.5, which suggests that the elasticity of price with respect to density is .5, and 3, which suggest the elasticity of price with respect to density is 2. The results are sensitive to different values of δ, but the basic finding of rising housing supply in the South after 1970 is not.

In the 1950s, there were no significant differences in housing price growth between the South and the non-South. When we let δ equal 1.5, Southern housing seems to be growing more slowly than housing supply elsewhere. When we let δ equal 3, Southern housing seems to be growing more quickly than housing supply elsewhere. In neither case is the result significant. In the 1960s, housing supply does appear to be increasing significantly faster in the South than in the rest of the country, and the effect lies between .077 and .086 depending on the value of δ. These estimates are economically quite modest.

In the 1970s and 1980s, the housing supply growth is substantially higher in the South. In the 1970s, our four estimates of λ_L range from .18 to .25. These effects are more economically meaningful and statistically significant. In the 1980s, the estimates range from .29 to .57, which are quite sizable. The estimates of λ_L in the 1990s are in a narrow range around .065 to.087, similar to the estimates for the 1960s. As such, we find that the housing supply in the South really boomed relative to the rest of the country between 1970 and 1990.

We now ask how important housing supply relative to economic productivity is in explaining economic growth. Equation (4) shows that the overall coefficient on the South dummy in a growth regression equals $(\delta + \alpha - \alpha\delta)\lambda_A + (1-\gamma)(\delta\lambda_\theta + \alpha(\delta-1)\lambda_L)$ times a constant. To compare the relative importance of productivity and housing supply, we must multiply the productivity effect by $\frac{1}{1-\gamma}\left(\frac{\delta}{\alpha(\delta-1)} - 1\right)$. If we let δ equal 1.5, this expression equals 12.8. If δ equals 3, the value of this multiplier falls to 5.7.

With multipliers in this range, it is clear that rising productivity, not rising housing supply drove the South's boom in the first two post-war decades. Our estimate of λ_A is .032 in the 1950s, and our estimate of λ_L ranges from -0.05 to .01. With a multiplier of 5.7 or more, the productivity effect dwarfs the housing supply effect. In the 1960s, our estimate of λ_A is .066 and our estimate of λ_L ranges from .077 to .086. Given the range of estimates for $\frac{1}{1-\gamma}\left(\frac{\delta}{\alpha(\delta-1)}-1\right)$, the productivity effect is between four and twelve times as important as the housing supply effect.

In the 1970s and 1980s, however, housing supply becomes more important relative to productivity growth. Our estimates of λ_A for the 1970s range from .05 to .068, and our estimates of λ_L range from .18 to .25. Given a multiplier of 5.7, then the productivity and housing supply effects are roughly similar in magnitude. Higher values of the multiplier will mean that productivity growth was still more important than housing supply growth. In the 1980s, our estimates of λ_A range from -.01 to .01, and our estimates of λ_L range from .29 to .57. During this decade, relative housing supply increases in the South were extremely big and relative productivity growth was negligible.

The 1990s represent something of a reversion to the earlier time periods where productivity growth seems slightly more important than housing supply growth. During this period, our estimates of λ_A range from .027 to .038, and our estimates of λ_L range from .065 to .087. If given a lower multiplier of 5.7, productivity seems about twice as important as housing supply growth to the growth of the South in the 1990s.

Overall, the pattern suggests that the relative population growth of the South was never driven by amenities. Prior to 1970, population growth was driven by rising productivity. In the 1970s and 1990s, housing supply growth and productivity growth were about equally important in driving Southern population growth. Housing supply growth was almost completely responsible for Southern population growth in the 1980s.

January and July Temperatures

We now turn to Tables 8 and 9, our parameter estimates for January and July temperature. Both temperature measures are strongly associated with productivity growth in the 1950s and 1970s. The productivity growth effect in the 1970s is weaker when we use the IPUMS estimates than when we use the metropolitan area level data for both temperature measures. This reflects the fact that some part of this rising productivity is also reflecting rising human capital levels in disproportionately warm places. Warmer places also had positive productivity growth in the 1960s, but the effect is smaller and not statistically significant. Since we are unable to control for human capital changes during that decade, this increase may just reflect improvements in education.

The two temperature measures diverge in the 1980s and 1990s. In the 1980s, places with warm Januarys, but not warm Julys, saw their productivity increase. This was, after all, a boom era for California. In the 1990s, places with warm Julys saw their productivity levels increase more quickly than places with warm Januarys. While the 1950-1980 period saw a roughly parallel pattern of productivity growth for the entire Sunbelt, during the twenty years since then places with mild winters and places with hot summers have increasingly diverged.

Perhaps unsurprisingly, the connection between temperature and amenity growth has always been quite different for the two different warmth measures. Hot Julys have been negatively associated with amenity growth for every one of the post-war decades. This may just reflect the fact that hot Julys are always unpleasant, with or without air conditioning, and as people have gotten richer they have become increasingly willing to pay to avoid those hot summers. Warm Januarys are, however, positively associated with amenity growth in the 1960s and especially the 1970s, when January temperature strongly predicted housing price growth.

In the 1950s, warm Januarys had a slightly negative impact on amenity growth. In 1980s, the results are mixed. Using the aggregate data, we find a slight amenity downturn. Using the individual level data, we find a slight amenity upturn. In the 1990s, we find a weak negative correlation between January temperature and amenity growth. These results are quite sensitive to the booms and busts of the California housing cycles, so perhaps it is unwise to read too much into them. The general finding is that high January temperatures have sometimes been associated with rising amenity values, but high July temperatures have not.

The connection between temperature and housing supply growth also differs between the two measures. July temperature is always strongly associated with housing supply expansion relative to the rest of the county. The effect of July temperature on housing supply growth was weakest in the 1950s and strongest in the 1980s. In all three of the post-1970 decades, places with hot summers have had extremely high levels of housing supply expansion.

