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Economic Growth in Kentucky: Why Does Kentucky Lag Behind the Rest of the South?

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Economic Growth in Kentucky: Why Does Kentucky Lag Behind the Rest of the South?

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Partnership Board for the Cabinet for Economic Development

By

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Executive Summary

Kentucky has consistently been one of the poorest states in the country between 1939 and the present. On top of this already low level of income, Kentucky has experienced fairly slow growth in output in recent years. Between 1997 and 2004, Kentucky had an average annual growth in real gross state product (GSP) of 1.6 percent, ranking 43rd in terms of growth in GSP relative to the rest of the states.

In contrast to Kentucky's relatively stagnant growth, many of Kentucky's neighbors, especially to the south, have experienced relatively rapid growth in average earnings in recent years. In 1969, Georgia, Kentucky, North Carolina and Tennessee all had levels of average earnings that were 77-82 percent of the average earnings in the U.S., while Alabama had average earnings that were approximately 70 percent of the national average. By 2004, Kentucky's average earnings remained at approximately 80 percent of the national average while average earnings in Georgia, North Carolina and Tennessee had grown to 90 percent of the national average, and average earnings in Alabama had grown to over 85 percent of the national average. In other words, while relative average earnings in Kentucky has been flat for the past forty years, average earnings in a number of southern states similar to Kentucky have experienced fairly rapid relative growth since 1969.

In this report, we examine whether there are identifiable factors that can explain why Kentucky remains mired at the bottom of the income distribution. We start by first estimating a standard growth regression using data from all the states in the continental U.S. to examine what factors are most important in explaining why some states have grown faster. For this part of the report, we draw on data from a number of sources covering the period from 1969 to 2004. Next we compare the growth of these factors in Kentucky with the growth of these factors in our comparison states: Alabama, Georgia, North Carolina and Tennessee. This comparison will allow us to identify which of these factors explain why these other states have grown faster than Kentucky. Finally, we examine various policies in our comparison states to see if we can identify specific policies that can explain why a given state experienced differential growth in one of these factors.

When examining growth we will focus on seven possible explanations for Kentucky's low level of income. These possible explanations focus on differences between Kentucky and other states in: (1) the stock of knowledge; (2) the business climate and taxes; (3) state industrial structure; (4) state infrastructure; (5) the size of the government sector and role of transfer payments; (6) demographic changes; and (7) other observed or unobserved factors that are related to income growth.

The main results from our analysis are:

- Our stock of knowledge variables—the percent of residents age 25 and older with a high school diploma as their highest level of schooling; the percent of residents age 25 and older with a bachelor's degree as their highest level of schooling; the per capita stock of patents in a state; and per capita federal spending on research and development (R&D) in a state—account for the largest share of cross-state difference in earnings.

- The variables measuring the demographic changes and the infrastructure in a state also play an important role in determining income in a state. These variables include the percent of a state's population living in an urban area, the stock of highway capital per capita in a state, and the percent of the population that recently moved into the state.

- Relative to Kentucky, our comparison states—Alabama, Georgia, North Carolina and Tennessee—experienced faster growth in the per capita stock of patent capital, the percent of adults in the state with a four-year college degree, the percent of the population living in an urban area, and the percent of residents who have recently moved into the state. Faster growth in these factors largely accounts for the faster growth in income in these comparison states.

- When we look more closely at some of these factors, we see that college graduates in Kentucky receive lower earnings than college graduates in any of the four comparison states. In addition, migrants to Kentucky tend to be less educated, receive lower wages, and are more likely to move to a rural area than people moving into comparison states.

- The slow growth in income in Kentucky is almost exclusively due to the slow growth in income in the rural areas of Kentucky; the growth in the urban areas in Kentucky is quite similar to the growth in income in the urban areas of Georgia, North Carolina and Tennessee and is much faster than the growth of income in the urban areas of Alabama and the U.S. as a whole.

- Our discussion with site consultants largely confirms the results from our empirical analysis: the primary reasons for the slow growth in Kentucky are the lack of skilled workers, the fact that Kentucky struggles to attract innovative businesses and skilled workers to the state, and the fact that these problems are particularly acute in the rural areas of the state.

- Site consultants indicated that, although Kentucky's Cabinet for Economic Development performs the traditional economic development functions very well, Kentucky suffers from a lack of coordination between economic development, workforce development, community and technical colleges, public four-year universities and research parks, and tourism.

- Economic development agencies in other states indicate several efforts used to improve their states' economies. First, they coordinate efforts between themselves and workforce development officials, which is a significant contributor to their ability to attract and retain businesses. Second, they also indicate that they work closely with officials at the public universities and research centers in the state to attract innovative businesses and skilled workers. Third, they work with tourism officials in an effort to market the state to people who might potentially relocate to the state.

- Economic development agencies in other states indicated that they work closely with individuals involved in workforce development, higher education and tourism to ensure

that legislators in the state recognize that all of these parts of state government are an integral part of economic development and need financial support.

The empirical analysis contained in this report, our comparison of Kentucky with other states and our conversations with site consultants all lead to the same conclusion—the primary limitation to economic growth in Kentucky is the low skills of workers in Kentucky. Every site consultant we spoke with indicated the primary limitation to firms locating or expanding in Kentucky is the lack of training and poor education of the workforce. We have seen that the problems of workforce development are particularly acute in the rural areas of the state, since it is the slow growth in the rural areas of Kentucky that accounts for Kentucky's slower growth relative to our neighboring states to the south. Compounding the problem of poor workforce development is the fact that, relative to our comparison states, Kentucky struggles to attract innovate businesses and skilled workers to the state. Until the problem of workforce development is addressed, all other efforts at economic development will be unsuccessful.

Every economic development official in the competing states with whom we spoke indicated the single most important reason for their economic growth over the previous three to four decades was an emphasis on education and workforce development. Site consultants confirmed this statement indicating that, relative to the states we compete with when trying to attract businesses, Kentucky suffers from a lack of coordination between economic development, workforce development, community and technical colleges, public four-year universities and research parks, and tourism. Other states have recognized that workforce development officials, community and technical college officials, officials at the public four-year colleges in the state, and tourism officials are all key partners in economic development efforts.

Other states have also been more successful at linking economic development in urban areas with economic development in bordering rural areas, thereby raising the productivity and income in these previously rural areas. This point was confirmed again by site consultants who suggested that Kentucky form economic development regions around some of the cities in Kentucky such as Louisville, Lexington, Elizabethtown/Bardstown, Bowling Green, Paducah, Owensboro/Henderson, Somerset/London and Ashland and promote economic development in the cities that would then spillover into the surrounding rural areas.

In this report, we find that the keys to economic growth in Kentucky are ensuring we have the inputs necessary for businesses to continue to grow if they locate in the state—with the key input being skilled workers; ensuring that we have an environment where people want to move and raise a family; and ensuring that people know about the positive attributes of the state. Other states have accomplished these objectives by adopting a much more expansive view of economic development than we have adopted in Kentucky.

I.   Introduction

Kentucky has long been one of the poorest states in the country. In 1939, Kentucky ranked 44th out of 48 states in terms of per capita personal income (Bauer, Schweitzer and Shane, 2006). In 1970, Kentucky ranked 44th out of 50 states in terms of per capita personal income, and in 2004, Kentucky was still the 6th poorest state in the union with average earnings of $27,151 compared to the average for the entire country of $33,041. On top of this already low level of income, Kentucky has experienced fairly slow growth in output in recent years. Between 1997 and 2004, Kentucky had an average annual growth in real gross state product (GSP) of 1.6 percent, ranking 43rd in terms of growth in GSP relative to the rest of the states. Without increasing the speed at which income is growing in the Commonwealth, it is unlikely that Kentucky will move from the bottom of the income distribution in the near future.

In contrast to Kentucky's relatively stagnant growth, many of Kentucky's neighbors, especially to the south, have experienced relatively rapid growth in average earnings in recent years. Figure 1 shows that in 1969, Georgia, Kentucky, North Carolina and Tennessee all had average earnings that were 77-82 percent of the average earnings in the U.S., while Alabama had average earnings that were approximately 70 percent of the national average. By 2004, Kentucky's average earnings remained at approximately 80 percent of the national average while average earnings in Georgia, North Carolina and Tennessee had grown to 90 percent of the national average and average earnings in Alabama had grown to over 85 percent of the national average. In other words, while relative average earnings in Kentucky has been flat for the past forty years, average earnings in a number of southern states similar to Kentucky have experienced fairly rapid relative growth since 1969.

One obvious question is, "Are there identifiable factors that can explain why Kentucky remains mired at the bottom of the income distribution?" A number of factors have been offered to explain Kentucky's low income. One of the more prominent explanations has been the historically low level of education in Kentucky. Clearly this was part of the motivation behind the Kentucky Education Reform Act of 1990 and the Post Secondary Education Reform Act of 1997 (known as HB1). The education explanation appears credible since in 2004 Kentucky ranked 49th in the percent of the adult population with a high school degree and 47th in the percent of adults with a college degree. Other explanations have focused on Kentucky's relatively low concentration of "high technology" employment as a contributor to our low ranking. Again, this argument is bolstered by a recent report from the Milken Institute (DeVol and Koepp 2004) in which Kentucky ranks 48th in the institute's State Technology and Science Index. More generally, the overall focus of Kentucky's economy, which has historically been concentrated in manufacturing, mining and agriculture, may explain the poor performance. More recently, policy makers have been examining what is perceived as the poor business environment in Kentucky, with efforts to lower taxes on business and to make Kentucky a "right-to-work" state. Arguments can be made supporting each of these as a possible reason for the poor performance of the economy and it seems likely that all play some role. However, before we can develop policies to address the problem of low income in the state, it is important to determine which factors are the most important in hindering Kentucky's growth.

Even after identifying which factors account for differences in the growth of a state, a second question that needs to be answered is: "Are there specific programs in a state that promote economic growth?" More specifically, can we identify programs in Alabama, Georgia, North Carolina and Tennessee that enhanced the economic growth in these states?

In this report, we start by examining whether there are identifiable factors that can account for why Kentucky remains mired near the bottom of the income distribution while other southern states have experienced more rapid economic growth in the recent period. Next, we evaluate whether there are policies adopted by other states that have proven to be more effective in promoting economic growth or whether Kentucky's slow relative growth can be explained by some other factors that are difficult for the state government to affect.

When examining growth we will focus on seven possible explanations for Kentucky's low level of income. These possible explanations focus on differences between Kentucky and other states in: (1) the stock of knowledge; (2) the business climate and taxes; (3) state industrial structure; (4) state infrastructure; (5) the size of the government sector and the role of transfer payments; (6) demographic changes; and (7) other observed or unobserved factors that are related to income growth. In the first part of our report we examine which of these factors are the most important in accounting for differences across states in the growth of average earnings. For this part, we will draw on data from a number of sources covering the period from 1969 to 2004. In the second part of the study we will compare the growth of these factors in Kentucky with the growth of these factors in our comparison states: Alabama, Georgia, North Carolina and Tennessee. This comparison will allow us to identify which of these factors explain why these other states have grown faster than Kentucky. In this part of the analysis, we will compare the growth in similar regions of these states. For example, we will compare the growth of urban areas in Kentucky with the growth of urban areas of the other states. In addition, we will compare the growth of rural areas in these states. This portion of the study will allow us to determine whether it is urban or rural areas of Kentucky that are underperforming relative to our comparison states. Finally, we will examine various policies in our comparison states to see if we can identify specific policies that can explain why a given state experienced differential growth in one of these factors.

II.   National Determinants of Economic Growth

We begin our analysis by examining what variables can account for why some states have grown faster between 1969 and 2004. In our analysis, we use ordinary least squares regression techniques to see which factor accounts for the largest portion of the differences in the growth of states. The actual regression we use is based on standard economic theory and is similar to the model used by Bauer, Schweitzer and Shane (2006) to examine state growth since 1939. In this analysis, we treat all states as separate economies. In essence, for the purposes of our analysis, each state is treated as an independent country. We focus on the period 1969-2004 since, prior to 1969 Kentucky (along with other poor states) appeared to be catching up with wealthier states (see Bauer, Schweitzer and Shane, 2006). Since the early 1970s, this convergence appears to have stopped for Kentucky, and the state may have actually gotten poorer relative to the average state. Certainly, earnings growth in Kentucky has slowed relative to other states in the Southeast region (see Figure 1). Our approach will allow us to document the ways in which the average Kentucky resident has lost ground relative to residents in other states in the Southeast region and relative to residents in other states in the U.S. over this period.

Figure 1: Average Earnings for all Residents in a State (2004 dollars)
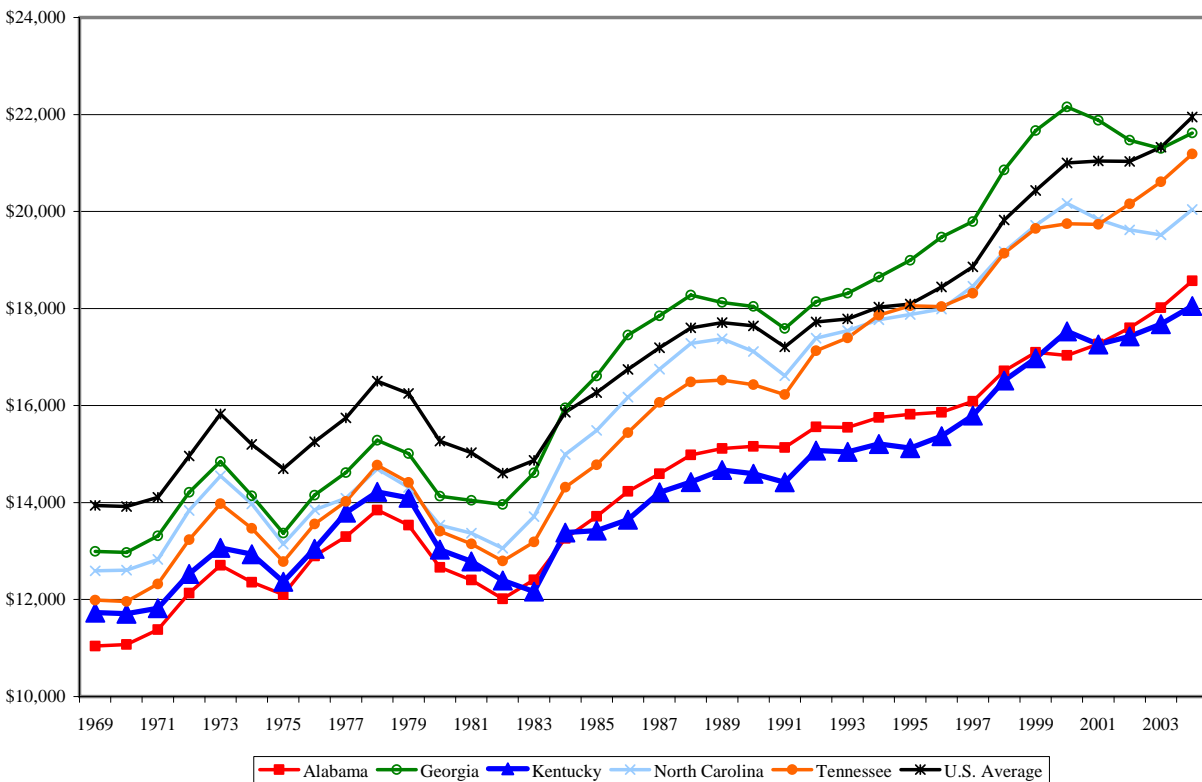
Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 2006

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II.A   Measuring Economic Growth and Its Determinants

Our primary measure of economic performance will be per capita earned income in a state. Income is a commonly used measure of economic well-being because additional income allows individuals to consume more of what they desire, whether it is a nicer house or better clothes for their children. We focus on earned income or earnings because this is income earned by working. Total income includes income transferred to individuals by the government, so difference in total income across states could reflect more generous public assistance programs which is unrelated to the productivity of workers. Therefore, changes in earned income provide a better measure of long-term changes in the well-being of citizens in a state.

We focus on seven primary explanations to account for differences in economic growth between states. These explanations are: (1) differences in the stock of knowledge between states; (2) differences in the business climate and taxes; (3) differences in state industrial structure; (4) differences in state infrastructure; (5) differences in the size of the government sector and role of transfer payments; (6) differences in demographic changes; and (7) other observed or unobserved factors that are related to income growth. Below we discuss the variables we use to capture these differences.

We use four variables to capture the stock of knowledge in a state. The first variable is the percent of residents age 25 and older with a high school diploma as their highest level of schooling, and the second variable is the percent of residents age 25 and older with a bachelor's degree as their highest level of schooling.[1]

The third variable we use to capture the stock of knowledge of the residents of a state is the average number of patents per resident in a state. Rather than using the raw number of patents granted in a year, we construct a stock of patents in a state using a perpetual inventory method. We prefer a stock measure over the year to year flows in patents because patents should have an economic impact for a number of years, not just in the year it was awarded. The stock measure will capture this long-term impact. The stock of patents measure is also a better long-term measure of technological change in a state than measures based on recent technologies such as the miles of fiber optic cable in a state or the number of households with a computer.

The fourth and final knowledge variable is per capita federal spending on research and development (R&D) in a state. This is another variable that captures the amount of innovative activity that is occurring in a state as well as capturing the amount of federal funds flowing to the state in support of both public and private research.