The effect of January temperature on housing supply growth has been far more mixed. In the 1950s and 1990s, January temperatures predicted housing supply growth. In the 1970s, when California became much more anti-development, January temperature is associated with less housing supply growth. In the 1960s and 1980s, January temperature was weakly positively associated with housing supply growth.

How important were amenities, productivity and housing supply in explaining the relative growth of warm places? Certainly rising amenities had nothing to do with the rise of the places with hot summers, since our estimates suggest that the amenity flows in these places have been declining. During the 1950s, rising productivity was more important than rising housing supply in explaining the growth of places with both warm Januarys and warm Julys. In the 1960s, if the multiplier $\frac{1}{1-\gamma}\left(\frac{\delta}{\alpha(\delta-1)}-1\right)$ equals 5.7, the productivity growth was more important than housing supply growth in places with warm Januarys but less important housing supply growth in places with warm Julys. If the multiplier is higher, then productivity growth may have been more important in both types of areas.

In the 1970s, productivity was certainly much more important than housing supply growth in explaining the success of places with warm Januarys, since housing supply did not disproportionately rise with January temperature. When we look at the effect of July temperature in the 1970s, our estimates of λ_A range from .224 to .3, and our estimates of λ_L range from 1.37 to 2.27. If δ equals 1.5 then housing supply growth is much more important than productivity growth. If δ equals 3 then productivity growth in more important than housing supply growth for places with hot Julys.

In the 1980s, productivity growth was more important than housing supply growth for places with warm Januarys, but housing supply growth was more important than productivity growth for places with hot Julys. In the 1990s, housing supply growth was more important than productivity growth in places with hot summers if δ equals 1.5, but productivity growth was more important than housing supply growth if δ equals 3. Housing supply growth was certainly more important than productivity growth in places with hot Januarys in the 1990s.

The growth of high temperature areas has generally not been driven by an increasing willingness to pay for their amenities. Instead, rising populations were the result of rising productivity during most of the post-war period and, since 1970, large increases in housing supply relative to the rest of the nation.

VI. Why is there so much Housing Supply in the Sunbelt?

While there has been a great deal written about rising productivity in the South, much less has been written about why housing supply appears to be increasing so much more quickly in that region. As a final exercise, we will see whether any simple factor can explain the relationship between housing growth and the Sunbelt. Our final empirical exercise is to attempt to understand why new housing supply has been so much more abundant in the Sunbelt.

In Table 10, we look at the relationship between the logarithm of housing permits in a county between 2000 and 2005 and the different proxies for Sunbelt status. We examine only those counties with more than 50,000 inhabitants in 2000. In all regressions, we include the logarithm of total land area in the county, so that the regression can be understood as trying to explain the logarithm of new housing per acre. Our basic methodology is to first regress the logarithm of new housing on just the proxy for Sunbelt status and the logarithm of new acreage. We then include four other variables. Two of these variables, the logarithms of year 2000 income and median housing values, are meant to proxy for demand.

The other two variables, the logarithm of year 2000 housing density and the number of governmental units in the county, are meant to proxy for supply conditions. Greater year 2000 housing density should capture the possibility that Southern places build more because they begin with less housing. The number of government units may decrease development if small jurisdictions are more prone to restrict development because they fail to internalize the benefits to the entire community of building more. This hypothesis suggests that small bedroom communities are likely to just see new development as increased congestion and increased public costs, while large cities also see the benefits that new development might bring in creating lower costs for businesses.

In the first regression, we see the basic impact of the South dummy on the logarithm of new construction after 2000. The coefficient suggests that those counties in the South have roughly a 20 percent greater propensity to permit than counties outside of the South holding land area, but nothing else constant. In the second regression, we see that controlling for the other four characteristics not only fails to explain the greater Southern propensity to develop, but increases the size of the coefficient to .7. There is a remarkable correlation between location in the South and permitting that is only made stronger by controlling for density, prices and income.

In the third column, we look at the correlation between January temperature and permitting. A ten degree increase in January temperature is associated with approximately 25 percent more permitting. Controlling for price and income in the fourth regression does essentially nothing to this coefficient. Again, the warmth-permitting correlation is not explained by land density or price or income or the number of governmental units.

The fifth and sixth regressions look at July temperature. The raw impact of July temperature is that a ten degree increase in July temperature increases permitting by about 35 percent. When we control for the other variables, this coefficient increases so that a ten degree increase in July temperatures increases permitting by about 65 percent. The seventh and eight regressions include all three variables. In regression (8), we see that controlling for a full roster of controls, the South dummy and July temperature both strongly predict permitting, while January temperature does not. Table 10 shows that a number of simple theories cannot explain the Sunbelt predilection for construction.

VII. Conclusion

The traditional view of the post-war South emphasizes the economic convergence of this region. This view is certainly correct for the period between 1950 and 1980 and even in the 1990s; productivity grew more quickly in the states of the old Confederacy. Moreover, our estimates suggest that the increasing population of the Sunbelt prior to 1970 was driven almost entirely by the increasing association between warmth and economic productivity.

We found little evidence to support the view that the growth of the Sunbelt had much to do with sun-related amenities. Real incomes in the South appear to have been steadily rising, which suggest that amenities flows are falling. The relationship between real incomes and July temperature are also falling. Real incomes did fall in places with high January temperatures in the 1960s and 1970s, which is the only evidence we found of rising amenity flows in the Sunbelt. Our results do not mean that air conditioning or clean water was irrelevant. We suspect that amenity flows would have been far lower without them. Our results do suggest that over time, the marginal resident required more and more compensation for living in the South.

The final significant fact about Sunbelt growth is that since 1970, the greater expansion of Southern housing supply has been particularly important. We estimate that housing supply was increasing by at least 20 percent more in the South than elsewhere in the country in the 1970s and 1980s. Ten extra degrees of July temperature was similarly associated with 20 percent or more housing supply growth. Over the past three decades, our estimates suggest that faster housing supply growth in the South has been as big a factor as economic productivity in driving the rise of Sunbelt population. The causes of greater housing supply in the Sunbelt remain a pressing topic for future research.

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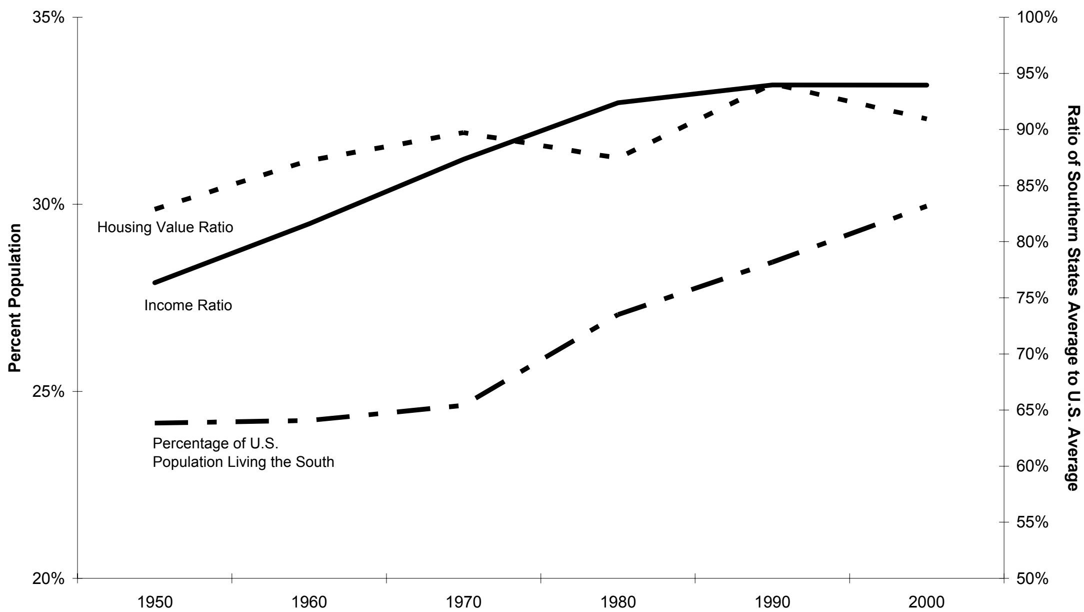
Figure 1:
Population, Income, and Housing Values in the South versus the Entire United States
1950 - 2000



Notes: Population data from the Census at http://www.census.gov/population/censusdata/urpop0090.txt and factfinder.census.gov. Housing value and income ratios from historical U.S. Census County Data Books, found in Haines, Michael R.; Inter-university Consortium for Political and Social Research, 2005-02-25, "Historical, Demographic, Economic, and Social Data: The United States, 1790-2000", hdl:1902.2/02896 http://id.thedata.org/hdl%3A1902.2%2F02896 Inter-university Consortium for Political and Social Research [distributor(DDI)].

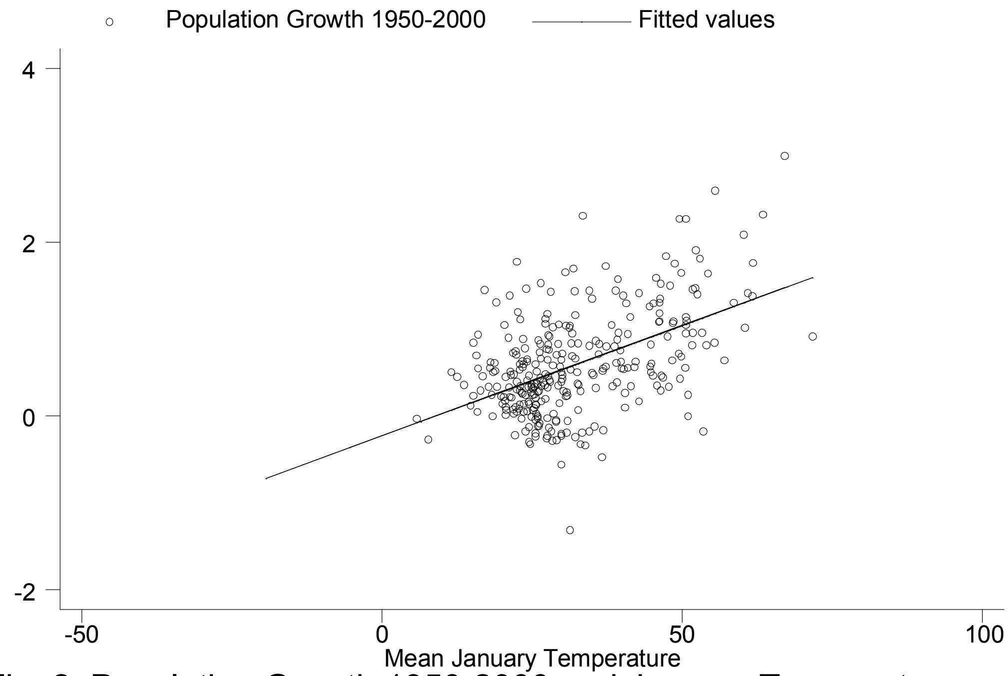


Fig. 2: Population Growth 1950-2000 and January Temperature

Notes: For the top 10% of counties based on 1950 population. Population data from historical U.S. Census County Data Books, found in Haines, Michael R.; Inter-university Consortium for Political and Social Research, 2005-02-25, "Historical, Demographic, Economic, and Social Data: The United States, 1790-2000", hdl:1902.2/02896 http://id.thedata.org/hdl%3A1902.2%2F02896 Inter-university Consortium for Political and Social Research [distributor(DDI)]. Temperature data from cdo.ncdc.noaa.gov.