We capture the business climate in a state using four different variables. The first two variables are whether the state is a right-to-work state in a year and a measure of the cost of workers' compensation in a state. Both of these variables are cited by Kentucky policy-makers as burdens to attracting business to the state**.** We also include corporate and individual tax revenue as a percent of total income as a measure of the tax burden in a state. We include measures of both corporate and personal income taxes in a state because previous research has shown that business

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[1] The percent of individuals with an associate's degree as their highest level of schooling is not included in the analysis because it is too closely related to the percent of individuals with a bachelor's degree.

owners care about personal income taxes as much as, if not more than, business taxes when deciding where to locate their business (Hoyt and Hardin, 2005). Along with these variables, we experimented with including measures of energy prices in the analysis but dropped them from the final analysis because they do not seem to affect state-level economic growth.

Industrial structure variables are included to control for cross-state differences in industrial structure. Our measure of industrial structure in each state is the percent of employment in each of the industries: Agriculture, Mining, Construction, Manufacturing, Transportation and Utilities, Wholesale Trade, Retail Trade, Finance/Insurance/Real Estate and Other Services.

We use two variables to measure the infrastructure in a state: the percent of a state's population living in an urban area and the stock of highway capital per capita in a state. We control for the amount of infrastructure in a state because it is commonly believed that increased state spending on infrastructure leads to greater economic growth. Previous research has shown that people who live in urban areas tend to have more education and are more productive—perhaps because there is more capital infrastructure in urban areas. Since urban residents are more productive, states with a larger urban population have faster growth. Highway capital is a commonly used measure of infrastructure. We considered a number of other measures of infrastructure, such as the size of ports and airports and the amount of capital expenditures devoted to education and prisons. However, all of these measures tend to move together with the stock of highway capital—if a state has a large stock of highway capital, they also have large airports and spend a large amount on educational infrastructure. Therefore, it is only possible to include highway capital or one of these other measures in the analysis and we have chosen to include highway capital. However, this variable should be viewed as a proxy for overall spending on infrastructure in a state.

We use two measures to capture the size of the government sector in a state: the percent of all employees in a state that work for local, state or federal government and transfer payments as a percent of total personal income in a state. One concern about the size of government is that a larger government may tend to squeeze out more productive spending by the private sector. In addition, large transfer payments may lead individuals to work less, thereby lowering overall productivity in the state.

People who move from one state to another tend to be more educated and more productive, on average, than people who do not move. States that are able to attract a large number of migrants into the state will be able to improve their workforce and grow faster than states that do not attract many new migrants. Therefore, we control for demographic changes within states by looking at the percent of the population that recently moved into the state and the percent that moved out of the state.

Finally, we also use a statistical technique, called fixed effects, to capture unobserved differences in states that may affect economic growth. These effects include things such as a state's climate, access to overseas markets or its citizens' work ethic.

The variables used in our analysis are constructed using data from a number of sources including the Bureau of Economic Analysis, the U.S. Patent and Trademark Office and the U.S. Bureau of

the Census. Appendix A provides a more complete discussion of how we construct our variables as well as a more technical discussion of the statistical model we estimate.

II.B   Results

The results for the multivariate analysis are reported in Table A-1 in the Appendix. This table contains the coefficients, standard errors and beta coefficients from our regression. Identifying whether a particular variable is more or less important than other variables is complicated. Variables with larger coefficients are not necessarily more important than variables with smaller coefficients, because the variables have different scales (such as dollars or percents). Therefore, we use beta coefficients to compare explanatory variables. In this technique, all the explanatory variables are measured on the same scale. Specifically, the variables are transformed so that each of them has a mean of zero and a standard deviation of one. Because the variables now have the same scale, it is easier to compare them to each other. Variables with larger beta coefficients are considered more important factors than factors with smaller beta coefficients.

Table 1: Predicted Effects of Variables on the Average Earnings in a State

	One Standard Deviation Change in the Variable	Resulting Percentage Change in Average Earnings	Change in Average Earnings in Kentucky in 2004	Change in Kentucky's Earnings Ranking in 2004
Stock of Knowledge				
Average number of patents per resident in a state	0.002	11.2%	$2,017	Increase 12 places
Percent of population 25 and older with 4+ years of college	5.4	3.1%	$567	Increase 4 places
Percent of population 25 and older with high school diploma	10.8	2.3%	$421	Increase 2 places
Federal R&D expenditures per person in a state	$221	0.9%	$156	Increase 1 place
Business Climate				
Proportion of states that are right-to-work states	0.490	-0.3%	-$48	No Change
Payments into the workers' compensation system per worker	$108	-1.4%	-$249	No Change
Corporate income taxes as a percent of total personal income	20.0%	0.7%	$119	Increase 1 place
Individual income taxes as a percent of total personal income	110.0%	-0.8%	-$143	No Change
State Infrastructure				
Percent of population in an urban area	14.5	9.9%	$1,795	Increase 11 places
Per capita total highway capital stock	$731	-3.9%	-$701	Decrease 2 places
Size of Government				
Government employment as a percent of total state non-farm employment	3.6	-1.9%	-$340	No Change
Personal current transfer receipts as a percent of total personal income	10.8	-2.7%	-$492	Decrease 2 places
Demographic Changes				
In-migrants as percent of total population	1.1	10.2%	$1,844	Increase 11 places
Out-migrants as percent of total population	0.6	-0.7%	-$118	No Change

Because the results in Table A-1 are difficult to interpret, we use these results to show how changes in a variable are predicted to affect average earnings in a state. This is shown in Table 1. In this table, we report the size of a one standard deviation change in a variable, the predicted percentage change in average earnings in a state that would occur with a one standard deviation change in a variable, the predicted change in average earnings in Kentucky in 2004 that would result from a one standard deviation change in a variable, and how this change in earnings would change Kentucky's ranking in average earnings among all 48 states used in our analysis.

Looking at Table 1 we can see that, as a group, the stock of knowledge variables has the strongest positive and significant relationship with state-level income. If the number of patents in a state were increased so that the average number of patents per resident rose by 0.002 then the model predicts that average earnings in a state would increase by 11 percent.[2] We can also see that increasing the percent of adults with a college degree by 5.4 percentage points, which in Kentucky means increasing the percent of adults with a college degree from 18 to 23 percent, leads to a three percent increase in average earnings, while increasing the percent of adults with a high school degree in a state by 10 percentage points is associated with a two percent increase in earnings. Finally, a $220 increase in per capita federal R&D expenditures in a state produces a one percent increase in income. Taken together, a one standard deviation increase in the stock of knowledge in a state would lead to an 17.5 percent increase in income and approximately a $3,000 increase in average earnings in Kentucky. This would move Kentucky from being the 44th poorest state in the union to being the 25th poorest state, which would be an enormous jump up in the state earnings ranking.

The group of variables that has the second largest impact on income in a state is the group measuring demographic changes in a state—in particular the variable measuring the percent of individuals in a state who have recently migrated into the state. The results in Table 1 show that increasing the percentage of in-migrants in a state by one percentage point is associated with a 10 percent increase in income. In Kentucky, if we could increase the percent of residents in the state who had arrived within the last five years from 1.6 percent to 2.6 percent, this would lead to a $1,800 increase in income in 2004 and would result in Kentucky moving up 11 places in the ranking of state earnings. The fact that Kentucky is unable to attract a large number of people to move to the state is clearly one of the reasons why Kentucky remains a relatively poor state.

Equally important in explaining differences in income between states are the variables measuring state infrastructure, although these variables work in opposite directions. The percent urban variable shows that, for a state that is more than 50 percent urban, a one standard deviation increase in the percent of the population living in an urban area is associated with a 10 percent increase in income in the state. This means that if we could increase the percent of Kentuckians who live in cities from 57 percent to 71 percent, the model predicts that 2004 average earnings in the state would be $1,800 higher, which would move Kentucky up 11 places in the state earnings ranking. By contrast, states with a large stock of highway capital tend to have lower income than similar states with a smaller stock of highway capital. One possible explanation for the negative relationship is that, holding state revenues fixed, states that spend more money on highways tend to spend less money on productivity enhancing items such as education. Since Kentucky has a large stock of highway capital relative to other states, this negative relationship accounts for part of Kentucky's low income.

The size of the government sector in a state has a weak negative relationship with income in a state. Looking at Table A-1, we see that the variable measuring employment in the government sector as a percentage of overall employment is not significantly related to state income. However, the variable measuring per capita transfer payments is negative and significant: large transfer payments are associated with lower income, presumably because individuals receiving transfer payments are less likely to work. The fact that, relative to other states, Kentucky

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[2] Table A-2 provides the means and standard deviations for all of the variables in Tables 1 and A-1.

residents receive a large percentage of their income in the form of transfer payments is another reason why Kentucky remains a poor state. However, the results in Table 1 show that the relationship between transfer payments and income is weaker than some of the other relationships we have discussed.

Since the variables measuring the industrial structure in a state are difficult to interpret, we have not presented them in Table 1. However, if we look at Table A-1 and focus just on the signs on the coefficients, we see that the impact of these variables is mixed. States with relatively large mining, construction and wholesale sectors experienced slower growth over this period, while states with more employment in the manufacturing, transportation and retail sectors experienced faster growth. However, the result for manufacturing is somewhat misleading since additional analysis (not shown) suggests that the overall positive effect of manufacturing is primarily due to a positive relationship between manufacturing employment and income growth in the early part of the period. In more recent years, having more employment in the manufacturing sector is associated with lower average earnings.

Table 1 shows that the business climate variables are not strongly related to per capita personal income in a state. Looking at Table A-1, we see that, of the four variables we use to measure business climate, only the variable measuring the amount of workers' compensation payments is significantly related to income. The negative coefficient on the workers' compensation variable means that states—such as Kentucky—where firms pay relatively high premiums tend to have lower income, although the effect is not very large. For example, a $108 increase in the amount of workers' compensation per worker would result in a $249 fall in average earnings in Kentucky.

II.C   Summary

The results from our regression analysis show that our stock of knowledge variables account for the largest share of cross-state difference in income. In addition, the variables measuring the demographic changes in a state and the variables measuring the infrastructure in a state also play important roles in determining earnings in a state. Among these variables our measures of the per capita stock of patent capital (the average number of patents per resident), the percent of the population that lives in an urban area, the percent of residents that have recently moved to a state and the percent of adults with a college degree are particularly important in explaining the average income level in a state. The fact that Kentucky ranks below average on every one of these measures is obviously an important reason why Kentucky is one of the poorest states in the country.

III. A Closer Look at the Determinants of Income in Kentucky and Other Southern States

The results in the previous section show the relative importance of different factors in accounting for differences in income among the U.S. states. In this section, we focus on how these variables change in Kentucky over time and in the group of states that had similar economic activity in 1969, but are now noticeably more prosperous. These states are Alabama, Georgia, North Carolina and Tennessee. As we have already seen in Figure 1, Georgia, North Carolina and Tennessee had similar levels of income as Kentucky in 1969, but all are now noticeably wealthier than Kentucky in 2004. Alabama had a lower level of income relative to Kentucky in 1969, but by 2004 had caught and even passed Kentucky in average earnings.

III.A   Analysis of the Change in Factors

Figure 2: Average Number of Patents per Resident in a State
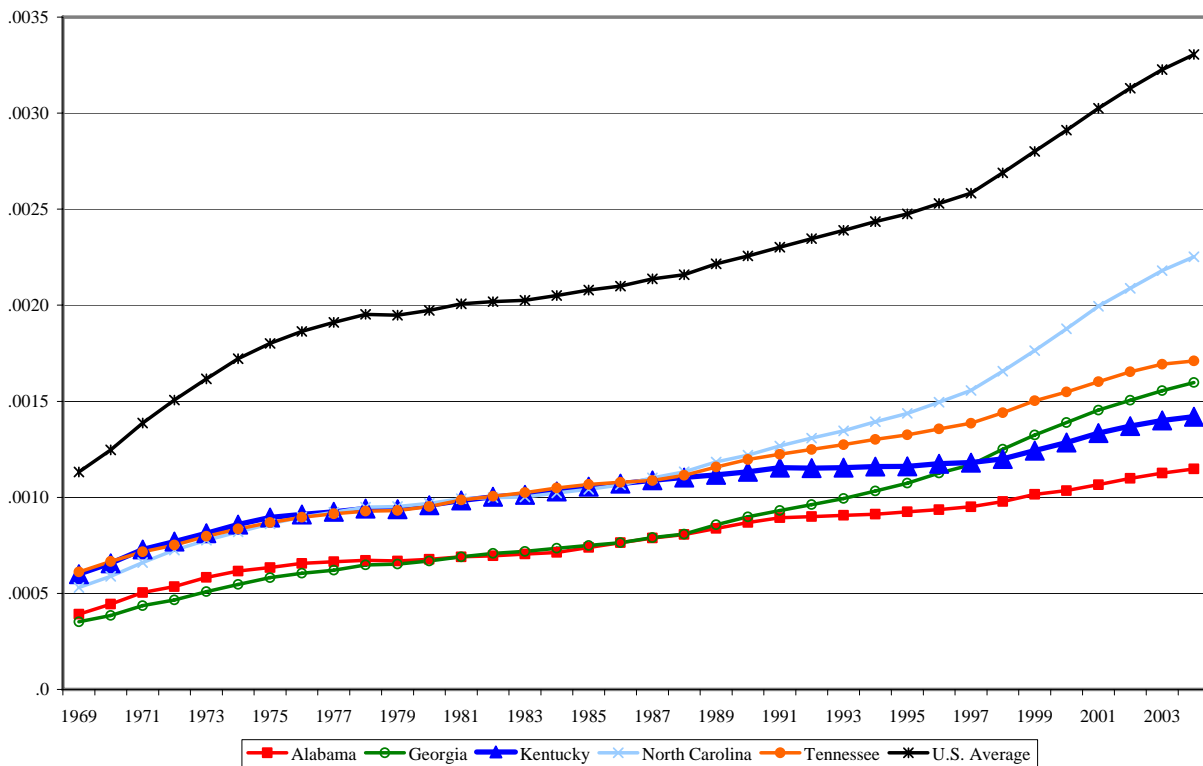
Note: This is the per capita patent stock depreciated at a 5 percent rate.
Source: U.S. Patent and Trademark Office, 2007

We start with Figure 2 which shows the changes in the average number of patents per resident in our five states, along with the average for the U.S. as a whole.[3] Recall that our results in Table 1

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[3] See Appendix A.2 for information on how we calculate the number of patents in a state.

showed that this variable is one of the strongest predictors of high income in a state. This figure shows that while all of the five southern states have levels below the U.S. average, North Carolina, Georgia, and to a lesser extent, Tennessee all experienced substantial growth in the average number of patents per resident, particularly in the 1990s. Clearly for these states the growth in innovative activity fueled a significant portion of their growth in income over this period. In contrast, Kentucky has remained a state with very little innovative activity, experiencing almost no growth in patents during the 1990s.

Figure 3: Percent of Residents Age 25 and Older in State with At Least a Four-Year College Degree (3-year moving average)
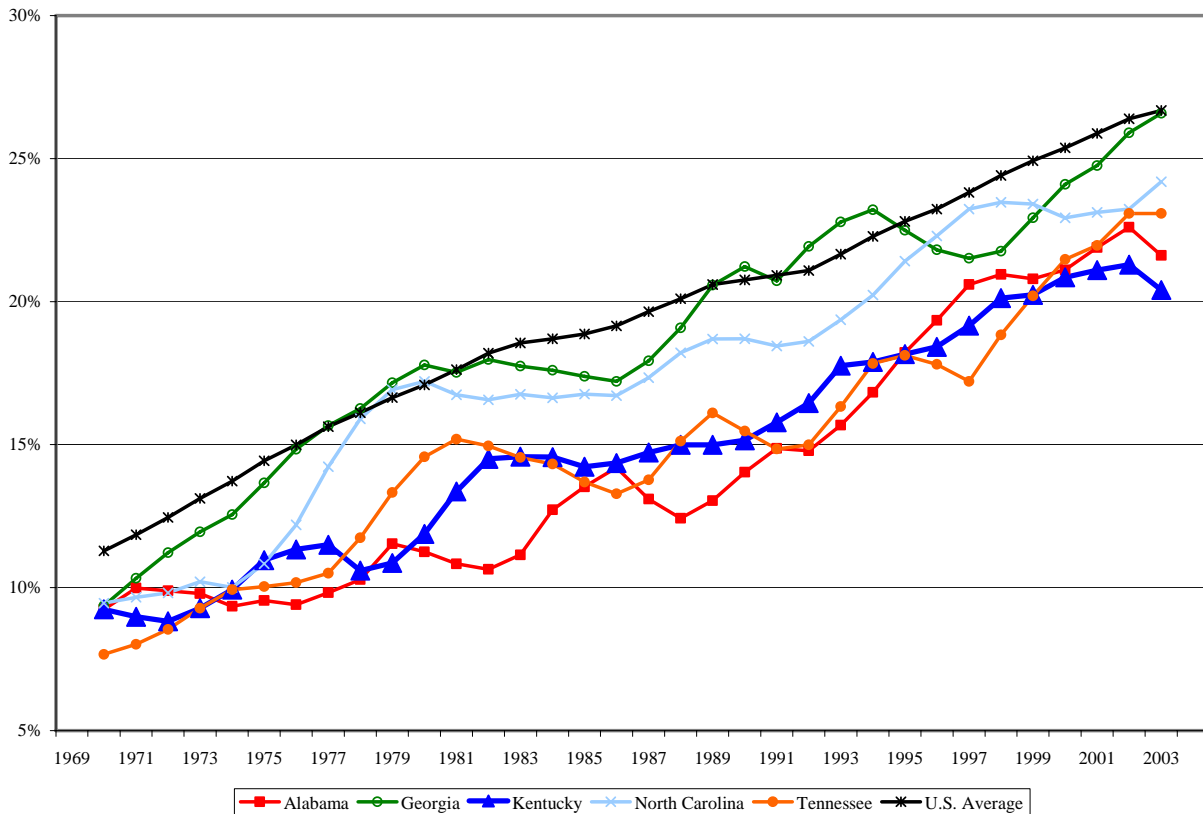
Source: U.S. Bureau of the Census, Current Population Survey, March Supplement, 1969-2006

Figure 3 presents the percentage of adult residents age 25 years and older in a state with at least a four-year college degree for our five states and an average across all states.[4] This figure shows that at the start of our period four of our five states had approximately the same share of adults with a college degree, Tennessee had a slightly lower percentage than the other states and all five states had a smaller share of educated adults than the typical state. Over this period, while all states including Kentucky have seen a growth in the percentage of adults with a college degree, Kentucky has experienced much slower growth of college-educated residents than the other southern states. By 2004, Kentucky has the lowest share of college graduates compared to Georgia, North Carolina and Tennessee, which have all experienced much faster growth.   The

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[4] These percentages are a 3-year moving average.

percentage of college-educated adults in the state is another factor that plays a significant role in explaining the more rapid economic development in these states.