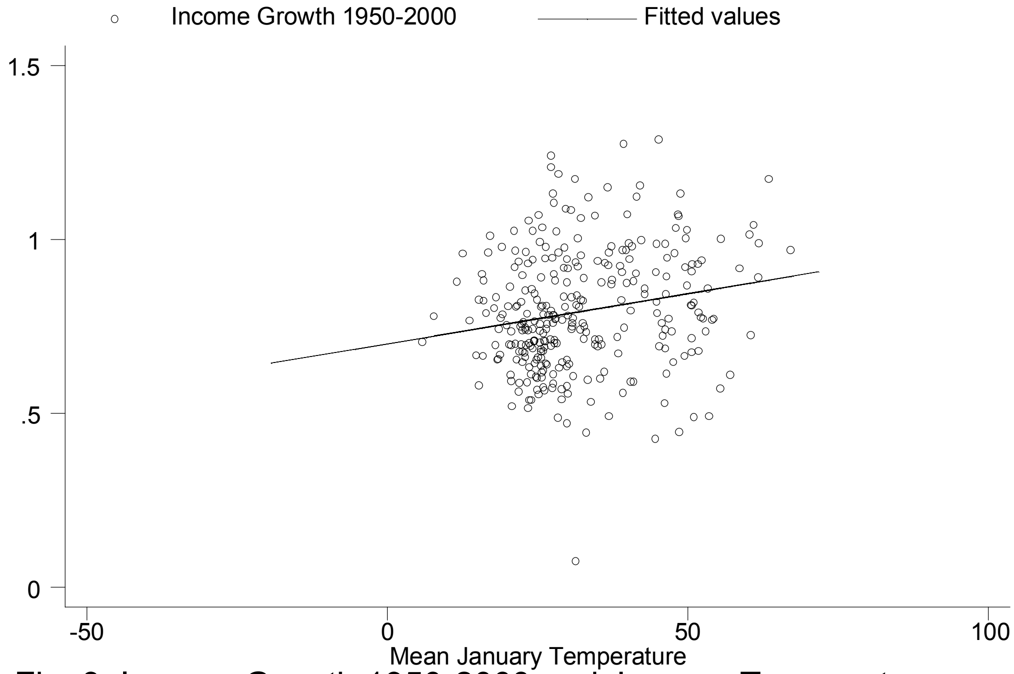


Fig. 3: Income Growth 1950-2000 and January Temperature

Notes: For the top 10% of counties based on 1950 population. Population and income data from historical U.S. Census County Data Books, found in Haines, Michael R.; Inter-university Consortium for Political and Social Research, 2005-02-25, "Historical, Demographic, Economic, and Social Data: The United States, 1790-2000", hdl:1902.2/02896 http://id.thedata.org/hdl%3A1902.2%2F02896 Inter-university Consortium for Political and Social Research [distributor(DDI)]. Temperature data from cdo.ncdc.noaa.gov.

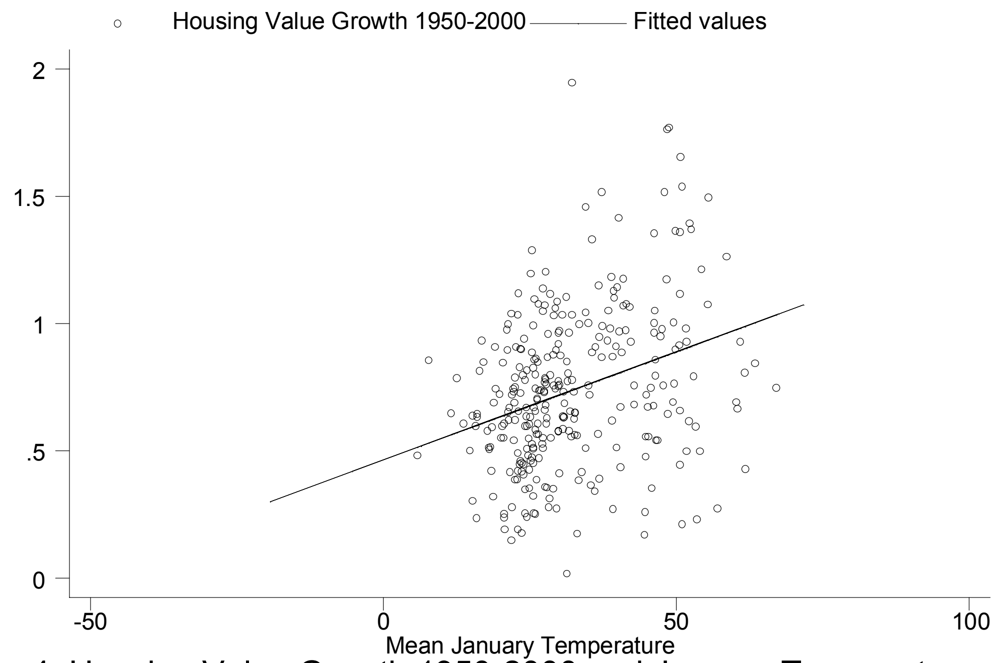


Fig. 4: Housing Value Growth 1950-2000 and January Temperature

Notes: For the top 10% of counties based on 1950 population. Population and housing value data from historical U.S. Census County Data Books, found in Haines, Michael R.; Inter-university Consortium for Political and Social Research, 2005-02-25, "Historical, Demographic, Economic, and Social Data: The United States, 1790-2000", hdl:1902.2/02896 http://id.thedata.org/hdl%3A1902.2%2F02896 Inter-university Consortium for Political and Social Research [distributor(DDI)]. Temperature data from cdo.ncdc.noaa.gov.

Table *1: Correlation of Change in County-Level Population, Income, and Housing Values with South Dummy, January Temperature, and July Temperature*

	South Dummy			**January Temperature**			**July Temperature**		
	Change in Population	Change in Income	Change in Housing Value	Change in Population	Change in Income	Change in Housing Value	Change in Population	Change in Income	Change in Housing Value
1950s	-3%	32%	-1%	11%	38%	10%	-5%	22%	-6%
1960s	4%	38%	22%	18%	21%	34%	-1%	30%	19%
1970s	14%	33%	8%	28%	31%	13%	-1%	37%	-19%
1980s	19%	11%	25%	33%	5%	33%	5%	-2%	4%
1990s	19%	0%	25%	29%	-9%	32%	4%	4%	5%

Notes: Sample is all counties. Population, income, and housing value data from historical U.S. Census County Data Books, found in Haines, Michael R.; Inter-university Consortium for Political and Social Research, 2005-02-25, "Historical, Demographic, Economic, and Social Data: The United States, 1790-2000", hdl:1902.2/02896 http://id.thedata.org/hdl%3A1902.2%2F02896 Inter-university Consortium for Political and Social Research [distributor(DDI)]. Temperature data from National Climatic Data Center, U.S. Department of Commerce, at http://cdo.ncdc.noaa.gov/.

Table 2: Population Growth in the Sunbelt

	Log Change in Population				
	1950s	1960s	1970s	1980s	1990s
With South Dummy					
Intercept	0.288 (0.02)	0.198 (0.013)	0.141 (0.014)	0.115 (0.012)	0.126 (0.009)
South Dummy	0.041 (0.045)	0.017 (0.029)	0.086 (0.03)	0.059 (0.025)	0.065 (0.02)
R^2	0.006	0.003	0.057	0.039	0.074
Observations	135	135	135	135	135
With Mean January Temperature					
Intercept	-0.005 (0.052)	0.039 (0.035)	-0.104 (0.033)	-0.103 (0.027)	0.028 (0.025)
Mean January Temperature	0.843 (0.137)	0.455 (0.094)	0.731 (0.088)	0.644 (0.071)	0.312 (0.066)
R^2	0.221	0.15	0.341	0.384	0.142
Observations	135	135	135	135	135
With Mean July Temperature					
Intercept	-0.081 (0.223)	0.229 (0.148)	-0.132 (0.155)	-0.16 (0.128)	-0.224 (0.099)
Mean July Temperature	0.502 (0.296)	-0.036 (0.196)	0.386 (0.206)	0.383 (0.17)	0.484 (0.131)
R^2	0.021	0	0.026	0.037	0.093
Observations	135	135	135	135	135
With South Dummy and Mean January and July Temperatures					
Intercept	-0.454 (0.231)	0.094 (0.161)	-0.222 (0.153)	-0.324 (0.12)	-0.23 (0.112)
South Dummy	-0.157 (0.051)	-0.058 (0.036)	-0.042 (0.034)	-0.071 (0.027)	-0.004 (0.025)
Mean January Temperature	1.05 (0.155)	0.574 (0.108)	0.786 (0.103)	0.733 (0.081)	0.27 (0.076)
Mean July Temperature	0.542 (0.304)	-0.114 (0.212)	0.143 (0.201)	0.27 (0.158)	0.365 (0.148)
R^2	0.274	0.181	0.349	0.417	0.188
Observations	135	135	135	135	135

Note: Population data is MSA-level data from the U.S. Census. Sample is restricted to the 135 MSAs for which there is OFHEO data available. OFHEO data from http://www.ofheo.gov/download.asp. Temperature units are in hundreds of degrees.

Table 3: Income Growth in the Sunbelt

	Log Change in Income				
	1950s	1960s	1970s	1980s	1990s
With South Dummy					
Intercept	0.359 (0.006)	0.28 (0.005)	-0.181 (0.005)	0.282 (0.01)	0.076 (0.005)
South Dummy	0.029 (0.013)	0.078 (0.011)	0.064 (0.011)	-0.001 (0.022)	0.018 (0.011)
R^2	0.039	0.268	0.193	0	0.02
Observations	135	135	135	135	135
With Mean January Temperature					
Intercept	0.331 (0.017)	0.3 (0.017)	-0.207 (0.016)	0.232 (0.029)	0.119 (0.014)
Mean January Temperature	0.095 (0.044)	-0.012 (0.045)	0.109 (0.043)	0.138 (0.076)	-0.11 (0.037)
R^2	0.034	0.001	0.047	0.024	0.061
Observations	135	135	135	135	135
With Mean July Temperature					
Intercept	0.207 (0.063)	0.154 (0.064)	-0.375 (0.061)	0.507 (0.11)	0.098 (0.056)
Mean July Temperature	0.211 (0.084)	0.189 (0.085)	0.276 (0.081)	-0.301 (0.146)	-0.024 (0.074)
R^2	0.045	0.035	0.081	0.031	0.001
Observations	135	135	135	135	135
With South Dummy and Mean January and July Temperatures					
Intercept	0.228 (0.075)	0.445 (0.061)	-0.228 (0.068)	0.521 (0.129)	0.237 (0.061)
South Dummy	0.008 (0.017)	0.119 (0.014)	0.059 (0.015)	0.004 (0.029)	0.057 (0.014)
Mean January Temperature	0.06 (0.051)	-0.204 (0.041)	-0.006 (0.046)	0.186 (0.087)	-0.194 (0.041)
Mean July Temperature	0.152 (0.099)	-0.134 (0.081)	0.067 (0.09)	-0.408 (0.17)	-0.132 (0.08)
R^2	0.065	0.393	0.197	0.075	0.176
Observations	135	135	135	135	135

Note: Income data is MSA-level data from the U.S. Census. Sample is restricted to the 135 MSAs for which there is OFHEO data available. OFHEO data from http://www.ofheo.gov/download.asp. Temperature units are in hundreds of degrees.