Figure 4 shows the pattern in urbanization. Georgia and North Carolina have had sizable increases in urbanization since 1990 with Georgia surpassing the national average and North Carolina moving from the least urban to the second most urban and tied with Tennessee. Kentucky's urbanization has increased slightly over the period making it the fourth most urban of the five states. Alabama has actually declined substantially since 1990, becoming the least urban state of the group. Kentucky's larger rural population than the typical state is important because workers in rural areas are less productive and, therefore, have lower incomes than workers in urban areas.

Figure 4: Percent of Residents in State Living in an Urban Area
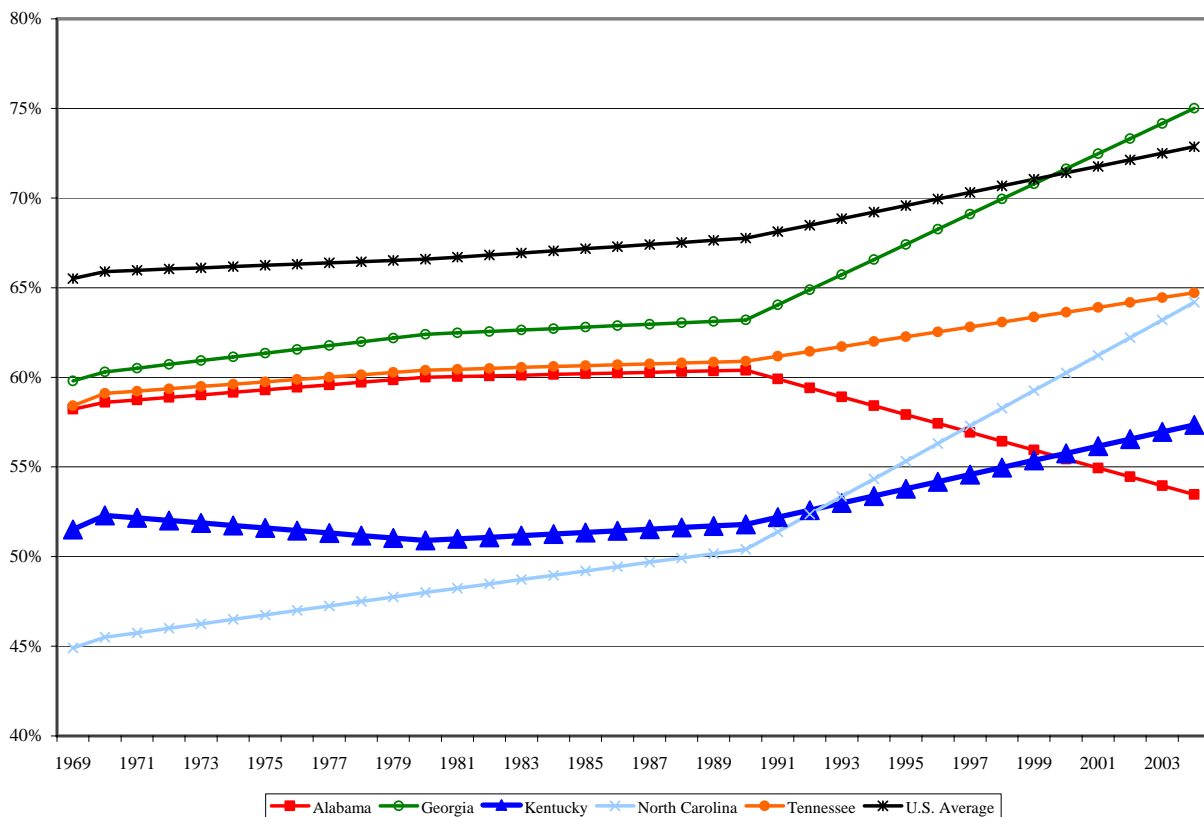
Source: U.S. Bureau of the Census: Census of Population and Housing, 1970, 1980, 1990, 2000 and American Community Survey 2001-2004

Figure 5 shows the trend in in-migration over a 31 year period.[5] Georgia had the highest in-migration throughout the late 20th century. North Carolina also experienced high levels of in-migration, well above the national average. Tennessee had a substantial increase in in-migration during that period. Kentucky had a slight increase in in-migration in the 1990s, surpassing

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[5] We only present migration data through 2000 because we use different data to measure migration from 2001-2004 and these data are not directly comparable to the earlier data. However, data for 2001-2004 are included in the regression.

Alabama but still remaining well below the national average. Clearly, Georgia, North Carolina and Tennessee have been more effective in attracting new residents to their states, and this helps explain why they have grown faster than Kentucky over this period.

Figure 6 shows changes in the amount of transfer payments as a percentage of total personal income in a state. Transfer payments are payments to individuals for whom no services are performed. The primary component of transfer payments consists of government payments to individuals through programs such as welfare, social security and disability insurance. In figure 6, we see that transfer payments have increased in all states. We can also see that, of the five states, Kentucky has always had the largest share of transfer payments. As the results in Table 1 show, having a larger percentage of transfer payments leads to lower wages and salary income. However, the estimated size of the impact is small, so Kentucky's relatively large share of transfer payments should have a small impact on the growth of income in the state.

Figure 5: People Moving into the State (In-Migrants) as a Percent of Total State Population
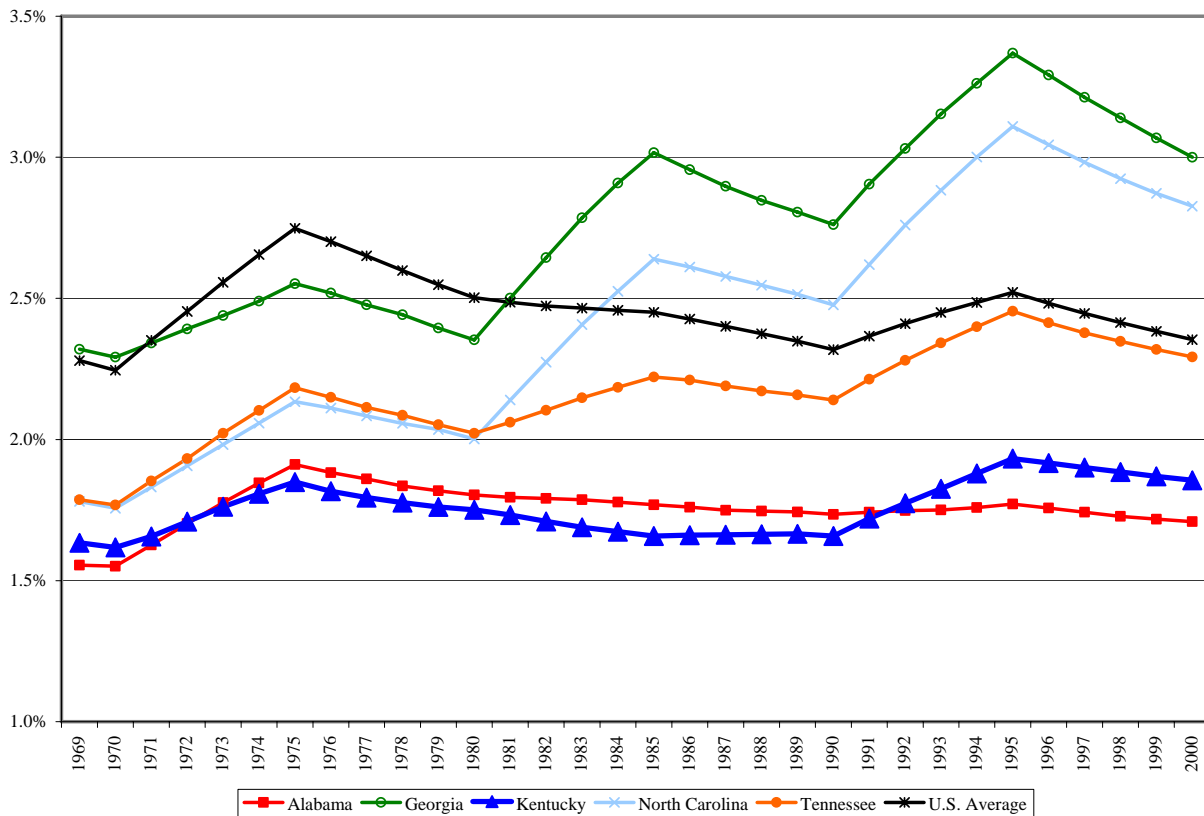
Source: U.S. Bureau of the Census, Census of Population and Housing, 1970, 1980, 1990, 2000

Figure 6: Value of Transfer Payments to Residents in State as a Percent of Total Personal Income
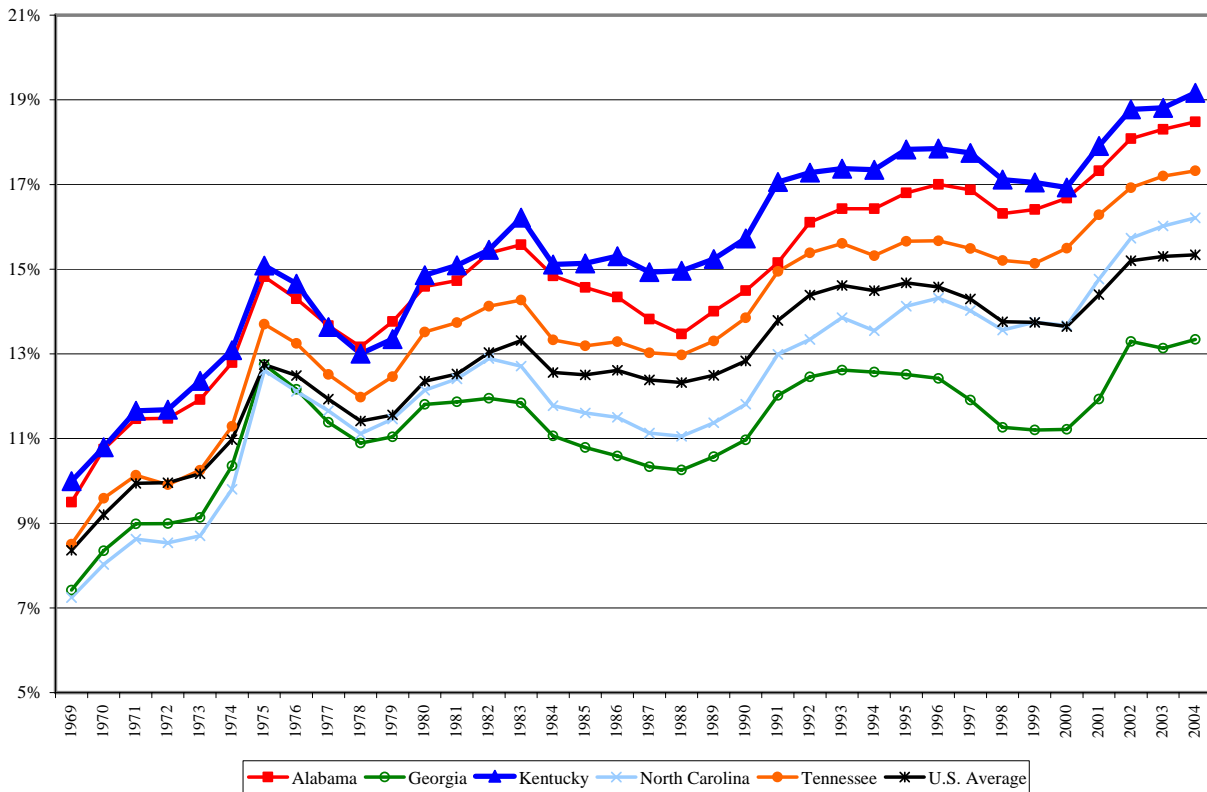
Legend: Alabama, Georgia, Kentucky, North Carolina, Tennessee, U.S. Average

So far in our analysis we have focused on tangible differences between states that can be easily measured and that change over time. However, it is possible that there are other differences between states, such as climate, access to natural resources or location, which either change slowly over time or become more or less important over time. For example, Kentucky's central location means that it is relatively inexpensive to get from Kentucky to business centers such as Chicago, New York or Dallas. However, as communication technology improves and the advantage of face-to-face meetings decline, the "value" of being centrally located could decline as well. To capture such effects we use a statistical technique called fixed effects which measures the impact that unobserved fixed differences across states have on the growth rate of different states. Once we control for all of the measurable characteristics of a state, fixed effects simply capture the effect on state growth rates of other factors that are difficult to measure. In the present context, the fixed effects tell us how fast one state would grow over the period relative to another state if the two states have the same values for all of the measurable characteristics such as the percent of the population with a high school diploma or college degree, the percent of the population living in an urban area, and the total amount of R&D expenditure in a state.

Figure 7: Individual State Fixed Effects by Five Year Period
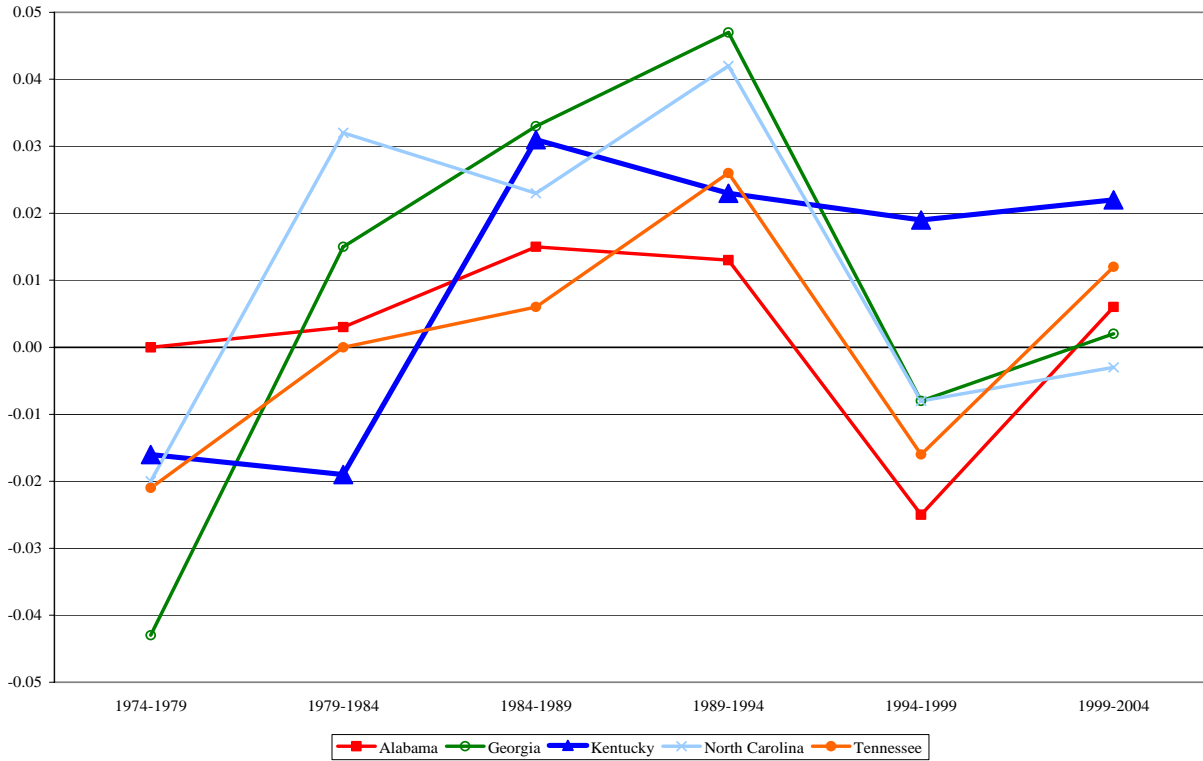
Source: Dataset compiled for Kentucky Cabinet for Economic Development Report, 2007

In order to see whether these unobserved differences change over time, we divided the 1969-2004 period up into six separate five-year periods and then re-estimated our model on each of these separate time periods. In Figure 7, we have plotted the estimated value of the fixed effects for our five states. As an example of how to interpret the fixed effects, we can see in Figure 7 that in the 1984-1989 period the value of the fixed effect for Kentucky was approximately 0.03. This means that if Kentucky and the typical state in the U.S. had the same values for all of the observable variables, then Kentucky would experience a growth rate over this period that was 3 percentage points faster than the growth rate of the typical U.S. state.