Table 4: Income Regressions Using IPUMS Data

	(1)	(2)	(3)
	Census Wage Income	**ACCRA-deflated Wage Income**	**ACCRA-deflated Wage Income**
With South Dummy			
South	-0.107 (0.004)	0.058 (0.007)	0.032 (0.003)
South * 1980 Dummy	0.041 (0.005)	0.028 (0.009)	
South * 1990 Dummy	-0.028 (0.004)	0.020 (0.007)	
South * 2000 Dummy	0.031 (0.004)	0.081 (0.006)	0.087 (0.004)
Observations	685,944	277,112	285,535
With January Temperature			
January	-0.188 (0.117)	0.125 (0.056)	-0.189 (0.096)
January * 1980 Dummy	-0.014 (0.16)	0.138 (0.139)	
January * 1990 Dummy	0.039 (0.17)	-0.377 (0.185)	
January * 2000 Dummy	-0.026 (0.161)	-0.383 (0.317)	-0.183 (0.234)
Observations	685,944	277,112	285,535
With July Temperature			
July	-0.685 (0.165)	0.777 (0.254)	0.404 (0.234)
July * 1980 Dummy	0.184 (0.25)	0.242 (0.703)	
July * 1990 Dummy	-0.074 (0.242)	0.598 (0.77)	
July * 2000 Dummy	0.043 (0.226)	1.170 (0.785)	0.614 (0.508)
Observations	685,944	277,112	285,535

Note: 1970-2000 income and control data from IPUMS, at Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. Integrated Public Use Microdata Series: Version 3.0 [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004. Sample is restricted to males aged 25-55 who work "full-time, full-year" (35+ hours per week, 40+ weeks per year) and who earn a yearly income more than half of that of a worker earning a yearly income at the minimum wage. Data controls are age, education, and race. MSA sample for regression (1) is the 86 MSAs that are available for all four decades in the IPUMS data. MSA sample for (2) is for the 22 MSAs that are available for all 4 decades in the ACCRA data. MSA sample for (3) is the 68 MSAs that are available for 1990 and 2000 in the ACCRA data. Temperature units are in hundreds of degrees.

Table 5: Housing Value Growth in the Sunbelt

	Log Change in Housing Value				
	1950s	1960s	1970s	1980s	1990s
With South Dummy					
Intercept	0.238 (0.01)	0.099 (0.01)	0.347 (0.018)	0.522 (0.027)	0.333 (0.017)
South Dummy	0.040 (0.021)	0.006 (0.022)	-0.035 (0.038)	-0.172 (0.06)	0.006 (0.037)
R^2	0.027	0.001	0.006	0.058	0.000
Observations	135	135	135	135	135
With Mean January Temperature					
Intercept	0.190 (0.027)	0.063 (0.029)	0.043 (0.043)	0.417 (0.081)	0.478 (0.047)
Mean January Temperature	0.157 (0.073)	0.103 (0.077)	0.831 (0.113)	0.196 (0.215)	-0.400 (0.124)
R^2	0.034	0.013	0.290	0.006	0.072
Observations	135	135	135	135	135
With Mean July Temperature					
Intercept	0.178 (0.107)	0.431 (0.108)	0.743 (0.191)	1.810 (0.291)	0.573 (0.186)
Mean July Temperature	0.092 (0.142)	-0.440 (0.144)	-0.536 (0.253)	-1.760 (0.386)	-0.318 (0.247)
R^2	0.003	0.066	0.033	0.135	0.012
Observations	135	135	135	135	135
With South Dummy and Mean January and July Temperatures					
Intercept	0.250 (0.126)	0.531 (0.127)	0.340 (0.168)	1.465 (0.338)	0.883 (0.21)
South Dummy	0.028 (0.028)	0.040 (0.028)	-0.170 (0.037)	-0.143 (0.075)	0.129 (0.047)
Mean January Temperature	0.116 (0.085)	0.119 (0.085)	1.205 (0.113)	0.663 (0.228)	-0.562 (0.142)
Mean July Temperature	-0.067 (0.166)	-0.641 (0.167)	-0.527 (0.221)	-1.578 (0.445)	-0.498 (0.277)
R^2	0.042	0.115	0.482	0.190	0.125
Observations	135	135	135	135	135

Note: Housing value data is MSA-level data from the U.S. Census and OFHEO. Sample is restricted to the 135 MSAs for which there is OFHEO data available. The 1980s and 1990s regressions use this OFHEO data, while the 1950s, 1960s, and 1970s regressions use Census data. OFHEO data from http://www.ofheo.gov/download.asp. Temperature units are in hundreds of degrees.

Table 6: Housing Value Regressions Using IPUMS Data

	(1)
	Housing Value Variable.
With South Dummy	
South	-0.318
	(0.002)
South * 1980 Dummy	0.001
	(0.003)
South * 1990 Dummy	-0.147
	(0.003)
South * 2000 Dummy	0.02
	(0.003)
Observations	2,030,019
With January	
January	-0.164
	(0.348)
January * 1980 Dummy	0.853
	(0.593)
January * 1990 Dummy	0.307
	(0.842)
January * 2000 Dummy	-0.554
	(0.879)
Observations	2,030,019
With July	
July	-2.399
	(0.378)
July * 1980 Dummy	-0.089
	(0.724)
July * 1990 Dummy	-1.035
	(1.066)
July * 2000 Dummy	0.017
	(1.166)
Observations	2,030,019

Note: 1970-2000 income and control data from IPUMS, at Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. Integrated Public Use Microdata Series: Version 3.0 [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004. Sample is restricted to homes built after 1940, with complete plumbing, and with between 2 and 8 rooms. Data controls are presence of a kitchen, number of rooms, and built year. MSA sample is for the 86 MSAs that are available in IPUMS for all four years. Temperature units are in hundreds of degrees.