In Figure 7, we can see that, if Kentucky had the national average value of all of the observable factors, Kentucky's growth rate would have had slower growth than the typical state for the periods 1974-1979 and 1979-1984, since the value for Kentucky's fixed effects in these periods is approximately -0.02. However, starting in the period 1984-1989, our regression results show that, based solely on unobservable factors, Kentucky would have experienced faster growth than the typical state and, since the period 1994-1999, faster growth than all four of the comparison states. This is indicated by the fact that for every period since 1984-1989, the value of Kentucky's fixed effect is positive and, since 1994-1999, the value of Kentucky's fixed effect is larger than the value of the fixed effects for the four comparison states. The fact that Kentucky has experienced slower growth over this period relative to the other states is entirely due to how poorly Kentucky ranks in the observable factors discussed above—in particular the stock of knowledge, changing demographics and government infrastructure variables.

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Rather than presenting figures for each variable in our analysis, we summarize the results for the remaining factors. In terms of other knowledge variables, federal R&D expenditures grew most for Alabama while Georgia experienced a short-term spike in R&D expenditures in the early 1990s. Kentucky had the lowest amount of annual federal R&D expenditures for all of the states over the entire period. The growth in federal R&D expenditures in Alabama appears to account for a significant portion of their relatively rapid growth between 1969 and 2004.

Business climate factors played different roles among the states. Workers' compensation revenues are exponentially higher in Kentucky relative to the comparison states. Taxes show little systematic change over the period, particularly for corporate taxes. Personal taxes are somewhat higher in Kentucky relative to other states, but the share of taxes is growing in all states over the period.

In terms of industrial employment, manufacturing declined less rapidly in Kentucky compared to other states. Highway stock of capital was much higher for Kentucky than for other states, but the gap between states has narrowed in recent years.

III.B   Further Analysis of Selected Factors

Figure 8a: Average Earnings of College Graduates Age 25 and Older by State (2004 dollars)
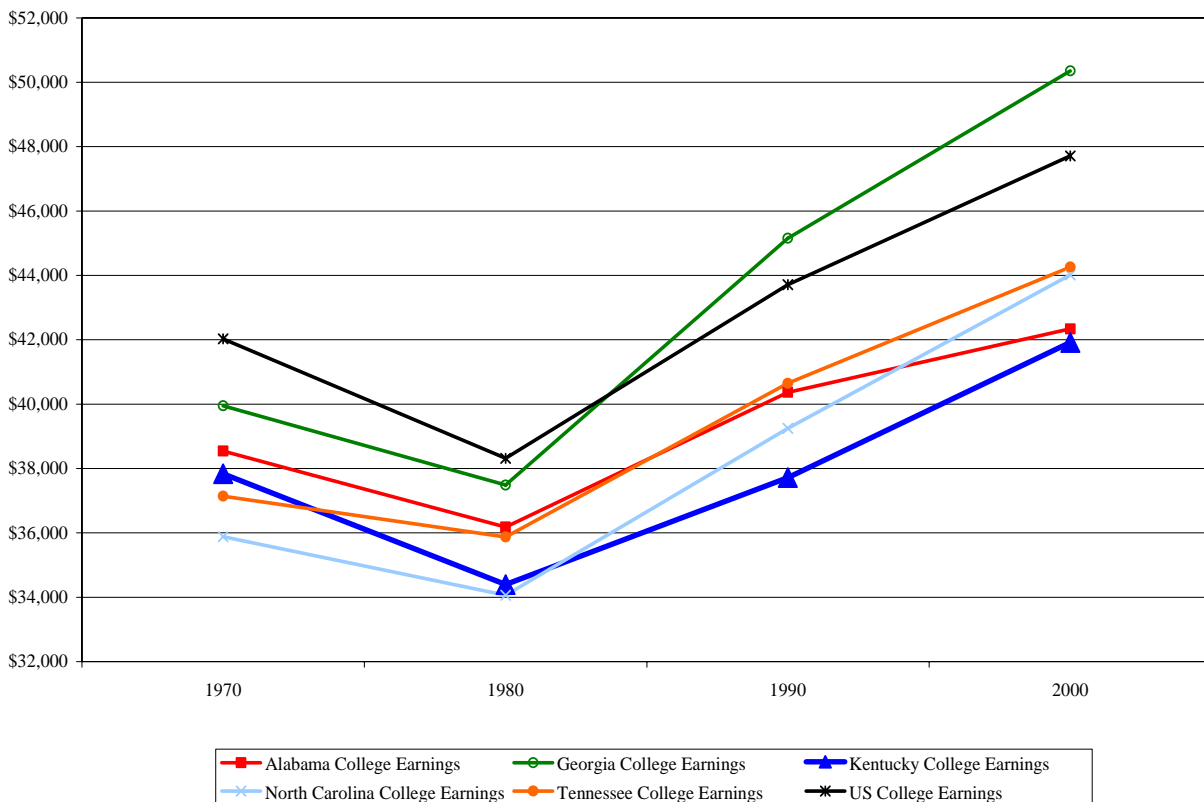
Source: U.S. Bureau of the Census, Census of Population and Housing, 1970, 1980, 1990, 2000

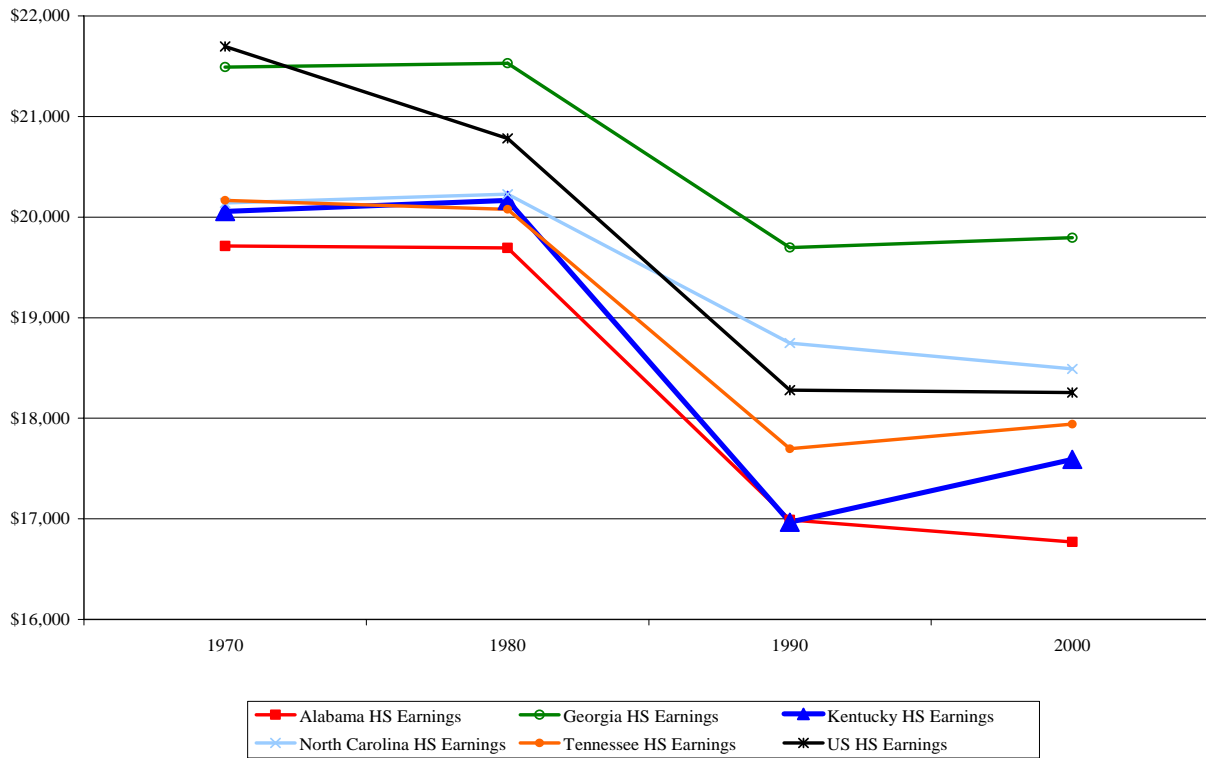**Figure 8b: Average Earnings of High School Graduates Age 25 and Older by State (2004 dollars)**

Source: U.S. Bureau of the Census, Census of Population and Housing, 1970, 1980, 1990, 2000

In this section of the report, we want to examine more closely some of the variables that account for a significant part of the cross-state differences in income and also appear to account for much of the differences in economic growth among the five states on which we are focusing. We start with Figures 8a and 8b which show the average earnings for college and high school graduates age 25 years old and older.[6] Comparing Figures 8a and 8b, they show that college graduates earn more than high school graduates and that this difference has widened over this period.

Because Kentucky has a lower proportion of college graduates as compared to high school graduates than the other states, this widening gap puts Kentucky at a greater disadvantage in 2004 than it did in 1970. In addition, college graduates earn less in Kentucky than in comparison states, and high school graduates in Kentucky only earn more then high school graduates in Alabama. Thus, compared to its southern neighbors, Kentuckians have both a lower average educational as well as lower earnings for each educational level.

Next, we consider the relationship between migration and education. We already know that Kentucky has lower levels of college graduates (Figure 3) and in-migrants (Figure 5) than other

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[6] For many of the graphs in this sub-section we are limited to using data from various U.S. Decennial Censuses, so we will only have data for years in which a Census was conducted.

states. Figures 9a and 9b show education levels for individuals moving into a state, in-migrants, and for individuals who reside in the state, existing residents age 25 years old and older. The figures show that in every state people moving into the state are more educated than the people living in the state. This result is to be expected since more educated workers are more mobile. However, shown in Figure 9a, people moving into Kentucky tend to be less educated than people moving into other states. Also in Figure 9b, people remaining in Kentucky are the least educated of the five states. Thus, two things are hurting economic growth in Kentucky. First, Kentucky is not attracting many people to move into the state as seen in Figure 5. Second, those who do move to Kentucky are less educated than people moving into other states.

Figure 9a: Percent of People Moving into State (In-Migrants) Age 25 and Older with Four or More Years of College
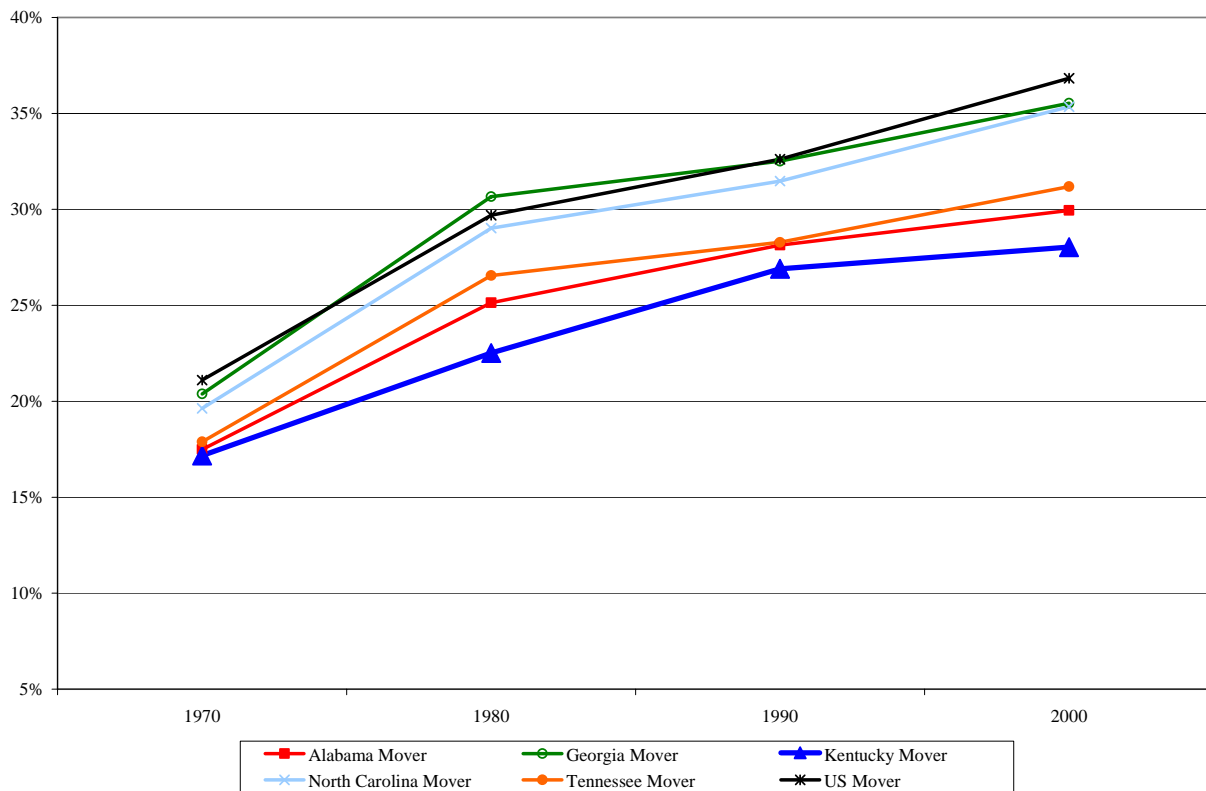
Source: U.S. Bureau of the Census, Census of Population and Housing, 1970, 1980, 1990, 2000

Figure 9b: Percent of Existing Residents Age 25 and Older in State (Non-movers) with Four or More Years of College
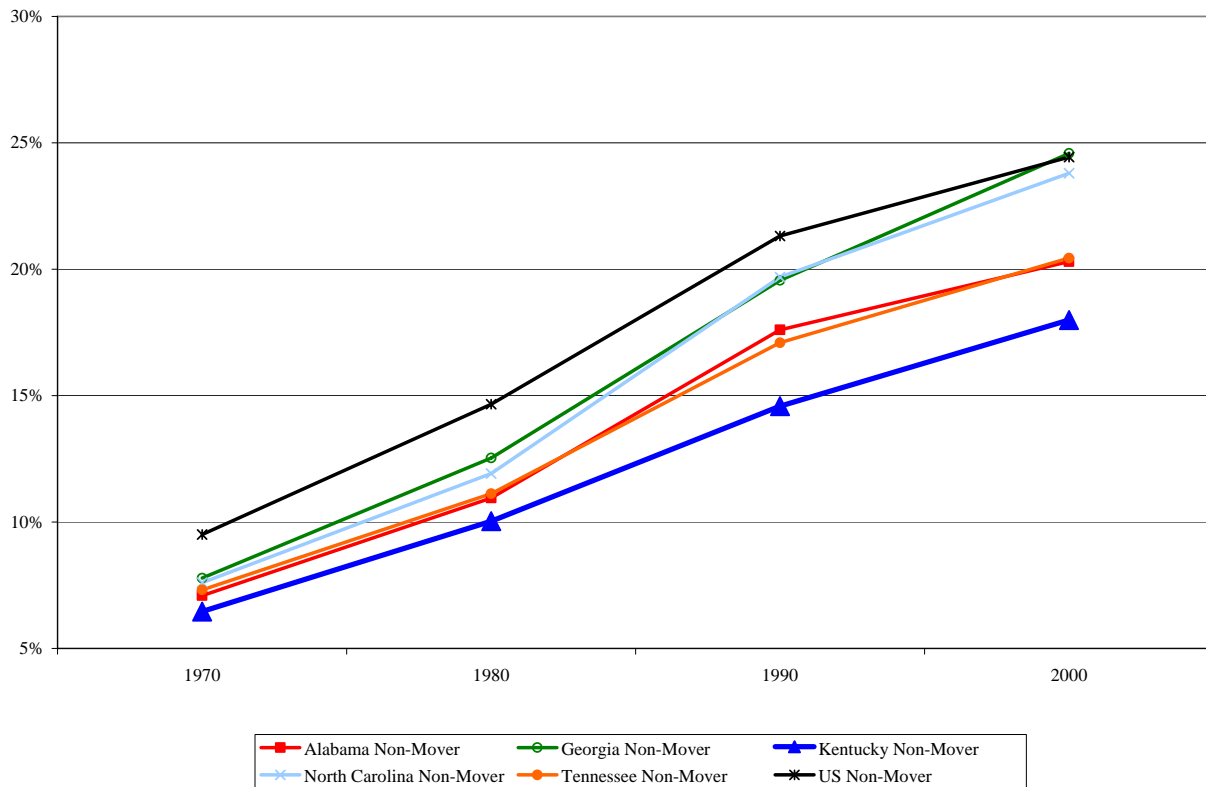
Source: U.S. Bureau of the Census, Census of Population and Housing, 1970, 1980, 1990, 2000

Figures 10a and 10b compare the earnings of in-migrants to the earnings of existing residents in a state for all individuals age 25 years old and older. The figures illustrate that, for each state, earnings of in-migrants are above the earnings of other residents of the state. The higher earnings are not surprising given the findings in Figure 9a showing that in-migrants were more educated. Figure 10a also shows that in-migrants into Kentucky make less money than migrants into the four other states, and Figure 10b shows that existing residents of Kentucky earn less than existing residents of other states. Again, this result mirrors the education findings in Figures 9a and 9b. Figure 11 shows where migrants into the states are locating. We can see in this figure that people who move into Kentucky are much more likely to live in a rural area than migrants into any of the other four states. Figures 10a, 10b and 11 together show that Kentucky's lower economic growth is hurt because the state does not attract very many workers to move into the state and those who do move to Kentucky seem to have the least skills and are more likely to move to the less productive parts of the state and, consequently, have the lowest earnings.