Table 7: Decomposition: South Dummy Regressions

	Using MSA Coefficients Only					Using MSA and IPUMS Coefficients		
	1950s	1960s	1970s	1980s	1990s	1970s	1980s	1990s
λ_α (Productivity)	0.032 (0.017)	0.066 (0.013)	0.068 (0.01)	0.011 (0.021)	0.027 (0.009)	0.050 (0.004)	-0.011 (0.003)	0.038 (0.003)
λ_θ (Amenities)	-0.017 (0.013)	-0.076 (0.01)	-0.074 (0.012)	-0.050 (0.014)	-0.016 (0.006)	-0.051 (0.005)	-0.024 (0.004)	-0.029 (0.004)
λ_L if δ=1.5 (Housing Supply)	-0.050 (0.075)	0.077 (0.066)	0.254 (0.064)	0.574 (0.115)	0.065 (0.07)	0.230 (0.005)	0.547 (0.004)	0.078 (0.004)
λ_L if δ=3 (Housing Supply)	0.010 (0.06)	0.086 (0.038)	0.202 (0.03)	0.316 (0.054)	0.074 (0.036)	0.178 (0.005)	0.289 (0.004)	0.087 (0.004)

Note: MSA-level data is from the U.S. Census. IPUMS data from Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. Integrated Public Use Microdata Series: Version 3.0 [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004. MSA coefficients from regressions in Table 2, 3, and 5. IPUMS coefficients from Table 4 Regression (1).

Table 8: Decomposition: January Temperature Regressions

	Using MSA Coefficients Only					Using MSA and IPUMS Coefficients		
	1950s	1960s	1970s	1980s	1990s	1970s	1980s	1990s
λ_α (Productivity)	0.245	0.082	0.233	0.239	-0.025	0.135	0.160	0.041
	(0.061)	(0.05)	(0.044)	(0.07)	(0.039)	(0.014)	(0.007)	(0.01)
λ_θ (Amenities)	-0.048	0.042	0.140	-0.079	-0.010	0.263	0.020	-0.094
	(0.043)	(0.051)	(0.056)	(0.045)	(0.026)	(0.017)	(0.009)	(0.012)
λ_L if δ=1.5 (Housing Supply)	0.466	0.134	-1.653	0.195	1.401	-1.776	0.095	1.485
	(0.228)	(0.233)	(0.358)	(0.573)	(0.284)	(0.017)	(0.011)	(0.012)
λ_L if δ=3 (Housing Supply)	0.702	0.289	-0.407	0.493	0.802	-0.529	0.389	0.210
	(0.195)	(0.15)	(0.19)	(0.267)	(0.136)	(0.017)	(0.01)	(0.012)

Note: MSA-level data is from the U.S. Census. IPUMS data from Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. Integrated Public Use Microdata Series: Version 3.0 [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004. MSA coefficients from regressions in Table 2, 3, and 5. IPUMS coefficients from Table 4 Regression (1). Temperature units are in hundreds of degrees.

Table 9: Decomposition: July Temperature Regressions

	Using MSA Coefficients Only					**Using MSA and IPUMS Coefficients**		
	1950s	1960s	1970s	1980s	1990s	1970s	1980s	1990s
λ_α (Productivity)	0.269 (0.124)	0.144 (0.088)	0.298 (0.084)	-0.164 (0.125)	0.078 (0.07)	0.224 (0.032)	0.018 (0.027)	0.131 (0.028)
λ_θ (Amenities)	-0.184 (0.081)	-0.320 (0.089)	-0.437 (0.102)	-0.227 (0.081)	-0.071 (0.051)	-0.344 (0.04)	-0.454 (0.034)	-0.138 (0.036)
λ_L if δ=1.5 (Housing Supply)	0.439 (0.473)	1.471 (0.364)	2.269 (0.646)	5.363 (0.81)	1.414 (0.554)	2.177 (0.04)	5.590 (0.036)	1.481 (0.039)
λ_L if δ=3 (Housing Supply)	0.576 (0.408)	0.812 (0.25)	1.465 (0.295)	2.723 (0.365)	0.937 (0.289)	1.373 (0.04)	2.950 (0.035)	1.004 (0.037)

Note: MSA-level data is from the U.S. Census. IPUMS data from Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. Integrated Public Use Microdata Series: Version 3.0 [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004. MSA coefficients from regressions in Table 2, 3, and 5. IPUMS coefficients from Table 4 Regression (1). Temperature units are in hundreds of degrees.

Table *10: Housing Permit Regressions*

	Log of the Ratio of the Sum of Housing Permits to Land Area for 2000-2005							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	7.374 (0.354)	-24.387 (1.598)	7.005 (0.343)	-26.259 (1.668)	4.652 (0.695)	-29.055 (1.65)	6.023 (0.817)	-28.381 (1.632)
South Dummy	0.219 (0.088)	0.72 (0.068)					-0.472 (0.126)	0.457 (0.086)
January Temperature			2.497 (0.342)	2.331 (0.256)			3.316 (0.507)	-0.467 (0.376)
July Temperature					3.617 (0.745)	6.475 (0.525)	1.551 (1.02)	5.314 (0.71)
Log of Number of Governmental Units		0.062 (0.038)		-0.029 (0.035)		-0.024 (0.032)		0.069 (0.037)
Log 2000 Income		1.493 (0.229)		2.266 (0.239)		1.243 (0.227)		1.074 (0.258)
Log 2000 Housing Density		0.762 (0.031)		0.74 (0.033)		0.714 (0.031)		0.705 (0.031)
Log 2000 Housing Value		0.563 (0.134)		0.024 (0.132)		0.861 (0.138)		1.017 (0.161)
Log Total Land Area	-0.84 (0.052)	-0.033 (0.046)	-0.899 (0.05)	-0.091 (0.049)	-0.828 (0.051)	-0.06 (0.046)	-0.943 (0.053)	-0.068 (0.047)
R^2	0.242	0.737	0.279	0.729	0.256	0.747	0.29	0.755

Note: Sample is restricted to counties with populations of 50,000 or more. Number of Governmental Units from the 2002 Census of Governments at http://www.census.gov/govs/www/cog2002.html. 2000 Income data, land area, and housing density, from the Census. Temperature data from National Climatic Data Center, U.S. Department of Commerce, at http://cdo.ncdc.noaa.gov/. Temperature units are in hundreds of degrees.

Data Appendix

1. Metropolitan Statistical Area Level Population, Income, and Housing Value Data

MSA level data on population, income, and housing value is from the U.S. Census Bureau. Income is median family income. Housing value is median value of specified owner-occupied housing units. This data is used in the regressions found in Tables 2, 3, and 5.

Income and housing value data is adjusted using the Consumer Price Index at:

http://www.bls.gov/cpi/home.htm

Census housing values for the 1980s and 1990s are replaced with Office of Federal Housing Enterprise Oversight (OFHEO) house price index data, found at:

www.ofheo.gov/download.asp

The yearly changes are determined by calculating the changes between the first quarters of each year.

OFHEO price indices are available for only 135 MSAs, so we restrict our sample to these 135 MSAs for all our regression (population, income, and housing value).

2. Individual Level Income and Housing Value Data

The individual level income and housing value data, along with all our control variables (age, race, and education for the income regressions, and age of home, kitchen details, and number of rooms for the housing regressions) is from the Integrated Public Use Microdata Series (IPUMS) at:

http://usa.ipums.org/usa/

The full citation for this data is:

Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. *Integrated Public Use Microdata Series: Version 3.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004.

The income variable is INCWAGE, or wage and salary income. The housing value variable is VALUEH, or value of the housing unit.

We use the 1% samples for 1970, 1980, 1990, and 2000.

For our income regressions found in Table 4, we use a sample of full-time, full-year workers, which consists of males 25-55 years old who work 40 or more weeks a year and 35 or more hours per week. We remove any individuals earning less than half the minimum wage for a full-year worker (that is, individuals with a yearly salary less than .5 * minimum wage * 1400 working hours per year). We adjust the top-coded earnings by multiplying them by 1.5.

For Table 4, Regression (1), wages are adjusted by deflating by the Consumer Price Index at:

http://www.bls.gov/cpi/home.htm

Regression (1) contains data for the 86 MSAs which are represented in all four decades in the IPUMS data.

For Table 4, Regressions (2) and (3), wages are adjusted by deflating by the ACCRA Cost of Living Index at:

http://www.coli.org/

Regression (2) contains data for the 22 MSAs that are available in all 4 decades in both the IPUMS data and the ACCRA data. Regression (3) contains data for the 68 MSAs that are available for 1990 and 2000 in both the IPUMS data and the ACCRA data.

For our housing regressions found in Table 6, we removed any homes without complete indoor plumbing, homes that were built before 1940, homes that had one room, and homes that had nine or more rooms.

Home values were deflated by the Consumer Price Index.

Sample contains data for the 86 MSAs which are represented in all four decades in the IPUMS data.

3. Census Level Population, Income, and Housing Value Data

The census level dataset with population, income, and housing value variables was put together using data from the U.S. Census County Data Books found at ICPSR 2896. This dataset is used for part of Figure 1 (the ratio calculations); Figures 2, 3, and 4; and the correlations in Table 1.

The full citation for this data is:

Haines, Michael R.; Inter-university Consortium for Political and Social Research, 2005-02-25, "Historical, Demographic, Economic, and Social Data: The United States, 1790-2000", hdl:1902.2/02896 http://id.thedata.org/hdl%3A1902.2%2F02896 Inter-university Consortium for Political and Social Research [distributor(DDI)].

Income is median family income. Housing value is median value of specified owner occupied housing units.

4. Temperature Data

Temperature data is from the National Climatic Data Center at:

http://cdo.ncdc.noaa.gov/CDO/cdo

5. Data used in the Housing Permit Regressions

The data we used in our housing permit regressions, found in Table 10, is from a variety of sources. The sample size for this dataset is the 912 counties that have populations over 50,000.

The permit data for 2000-2005 is from Residential Construction Data files, from the U.S. Census Bureau, at:

http://www.census.gov/const/www/permitsindex.html

The county level income and housing value data for 2000 is from the U.S. Census Bureau at:

http://factfinder.census.gov/

The county level housing density and land area data for 2000 is from the U.S. Census Bureau at:

http://www.census.gov/population/www/censusdata/density.html

Temperature data is from the National Climatic Data Center at:

http://cdo.ncdc.noaa.gov/CDO/cdo

The number of local governments is from the Census of Governments, *Preliminary Report No. 1 The 2002 Census of Governments*, Table 16, at:

http://www.census.gov/govs/www/cog2002.html

6. State Level Population Data

We use the state level population data for Figure 1.

Our historical data (1950-1990) on state level population comes from the U.S. Census Bureau at:

http://www.census.gov/population/censusdata/urpop0090.txt

Our 2000 data on state level population comes from the U.S. Census Bureau at:

http://factfinder.census.gov/servlet/GCTTable?_bm=y&-geo_id=01000US&-_box_head_nbr=GCT-PH1&-ds_name=DEC_2000_SF1_U&-redoLog=false&-format=US-9&-mt_name=PEP_2006_EST_GCTT1R_US9S