Figure 10a: Average Earnings of People Moving into State (In-Migrants) Age 25 and Older (2004 dollars)

Legend:
- Alabama Mover Earnings
- Georgia Mover Earnings
- Kentucky Mover Earnings
- North Carolina Mover Earnings
- Tennessee Mover Earnings
- US Mover Earnings
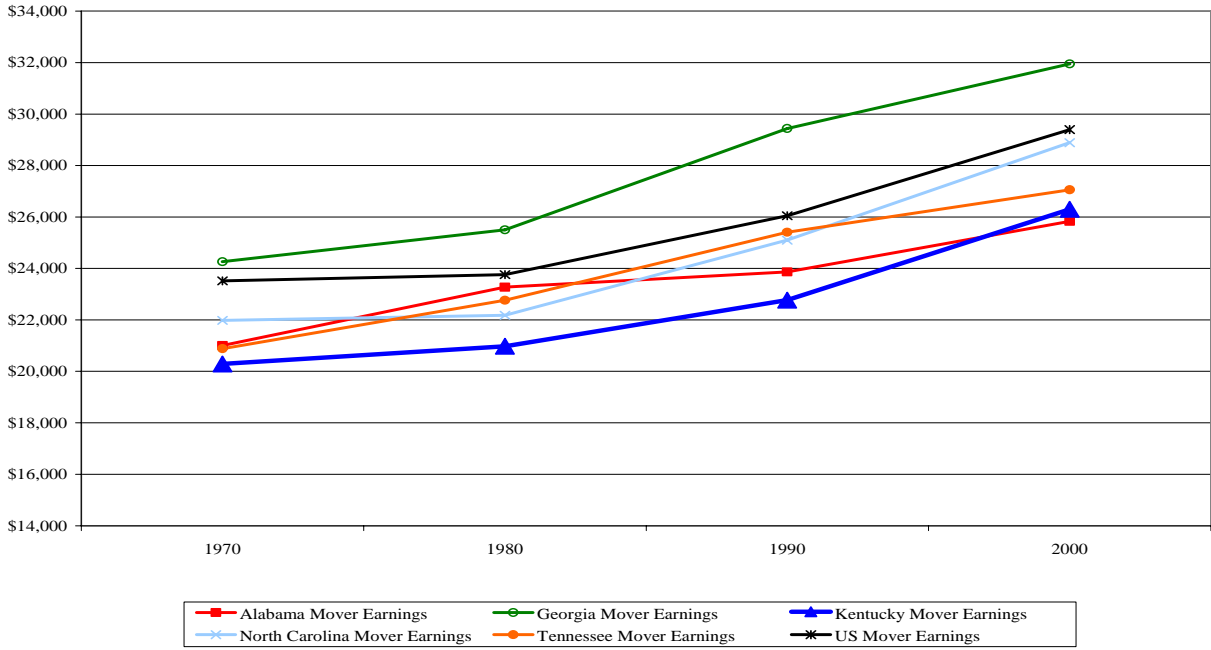
Source: U.S. Bureau of the Census, Census of Population and Housing, 1970, 1980, 1990, 2000

Figure 10b: Average Earnings of Existing Residents (Non-Movers) Age 25 and Older in State (2004 dollars)
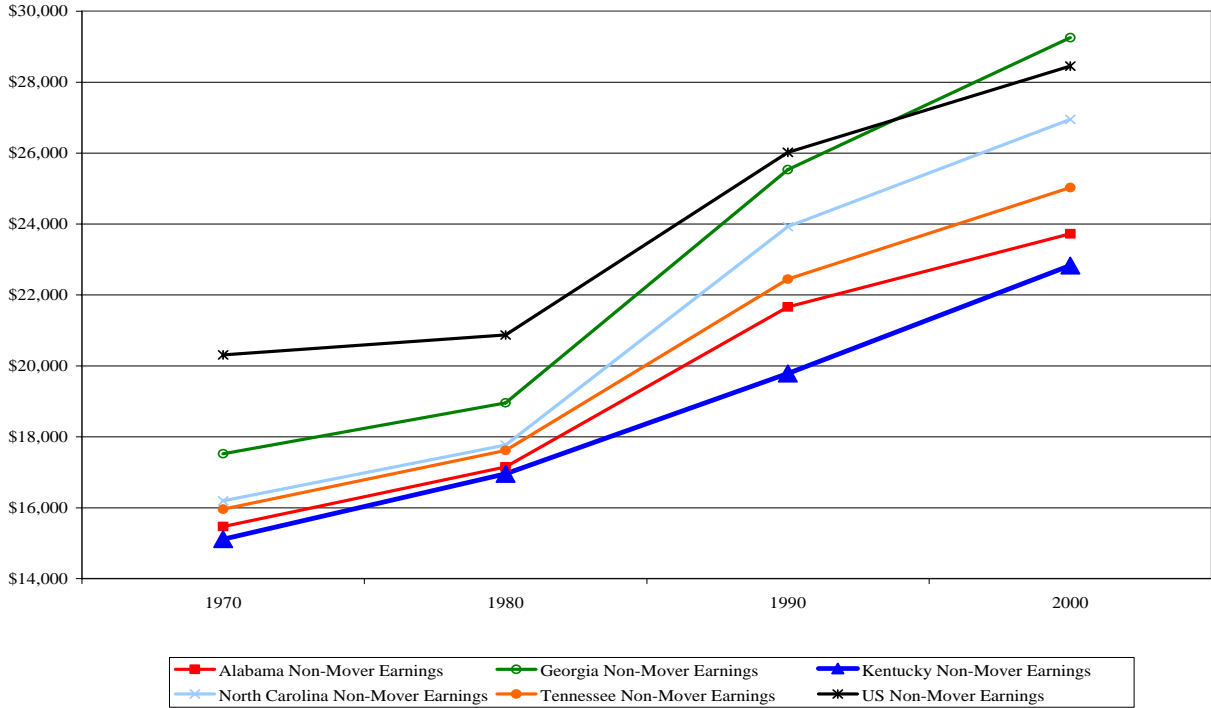
Legend:
- Alabama Non-Mover Earnings
- Georgia Non-Mover Earnings
- Kentucky Non-Mover Earnings
- North Carolina Non-Mover Earnings
- Tennessee Non-Mover Earnings
- US Non-Mover Earnings

Source: U.S. Bureau of the Census, Census of Population and Housing, 1970, 1980, 1990, 2000

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Figure 11: Percent of New Residents in State (In-Migrants) Locating in an Urban Area
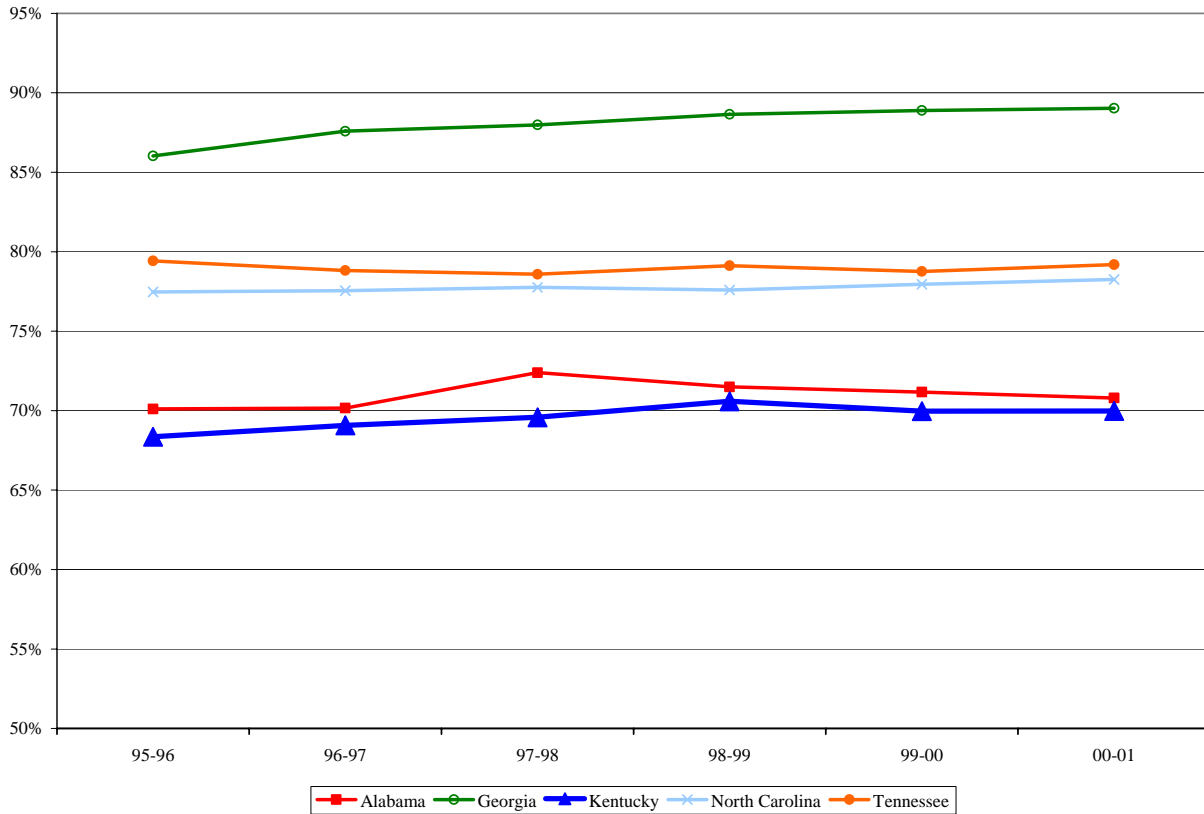
Source: Internal Revenue Service, Migration Data, Location of New Movers, 1995-2001

The previous figures show that Kentucky has lower levels of education and earnings among both its in-migrants and its long-term (existing) residents than the other four states. Now, we look more closely at growth in urban and rural areas for each of the five states. As cities grow and expand the definition of urban changes over time. To avoid having an area change its status, we identify each county in a state as being either urban or rural based on a 1974 definition of urban areas.[7] Using county-level data from the Bureau of Economic Analysis' Regional Economic Information System (REIS), we calculate average earnings for urban and rural areas of Kentucky and its four comparison states.

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[7] See Appendix A.3 for a discussion of how we identify rural and urban counties.

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**Figure 12: Average Earnings of Urban Residents Relative to US Urban Average
(1974 Urban Definition)**
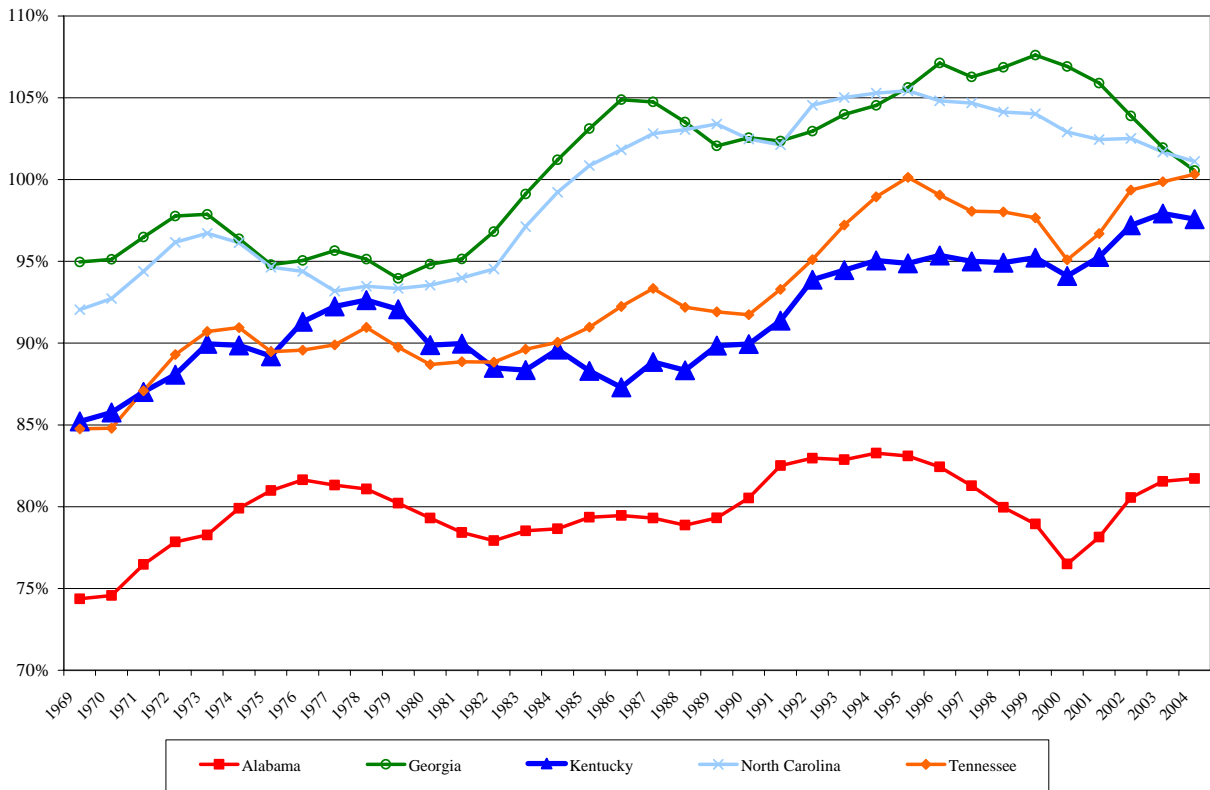
Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 2006*;* U.S. Department of Agriculture, Economic Research Service, Urban-Rural Continuum Codes, 1974

Figure 12 shows the average earnings in the urban part of each state relative to average earnings in all urban areas in the U.S.[8] The figure shows that, with the exception of Alabama, the growth of earnings in urban areas is very similar in each state. In 1969, income in Kentucky and Tennessee were approximately 85 percent of the earnings in all urban areas in the U.S., while the income in North Carolina and Georgia were close to 95 percent of the earnings in all urban areas. By 2004 the earnings in Georgia, North Carolina and Tennessee were equal to the earnings in urban areas in the rest of the U.S., while the earnings in urban areas in Kentucky were 98 percent of the earnings in all urban areas in the U.S. Thus, the historically urban areas of Kentucky such as Lexington, Louisville and Northern Kentucky have earnings that are approximately equal to urban areas in our comparison states and have actually experienced faster growth than the typical urban area in the U.S.

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[8] For Figures 12-15 average earnings in a county are calculated as the total earnings in the county divided by the total population in the county.

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Figure 13 plots the average earnings in rural areas in each state relative to the average earnings in the rural areas of the U.S. An analysis of the Figure 13 shows that, although earnings in rural areas in Kentucky was similar to earnings in the comparison states in 1969, by 2004 it is below the income in rural areas in all of the other states – including Alabama. The slow growth in rural areas accounts for much of the slow growth in Kentucky over this period. Kentucky's rural areas contain many more people than rural areas in other states, and the rural areas in Kentucky have grown slower than the rural areas in other states.[9]

Figure 13: Average Earnings of Rural Residents Relative to US Rural Average (1974 Rural Definition)
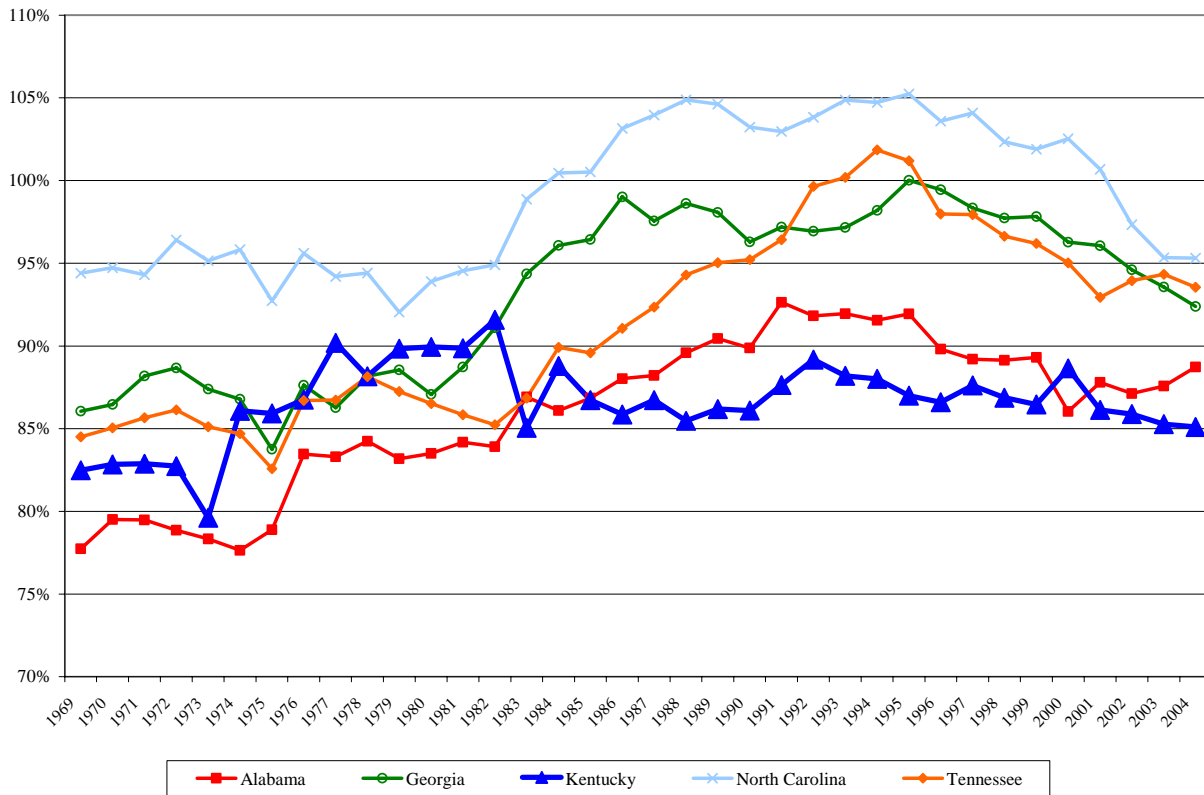

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 2006; U.S. Department of Agriculture, Economic Research Service, Urban-Rural Continuum Codes, 1974

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[9] Figures A-1, A-2 and A-3 present the same information as Figures 12, 13 and 14 using a 2003 definition of urban and rural areas. Using this alternative definition leads to the same conclusions reached based on Figures 12, 13 and 14.

Figure 14 shows earnings in urban areas as a percentage of earnings in rural areas. Not surprisingly, this figure shows that earnings in urban areas are higher than earnings in rural areas. However, this figure also shows that earnings in urban areas have grown much faster than earnings in rural areas over this period, particularly for Kentucky. In 1969 earnings in urban areas in Kentucky were approximately 1.5 times as large as earnings in rural areas, but by 2004 earnings in urban areas were almost twice as large as earnings in rural areas.

Figure 14: Ratio of Urban Average Earnings to Rural Average Earnings (1974 Urban and Rural Definitions)

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 2006; U.S. Department of Agriculture, Economic Research Service, Urban-Rural Continuum Codes, 1974

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In Figure 15, we look at the growth in earnings in counties that switch from being rural to urban between 1970 and 2004. We refer to these as transitional counties. These counties tend to have earnings levels that are below the earnings in the urban counties, but well above the earnings in the rural counties. Residents in these counties benefit from being close to the urban areas because some of the higher wage jobs in the urban counties are held by people who live in the rural counties. However, Figure 16 shows that the percent of the population living in transitional counties in Kentucky has changed very little over time, and this percentage is much smaller in Kentucky than in Georgia and North Carolina and, to a lesser extent, Tennessee. These comparison states have linked economic development in urban areas with economic development in the bordering rural areas thereby raising the productivity and income in these previously rural areas.

Figure 15: Average Earnings of Residents in State Living in Counties Transitioning from Rural to Urban (2004 dollars)
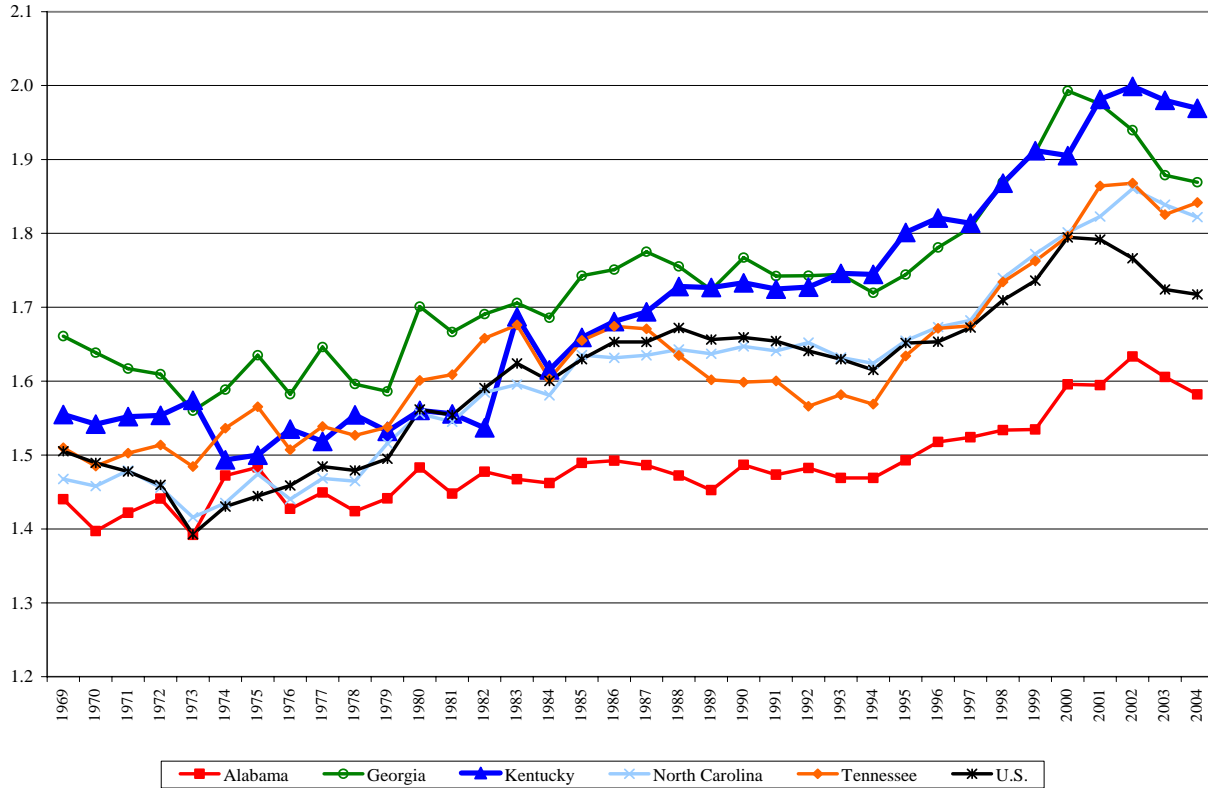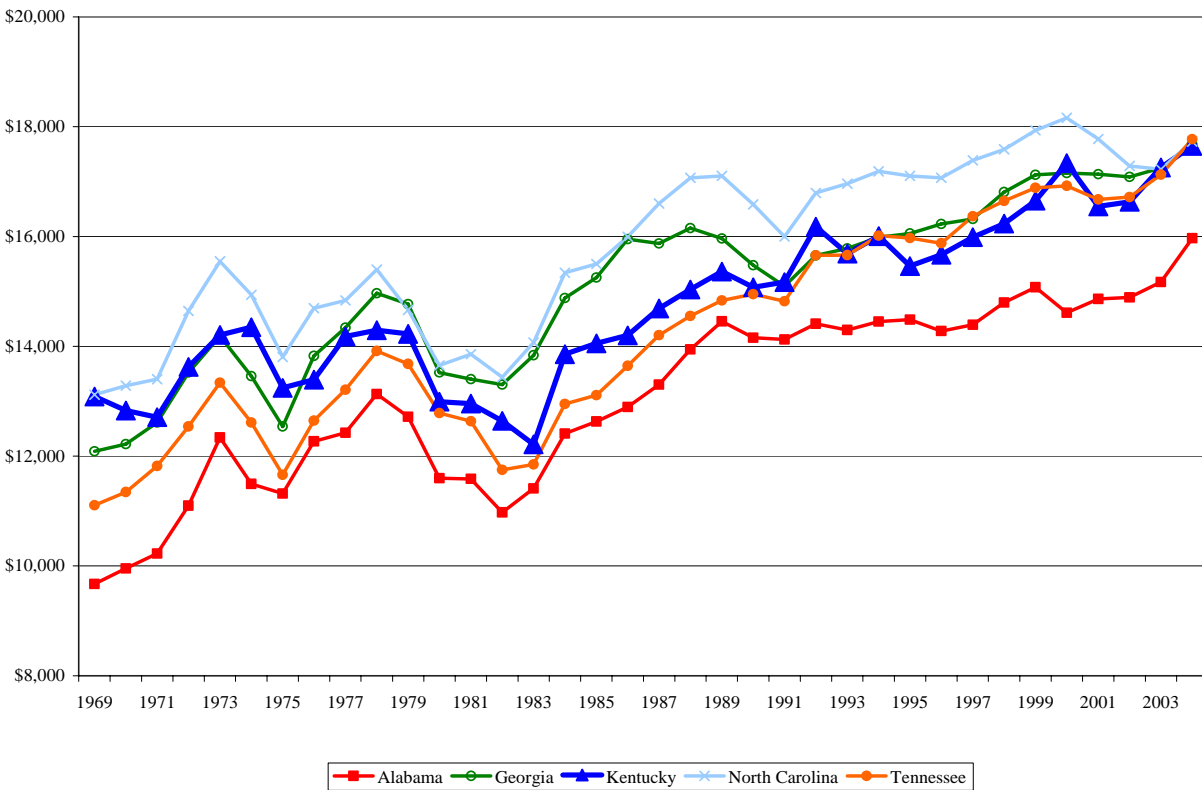

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 2006; U.S. Department of Agriculture, Economic Research Service, Urban-Rural Continuum Codes, 1974-2003.

Figure 16: Percent of Total Population in State Living in Counties Transitioning from Rural to Urban

Source: U.S. Census Bureau, Annual Population Estimates 1969-2004; U.S. Department of Agriculture, Economic Research Service, Urban-Rural Continuum Codes, 1974-2003

III.C   Summary

In this section of the report, we focused on the factors that we found to be important determinants of state growth and compared the changes in these factors in Kentucky with the changes in our four comparison states: Alabama, Georgia, North Carolina and Tennessee. We have seen that,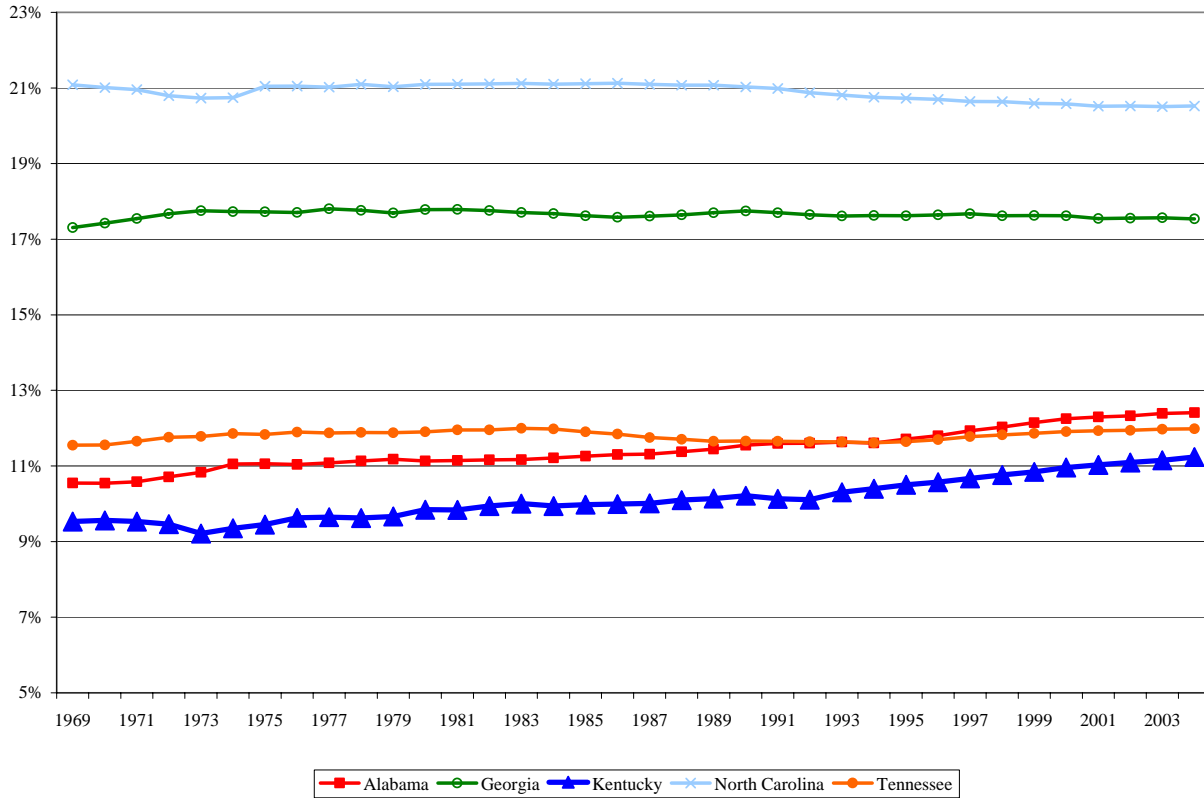 relative to Kentucky, the comparison states experienced faster growth in the average number of patents per resident, the percent of adults in the state with a four year college degree, the percent of the population living in an urban area, and the percent of residents who have recently moved into the state. Faster growth in these factors largely accounts for the faster growth in income in the comparison states.

When we looked more closely at some of these factors, we saw that, while workers with a college degree receive higher earnings in all states, college graduates in Kentucky receive lower earnings than college graduates in any of the four comparison states. In addition, we found that while new residents to a state tend to be more educated and receive higher earnings than people who have lived in the state for a longer period, migrants to Kentucky tend to be less educated, receive lower earnings, and are more likely to relocate in a rural area than people moving into comparison states. Finally, we have shown that the slow growth in income in Kentucky is

almost exclusively due to the slow growth in income in the rural areas of Kentucky. When we compare the growth in income in urban areas in the five states, the growth in the urban areas in Kentucky is quite similar to the growth in income in the urban areas of Georgia, North Carolina and Tennessee and is much faster than the growth of income in the urban areas of Alabama. The problem is that a much smaller portion of the Kentucky population lives in urban areas as compared to these other states, so a much smaller portion of the population in Kentucky has participated in the growth in income in the urban areas.

In the next section of the report, we examine economic development efforts in these other states to see if we can identify specific government programs that have helped promote the growth in income in these states.

IV. Limitations to Growth in Kentucky and Economic Development Efforts in Other States

A s part of our study, we spoke with consultants who specialize in helping businesses choose location sites and officials in economic development offices in our comparison states. Our conversations with site consultants were structured around two basic questions. First, what factors did they feel were limiting opportunities for firms to locate and expand in Kentucky? Second, what were some of the programs in other states that played a significant role in promoting economic development? Our conversations with economic development officials in other states were structured to answer the question: What specific programs did they feel were particularly important in promoting economic development in their state? The first question we asked to site consultants was designed to complement the empirical analysis in this report. In particular, we wanted to see whether there were important factors that we failed to capture in our empirical analysis and to add some additional insight into the empirical results. The second question we asked to site consultants as well as the question we addressed to economic development officials were designed to see whether there were specific economic development efforts in other states that have been particularly successful and may explain why these other states experienced faster growth than Kentucky over this period. In this section of the report, we summarize what we learned from these conversations.

We want to be clear that the point of this section is to report on our conversations with site consultants and economic development officials in other states and to describe economic development programs and activities in other states. We are not recommending any particular program or approach.

Every site consultant we spoke with indicated the primary limitation to firms locating or expanding in Kentucky is the lack of training and poor education of the workforce. Every economic development official in competing states that we spoke to indicated the single most important reason for their economic growth over the previous three to four decades was an emphasis on education and workforce development. These findings coincide with our empirical results that the primary reason for Kentucky's slow economic growth is Kentucky's low stock of knowledge. According to site consultants, the lack of a trained workforce is particularly acute in the rural areas and is the main limiting factor to economic development in the rural parts of the state. Businesses do not believe they can currently get the necessary workers, nor do they believe they will be able to hire the workers they need if their business is to grow in the future. Site selection consultants made it clear that our competitor states are better at coordinating workforce development and training efforts to meet the needs of new and expanding businesses than we are in Kentucky. One consultant said, "The states Kentucky competes with had similar limitations in the past but addressed these problems over a decade ago."

In all of our comparison states there is a close interaction between officials in charge of economic development in the state and officials responsible for workforce development. In North Carolina, Georgia and Alabama both the office responsible for economic development and the office responsible for workforce development and training are located in the same agency. In all of these states economic development officials work closely with workforce development and training officials to ensure workers receive the skills needed by businesses that are considering

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locating in these states as well as by businesses that are expanding their operations in these states. All three of these states use federal Workforce Investment Act (WIA) funds to develop training programs for new and expanding businesses. Businesses locating in these states indicate the type of training their workers will need. This training is provided by the local workforce investment board, and then workers are hired directly out of the training program.

In addition, economic development officials in all of our comparison states work closely with the community and technical colleges in their states to ensure that these colleges develop training programs for new or expanding businesses. In both North Carolina and Georgia, officials consult with community college officials on almost all major efforts to attract specific businesses to the state. Georgia employs a direct liaison between economic development officials and community and technical college officials. In Alabama, officials from the economic development office sit on the board overseeing the community college system. These state agencies can quickly develop programs to train workers for new and expanding businesses. For example, in Alabama economic development and technical college officials were able to develop a new welding program in three months to train the necessary welders for a new shipbuilding firm that was locating in Mobile. Further, while not one of our comparison states, a number of consultants mentioned South Carolina as another state where economic development, workforce development and community college officials work closely together to quickly develop programs to provide workers with the necessary skills for new and expanding businesses. Adding to the cooperative benefits is the fact that legislators in their states understand the important role workforce development plays in overall economic development and support these programs because these agencies are now sending a unified message.

Site consultants also indicated that another significant limitation to economic growth is Kentucky's inability to attract innovative firms and highly-skilled workers to the state. These two items are nearly identical since innovative firms are started and run by highly-skilled people. This feeling again is quite consistent with our empirical findings that Kentucky is less able to attract educated workers than our comparison states. Our findings show that Kentucky gets fewer total migrants and that these new residents possess less valuable skills than our comparison states' migrant populations. Our discussion with site consultants indicates our main limitation in attracting these firms and people is a perceived poor quality of life—by which they primarily mean the poor quality of schools. Consultants feel we lack quality education at both the K-12 level as well as at the public universities. Again the lack of quality public schools is of particular concern in the rural parts of the state. One consultant indicated that rural Kentucky could be doing much better with a relatively small investment in rural public education. The consultants also indicated that a lack of amenities in our big cities, such as fine dining, viable public transportation, urban residential options and cultural activities, hurts our ability to attract young professional workers to Kentucky.

Several site consultants mentioned that Kentucky does a relatively poor job marketing the attributes of the state, which is consistent with our findings that Kentucky is unable to attract educated, highly skilled people to Kentucky. Other than the Kentucky Derby (and perhaps University of Kentucky and University of Louisville basketball), most people do not know anything about Kentucky. Even Lexington is relatively unknown outside of Kentucky. One site consultant described Kentucky as "…a state of small cities. Many of these cities such as

Bowling Green, Elizabethtown/Bardstown, London/Somerset, Paducah, Owensboro are quite attractive but no one knows about them." The fact that these cities are unknown makes it difficult to convince people to move to these cities and raise a family.

Our comparison states focus a significant amount of effort on attracting people to the state and view these efforts as a key part of economic development. In both Georgia and North Carolina the state office of tourism is part of the same agency as economic development, and officials from both offices work closely together to promote economic growth. Both states are particularly active in marketing their state as a good place to live and both include information about the quality of life in the state on their economic development web sites. As part of economic development in Georgia, they actively pursue events, such as the 1996 Summer Olympics and the Tour of Georgia, in an effort to get people to visit the state. Officials in both Georgia and North Carolina say that tourism is more than just getting people to visit the state and spend money; it is also a way to get people to visit the state, become interested in the state, and perhaps eventually relocate to the state. In this way, tourism becomes an important link in economic development. These states treat tourism as a tool to introduce their states rather than an industry to create jobs.

Economic development officials in both Georgia and North Carolina indicated that both states have made a major investment in their higher education system over the past forty years and that this investment has paid off in terms of economic growth and development. Both states are home to prestigious public universities and both use this fact when recruiting businesses. Officials in Georgia and North Carolina indicated that they work closely with officials at the universities in the state when trying to attract innovative companies and the R&D divisions of companies. Officials in Alabama indicated that the state has invested in the university system, particularly in the medical school, and this has nurtured an environment for economic growth.

Economic development officials in both Georgia and North Carolina indicated that both states have made significant investments in research parks since 1970. This is particularly true for North Carolina with the state investment in Research Triangle Park (RTP). North Carolina officials said that they actively promote RTP and attribute RTP to attracting the research arms of a number of major pharmaceutical companies as well as the research parts of other major companies such as IBM. They feel that these investments really paid off in the 1990s when North Carolina experienced a significant growth in both innovative activity and average earnings.

As part of their economic development efforts, officials in North Carolina surveyed CEOs of major companies that were currently located in North Carolina or were considering locating their businesses in North Carolina to find out exactly what attributes of the state were important for these executives. They then used this information to guide development efforts as well as to focus on the attributes of the state that corresponded to the attributes that the CEOs mentioned.

North Carolina, Georgia and Tennessee have all focused on redeveloping the downtown area of their major cities as a way to attract young professionals to the state. Site consultants indicated that these are some of the most valuable workers but that efforts to attract them have to focus on

urban areas since these workers need to locate in places where both they and a partner can find employment. They also place a high value on the amenities found exclusively in cities.

In an effort to promote economic growth in rural areas, several economic development officials discussed efforts focused on attracting retirees to the state. North Carolina has focused on attracting retirees to the mountain area of the state for a long time, and they view these efforts as being largely successful. In conjunction with these efforts, North Carolina actively promotes tourism in the mountain region of the state, particularly through folk art; this strategy has been quite successful, most notably in the area around Asheville. Alabama has followed the lead of several other states and obtained information on former residents of the state, such as college graduates, and then worked on trying to bring them back into the state when they reach retirement age. While not one of our comparison states, Mississippi has been fairly innovative in its efforts to attract retirees to the state by exempting all retirement income from state personal income taxes.

A number of site consultants indicated that it was their impression that the urban areas of Kentucky, in particular Louisville, Lexington and Northern Kentucky, had experienced significant growth in recent years. This is consistent with the results from our empirical analysis. The consultants said that a difficult problem in Kentucky is promoting growth in the small cities and rural areas. As we indicated previously, one significant problem is the poor education of the workforce in these areas as well as the poor schools. These factors make it difficult to convince business owners to move their businesses and families to these areas. Also, many people simply do not know about the rural areas of Kentucky, and better marketing of the state may help. The consultants also suggested developing a better link between growth in the urban areas with growth in the rural areas. They said Kentucky should form economic development regions around some of the cities in Kentucky such as Louisville, Lexington, Elizabethtown/Bardstown, Bowling Green, Paducah, Owensboro/Henderson, Somerset/London and Ashland, and then promote economic development in the cities that would then spillover into the surrounding rural areas. Other states have developed corridors of opportunity which are development efforts that explicitly tie rural and urban areas together so that growth in the urban areas generates growth in the rural areas.

The site consultants with whom we spoke praised the staff of the Cabinet for Economic Development for their efforts to promote Kentucky and for the state's efforts at traditional economic development. They indicated that the staff was knowledgeable and quick to provide information that was requested. They also indicated that Kentucky was very aggressive in its use of incentives. However, most indicated that incentives were only useful in the last steps of the deal. Kentucky needs to overcome the other problems such as workforce development, poor quality of life, and the lack of knowledge about the state before incentives even become an issue. As indicated above, selection consultants feel that economic development in the state needs to be expanded and focused on these broader issues.

Although Kentucky is aggressive in its use of incentives, a number of consultants indicated that Kentucky's incentives are too restrictive—they are targeted toward certain industries or for firms locating in certain regions. If a region does not have the necessary inputs, such as a qualified labor force, then a firm will not locate in a region just for an incentive. The consultants feel that

Kentucky needs to have more flexible incentives so they can be used for all types of firms considering locating in any part of the state. In addition, the consultants indicated that for many businesses financial help with infrastructure, such as new roads, rail spurs or other transportation infrastructure, is more valuable than an explicit incentive. Finally, it is worth mentioning that site consultants indicated that some of our competitors, such as Tennessee and North Carolina, have less attractive incentives and do not offer or promote incentives to the extent that Kentucky does. However, both of these states have experienced more rapid growth over the period of our study.

V.   Conclusion

Our empirical results in this report lead to some general conclusions about the slow income growth in Kentucky. First, a primary reason for the slow growth has been the lack of innovative companies in Kentucky. A second primary reason is the lack of skilled workers in Kentucky and Kentucky's inability to attract skilled workers to the state. A final major reason for the slow growth in Kentucky is the slow income growth in the rural areas of the state and the fact that the more rapid growth in urban areas does not spillover to rural areas to the extent seen in the comparison states of Georgia, North Carolina and Tennessee.

Our discussion with site consultants largely confirms the results from our empirical analysis. They list the primary reasons for the slow growth in Kentucky being the lack of skilled workers, the fact that Kentucky struggles to attract innovative businesses and skilled workers to move to the state, and the fact that these problems are particularly acute in the rural areas of the state. Growth in the urban areas of Kentucky is similar to the growth in the other major urban areas in the south. Site consultants also indicated that while Kentucky's Cabinet for Economic Development performs the traditional economic development functions very well, Kentucky suffers from a lack of coordination between economic development, workforce development, community and technical colleges, public four-year universities and research parks and tourism. This conclusion is supported by the statements of economic development officials in other states who indicate that the coordination of efforts between them and workforce development officials is a significant contributor to their ability to attract and retain businesses. Economic development officials in our comparison states also indicated that they work with officials at the public universities and research centers in the state to attract innovative businesses and skilled workers. They also work with tourism officials in an effort to market the state to people who might potentially relocate to the state. Finally, economic development officials in other states indicated that they work closely with individuals involved in workforce development, higher education and tourism to ensure that legislators in the state recognize that all of these parts of state government are an integral part of economic development and need financial support.

The empirical analysis contained in this report, our comparison of Kentucky with other states and our conversations with site consultants all lead to the same conclusion—the primary limitation to economic growth in Kentucky is the low skill of workers in Kentucky. Until this problem is addressed all other efforts at economic development will be unsuccessful. Our discussions with economic development officials in other states show that these states have dealt with similar problems by recognizing that workforce development officials, community and technical college officials, officials at the public four-year colleges in the state, and tourism officials are all key partners in economic development efforts. Throughout this report we have repeatedly found that the keys to economic growth are ensuring we have the inputs necessary for businesses to continue to grow if they locate in the state, and the key input needed is skilled workers; ensuring that we have an environment where people want to move and raise a family; and ensuring that people know about the positive attributes of the state. Other states have tried to accomplish these objectives by adopting a much more expansive view of economic development than we have adopted in Kentucky.

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Appendix A: Data and Methods

Our objective in this study is to identify the causes of the persistently low level of income in the state of Kentucky. This appendix describes the empirical methodology and data sources used in this report to analyze Kentucky's economy and compare it to neighboring states.

A.1   *Empirical Methodology*

As discussed throughout the report, although the level of average earnings has increased in the state over the past 35 years, Kentucky's ranking has not changed dramatically over this time and remains near the bottom of all state income levels. This slow growth in Kentucky contrasts with improvements in the relative incomes of many other southeastern states. Since the nominal incomes of all states have increased over the years, we develop a model that takes rising levels of income into consideration. In addition, we examine the causes of growth differences across states over these 35 years. Since long run income growth determines the current level of income, we adopt a long-term growth accounting approach focusing on a period from 1969 to 2004 for the 48 contiguous states. Short-term studies that rely on cross-sectional data (one moment in time) or shorter time periods mask the differences across states.

Throughout the study, we are reminded that state economies are unique. Regardless of the number of explanatory variables included in the analysis, each state is likely to have unique factors contributing to its income growth. Therefore, we allow the state economies to have unobservable factors which may change growth in different ways. Economists often refer to this modeling structure as a "fixed effects" model. In essence, a fixed effect allows economists to build a layer of uniqueness into a model. In our case, a model lacking "fixed effects" would constrain all states to grow equally if they had the same increases in knowledge, business climate and other observable variables. The use of a fixed effects model lets us examine average growth effects arising from changes in our variables, while controlling for state-specific differences that we, as researchers, cannot take into account.

The basic model we estimate is given by:

$$\ln(\text{Earnings Per Capita}_{it}) = \lambda \ln(\text{Earnings Per Capita}_{i,t-5}) + \beta^T \text{Knowledge}_{i,t-5} + \phi^T \text{Business Climate}_{i,t-5}$$
$$+ \gamma^T \text{Industrial Structure}_{i,t-5} + \rho^T \text{Public Infrastructure}_{i,t-5} + \theta^T \text{Government Presence}_{i,t-5}$$
$$+ \psi^T \text{Composition Shifting}_{i,t-5} + \alpha_i + \text{Time}_t + \text{Region}_i + \text{Region}_i * \text{Time}_i + \varepsilon_{it}$$

The dependent variable used in the analysis is per capita earnings by place of residence. A five-year lag of the dependent variable is included on the right side of the equation. A lagged dependent variable provides the growth interpretation for the explanatory variables. Including lagged values of explanatory variables means that we are measuring the causal impact of these variables. For example, if we included current values of migration as an explanatory variable one could conclude that migrants are simply moving to high income areas. By lagging the explanatory variables, we ensure that a causal interpretation can be made from the estimates. A description of the specific control variables used in the analysis is listed in the data sources section.

Our analysis also utilizes an econometric method known as beta coefficients or standardized coefficients. Beta coefficients are used to evaluate the importance of various coefficients in determining the values of the dependent variable. Rather than using the levels of the explanatory variables in the regression, the process of retrieving beta coefficients involves standardizing the variables in the regression by subtracting the value of the observation for the state by the mean and dividing that value by the standard deviation for the respective variable. As a result of the standardization, the coefficients take on a more intuitive meaning. As the explanatory variables are now measured in the same units, the contribution by each variable can be ranked. In other words, we can say which variables are the most important for a state's income growth.

An additional concern when modeling growth differences is the potential of price changes occurring non-uniformly across states. If these non-uniform price changes occur, what looks like income growth in one state might simply be relatively high inflation. The typical procedure to control for non-uniform price changes is to adjust all income levels by a state-specific price index. Although there does exist a state-level price index used in several studies of this kind, the economic literature routinely questions the validity of these data. We propose a different solution to the problem of differential price changes. As our state economies are part of a larger regional economy, we allow prices to change differentially over time across regions by including a region-time interaction effect. The effect of adding these interacted variables is to hold constant any factor affecting regions over time. In addition, specifying a model with these region-time fixed effects further illustrates the role our explanatory variables play in state income growth. The model is now identified by both deviations from state averages and from region averages over all time periods and within any time period. In other words, the inclusion of these effects increases the robustness of our findings.

A.2   Data Sources

We measure income by per capita earnings by place of residence for each state from 1969-2004. These data are compiled by the Bureau of Economic Analysis (BEA) on all 50 states. The BEA uses the mid-year state population estimates from the U.S. Bureau of the Census (Census) to construct the per capita figures. We use these same population estimates throughout the study to generate per capita values.

The stock of knowledge in a state is measured by four variables that we believe capture both the quantity and quality of human capital available to state economies: the percent of the state population with a high school diploma, the percent with a college degree, the per capita patent stock, and the per capita allocation of federal R&D expenditures. The state-level estimates for the percent of the population age 25 and older with a high school diploma and college degree were constructed from the Bureau of Labor Statistics' (BLS) Current Population Survey (CPS). We note that during our period of study the BLS changed the CPS questionnaire regarding schooling level from years completed to degree attained. We chose to use the later definition of the level of schooling and assign individuals completing 12 years of education as having a high school diploma and those with 16 or more years of education as having a four year college degree. One should also note that the CPS did not uniquely identify an individual's state for some states in the early 1970's. These observations were estimated by linear interpolation. The per capita state patent stock variable has been constructed from the annual new patents issued to

inventors residing in that state from the U.S. Patent and Trademark Office from 1963 through 2004. The perpetual inventory method is used to create the patent stock value. We assume a five percent rate of depreciation. In brief, the perpetual inventory method entails adding the most recent flow of patents to the stock of depreciated capital from the prior year. We recognize that the initial estimates of the stock values will be sensitive to the starting values of the capital stock variables. This sensitivity declines later in the time series as initial capital stocks are depreciated. We attempt to mitigate these sensitivities by using data on annual patents issued starting in 1963. In addition, our use of state-level fixed effects controls for differences in state patent stock starting values. The data on federal dollars allocated to states for R&D from 1969 through 2004 were collected from the National Science Foundation's WebCASPAR database.

The business climate in a state is captured by four variables for the 1969 through 2004 time period: a state's right-to-work status, the corporate income taxes as a percent of total personal income in a state, the personal income taxes as a percent of total personal income in a state and the worker's compensation costs in a state. A state's right-to-work status in a year was collected from the Employment Standards Administration of the U.S. Department of Labor. The status was categorized as a zero-one indicator variable signifying the presence of right-to-work legislation in that state for that year. The corporate income tax and individual income tax variables come from the U.S. Census Bureau's Government Finances Database. Annual values of a state's total personal income are taken from BEA. The Government Finances Database provides annual estimates of state and local tax burdens. The tax variables used in this report include the sum of these two levels of taxation. The worker's compensation costs variable is constructed from the U.S. Census Bureau's State Government Finances Database. The estimate of the average cost per worker was constructed by taking the total annual revenues in the state for the worker's compensation program and dividing this value by the number of private non-farm workers in the state for the same year.

We include two measures of public infrastructure variables in the analysis: the per capita total highway capital stock and the percent of the state's population residing in an urban area. The per capita highway capital stock for a state has been constructed from data on the annual state and local highway expenditures from the U.S. Census Bureau's Government Finances Database. We use the annual flow of total new highway capital expenditures in each state to construct a capital stock measure for highways utilizing the perpetual inventory method. Again, we assume existing capital stock depreciates at a constant five percent rate. The percent of a state's population living in an urban area is taken from the U.S. Census of Population and Housing for 1970 through 2000. Intercensal values of the percentage of the state population living in urban areas were estimated by linear interpolation.

The influence of the existing industrial structure within a state is controlled for with the inclusion of the percentages of total employment in each of the nine private industry classifications as provided by the BEA for 1969 through 2004. These employment percentages are organized by Standard Industrial Classification code (SIC). As the practice of coding employment by SIC was discontinued by the BEA in 2000, later year estimates were converted from the new coding system by the researchers. The algorithm to match the two coding systems together is available from the researchers upon request.

An important component of our analysis is the contribution to state income growth that has come about as the result of changes in the demographic makeup of states. As the U.S. is comprised of states which do not restrict the movement of its citizens from one state to another, we felt it necessary to control for the potential of certain states to gain qualified labor from other states. We capture these flows by examining annual gross migration rates to states from 1969 through 2004. Annual flows of new residents to states were constructed from the Decennial Census of Population and Housing from 1960-2000 and from the American Community Survey (ACS) from 2001-2004. As the Decennial Census provides information on the location of the individual five years predating the question, some assumptions must be made to generate an annual flow. Initially, we construct an aggregate number of residents currently living in a state that were not residents five years prior. Then we assume that over this five year period these new residents arrive at a constant number per year. For the remaining five year periods with no information, we linearly interpolate values for new movers. The ACS allows fewer assumptions to be made as the data are for annual movers. The values for later years are simply aggregated from survey micro data. All counts of movers are then divided by the value of the current population for each state. The interpretation of this constructed variable is then the percent of total residents that have been in the area for one year or less. The same method is used to create estimates of the out-migration rate.

The final set of explanatory variables included in the analysis is intended to capture any incentive decreasing effects of government presence within a state: the percent of total employment in the government sector and the percent of total income to the state arising via income transfers. The percent of total employment in the government sector for 1969 through 2004 is taken from BEA's estimates of employment by sector. Total transfer income as a percentage of total personal income in an area for 1969 through 2004 is taken from BEA's estimates of income.

A.3   Urban and Rural Definitions

Throughout this report we refer to urban and rural portions of states. We make the urban/rural distinction at the county level based on the Rural-Urban Continuum Code developed by the Economic Research Service (ERS) at the Food and Drug Administration. These codes are issued for all U.S. counties for 1974, 1983, 1993 and 2003. This coding system classifies a county as urban if that county is within a Metropolitan Statistical Area regardless of population size. A county is classified as rural if that county is not in an MSA.

Figure A-1: Average Earnings of Urban Residents Relative to US Urban Average (2003 Urban Definition)
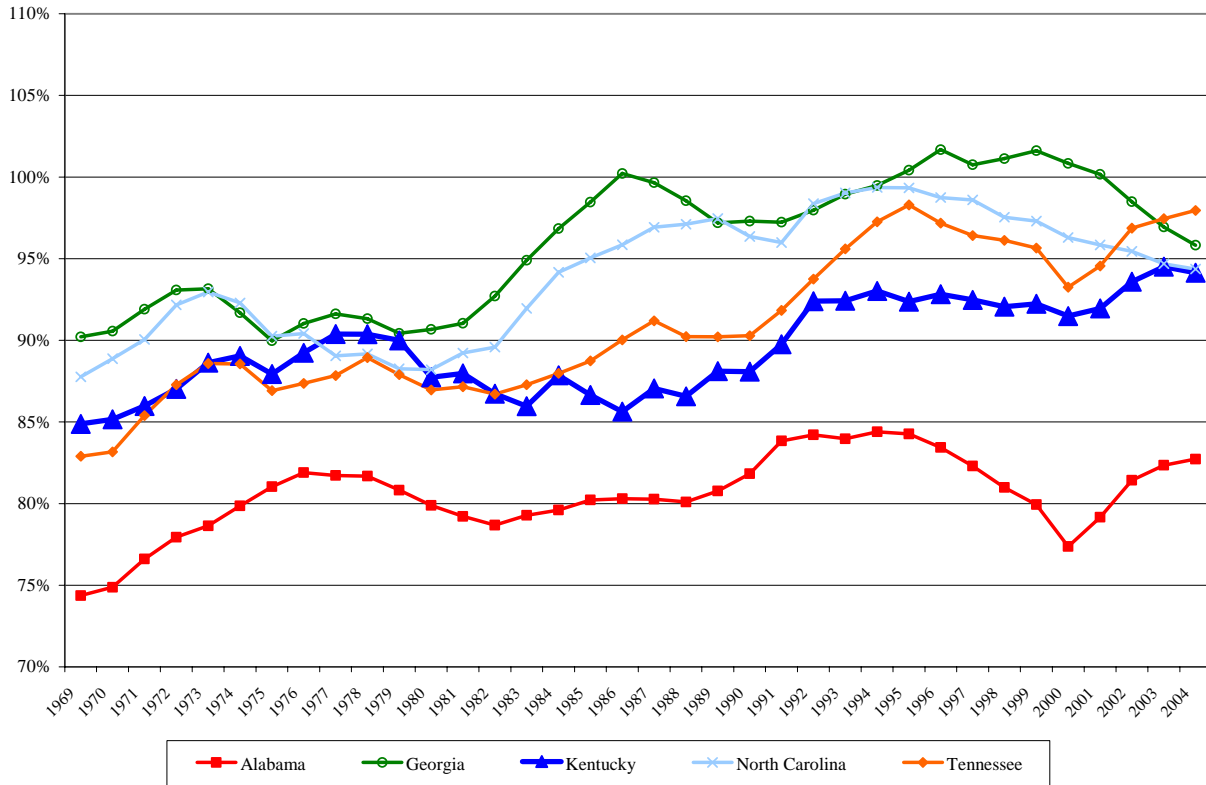
Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 2006; U.S. Department of Agriculture, Economic Research Service, Urban-Rural Continuum Codes, 2003

**Figure A-2: Average Earnings of Rural Residents Relative to US Rural Average
(2003 Rural Definition)**
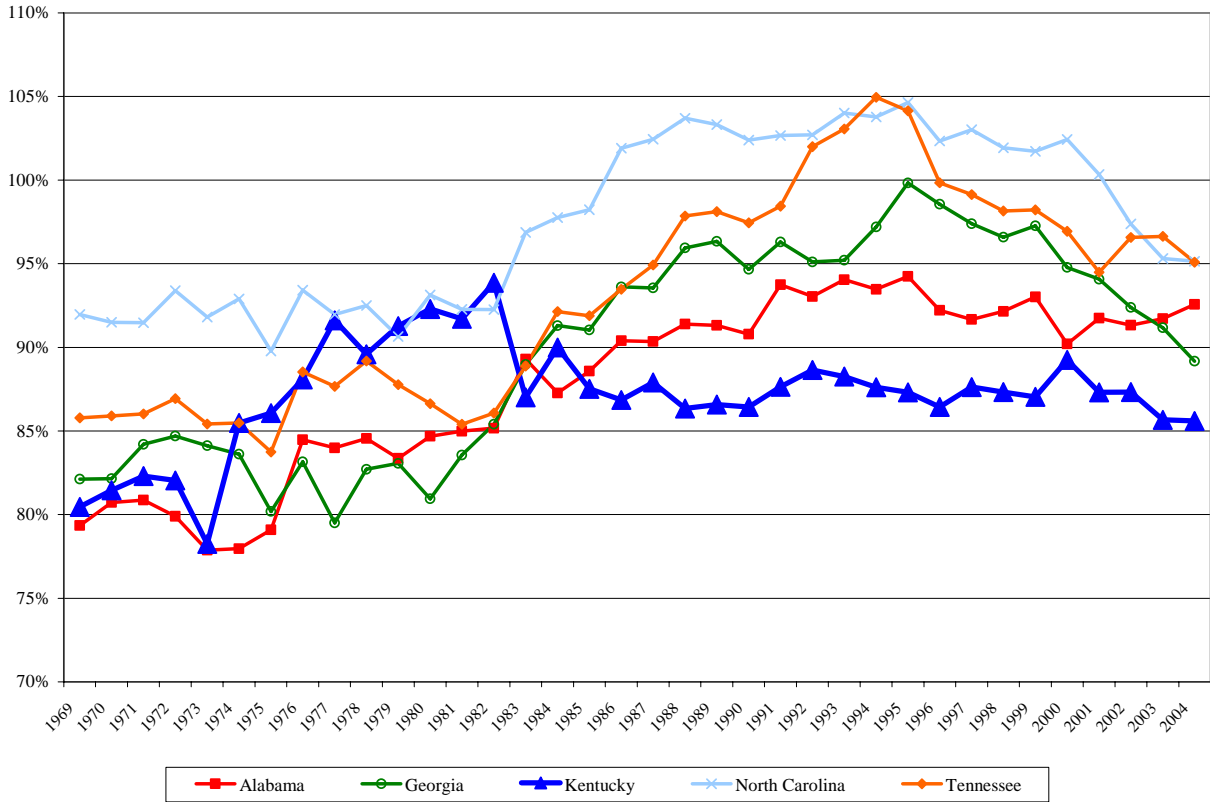
Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 2006; U.S. Department of Agriculture, Economic Research Service, Urban-Rural Continuum Codes, 2003

**Figure A-3: Ratio of Urban Average Earnings to Rural Average Earnings
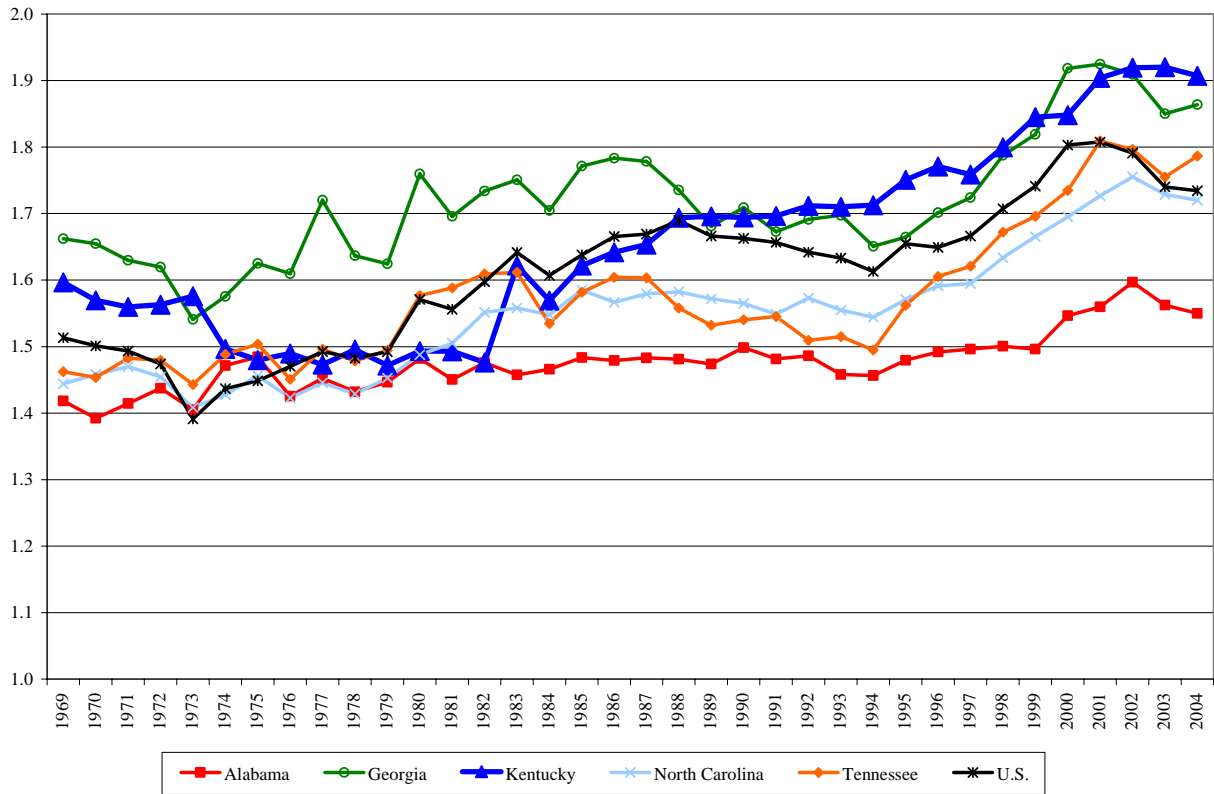(2003 Urban and Rural Definition)**

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System, 2006; U.S. Department of
Agriculture, Economic Research Service, Urban-Rural Continuum Codes, 2003

Table A-1: Results from Estimation of the Determinants of Average Earnings in a State

	Coefficient (standard error)	Beta Coefficient
Stock of Knowledge		
Average number of patents per resident in a state	34.786**	0.112
	(6.652)	
Percent of population 25 and older with 4+ years of college	0.295**	0.031
	(0.063)	
Percent of population 25 and older with high school diploma	0.110*	0.023
	(0.053)	
Federal R&D expenditures per person in a state ($000's)	0.020*	0.009
	(0.009)	
Business Climate		
Proportion of states that are right-to-work states	-0.003	-0.003
	(0.011)	
Payments into the workers' compensation system per worker	-0.065**	-0.014
	(0.021)	
Corporate income taxes as a percent of total personal income	1.436	0.007
	(1.044)	
Individual income taxes as a percent of total personal income	-0.366	-0.008
	(0.351)	
Industrial Structure		
Agriculture as a percent of total state non-farm employment	7.460**	0.065
	(0.974)	
Mining as a percent of total state non-farm employment	-0.994**	-0.039
	(0.236)	
Construction as a percent of total state non-farm employment	-1.380**	-0.029
	(0.341)	
Manufacturing as a percent of total state non-farm employment	0.485**	0.063
	(0.140)	
Transportation and utilities as a percent of total state non-farm employment	3.273**	0.053
	(0.506)	
Wholesale trade as a percent of total state non-farm employment	-0.930*	-0.016
	(0.404)	
Retail trade as a percent of total state non-farm employment	0.776**	0.021
	(0.243)	
FIRE as a percent of total state non-farm employment	0.097	0.003
	(0.271)	
State Infrastructure		
Percent of population in an urban area	-1.225**	-0.346
	(0.318)	
Percent urban population squared	1.193**	0.446
	(0.243)	
Per capita total highway capital stock ($000's)	-0.027**	-0.039
	(0.007)	
Size of Government		
Government employment as a percent of total state non-farm employment	-0.269	-0.019
	(0.225)	
Personal current transfer receipts as a percent of total personal income	-0.499*	-0.027
	(0.246)	
Demographic Changes		
In-migrants as percent of total population	4.934**	0.102
	(0.553)	
Out-migrants as percent of total population	-0.549	-0.007
	(0.753)	
Observations	1488	

Note: The regression includes controls for lagged per-capita income, the year, the state, and in interaction between the region and the year. * indicates it is significant at the 5 level and ** indicates the coefficient is significant at 1 percent level. The standard error appears in parenthesis below the coefficient and the beta coefficient appears to the right of the coefficient.

Table A-2: Summary Statistics for State Growth Analysis

	Mean	Standard Deviation
Dependent Variable		
Log of average earnings in a state	9.269	0.511
Stock of Knowledge		
Stock of patents per person	0.002	0.002
Percent of population 25 and older with 4+ years of college	18.2%	5.4%
Percent of population 25 and older with high school diploma	72.8%	10.8%
Federal R&D expenditures per person in a state	$153	$221
Business Climate		
Proportion of states that are right-to-work states	0.405	0.491
Payments into the workers' compensation system per worker	$54	$108
Corporate income taxes as a percent of total personal income	0.4%	0.2%
Individual income taxes as a percent of total personal income	1.7%	1.1%
Industrial Structure		
Agriculture as a percent of total state non-farm employment	0.9%	0.4%
Mining as a percent of total state non-farm employment	1.3%	2.0%
Construction as a percent of total state non-farm employment	5.6%	1.1%
Manufacturing as a percent of total state non-farm employment	16.2%	6.7%
Transportation and utilities as a percent of total state non-farm employment	5.0%	0.8%
Wholesale trade as a percent of total state non-farm employment	4.7%	0.9%
Retail trade as a percent of total state non-farm employment	17.0%	1.4%
FIRE as a percent of total state non-farm employment	7.2%	1.4%
State Infrastructure		
Percent of population in an urban area	67.5%	14.5%
Percent urban population squared	0.477	0.191
Per capita total highway capital stock	$1,175	$731
Size of Government		
Government employment as a percent of total state non-farm employment	17.3%	3.6%
Personal current transfer receipts as a percent of total personal income	5.4%	10.8%
Demographic Changes		
In-migrants as percent of total population	2.5%	1.1%
Out-migrants as percent of total population	2.0%	0.6%
Observations	1488	