Farmer with Horse-Drawn Plow, c. 1930s

Farming was one of the top three occupations in the Fourth District in 1930. The Rural Electrification Act of 1936 brought electric power to many isolated U.S. farms for the first time.

Still a Dominant Force

While both the number of farmers and the percentage of Ohio residents who are farmers have decreased since the mid-twentieth century, average farm size and output have increased.

Altered States: A Perspective on 75 Years of State Income Growth

All of us, it seems, would like to increase our incomes. If elected officials represent our interests, then it follows that these officials would like to help their citizens do just that. Yet boosting collective income levels is a difficult goal to achieve. There are no simple, one-size-fits-all solutions for raising income growth. Still, governments can—and do—try to improve the fortunes of their citizens through initiatives like providing public education systems, recruiting businesses to locate in their region, and assisting in the development and growth of new technologies. In this *Annual Report*, we ask: Why do residents of some states have higher incomes than residents of other states? Why have these income differences persisted for the past 75 years?

To answer these questions, we analyze the patterns of per capita income growth across the 48 contiguous U.S. states from the 1930s to 2004. We find that, over the long run, factors like innovation and a skilled labor force appear to make a big difference in explaining why some states have grown more than others.

Since our research does not examine *specific* policies for state taxation, spending, and regulation, we do not offer advice on any specific policies designed to raise state per capita incomes: Individual policies should be evaluated on cost–benefit criteria. Nevertheless, our findings suggest directions that public policy makers might consider pursuing as they chart their economic development strategies.

This essay begins by providing some facts about state incomes from 1930 to 2004, and we consider these facts in terms of economic growth models. Next, we discuss our own research and how it identifies factors that help to explain the paths of state incomes over this time period. Finally, we address state economic development strategies in light of what we have learned from our research.

THEN AND NOW: The 1930s and the 21st Century

U.S. incomes have risen dramatically over the decades, and how people spend their money has changed as well. Today, the percent of household consumption devoted to transportation expenditures (18 percent) is nearly double that of the 1930s, as lower auto prices, innovations in consumer credit, and rising incomes have made multiple-vehicle ownership widespread. Our food expenditures, on the other hand, have dropped from 34 percent of the U.S. household budget to just 13 percent; low-cost production techniques, refrigeration, and distribution improvements have made this drop possible.

Homeownership rates are also on the rise, increasing from roughly 48 percent in 1930 to 69 percent in 2004. These rising rates were spurred by increasing incomes, the availability of less-expensive suburban land and housing, and financing innovations.

U.S. demographics have changed, too. While the population of the entire United States grew 139 percent from 1930 to 2004, the Fourth Federal Reserve District did not keep pace: West Virginia grew at a meager 5 percent, Pennsylvania at 28 percent, and Kentucky at 58 percent. Ohio's 72 percent growth—the strongest in the District—was still no match for the national average (by comparison, California exploded by 528 percent). In 1930, all four states in the Fourth District were within the top 15 most densely populated states. Although each District state has fallen from its 1930 ranking, Ohio and Pennsylvania still ranked high in the 2004 list.

State Incomes

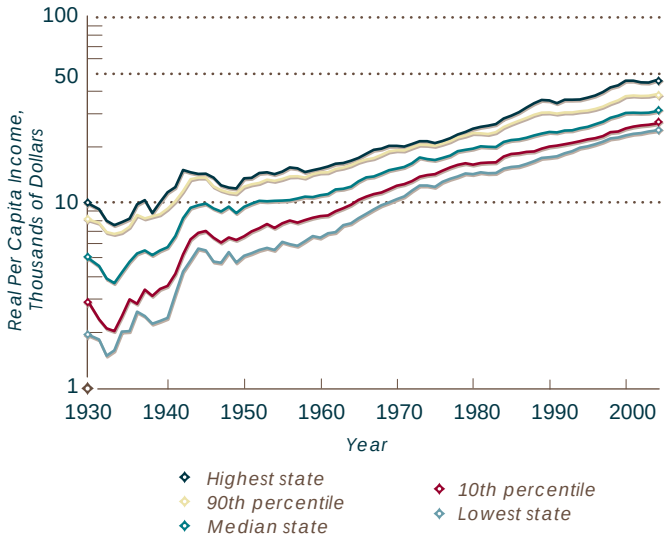
We begin with an analysis of the patterns of per capita income growth across U.S. states. All states have seen their incomes grow in real (inflation-adjusted) terms over the past few generations. Figure 1 shows the income-level growth in all states over the past 75 years: Even accounting for rising prices, the 2004 median of state per capita incomes is more than *six* times higher than it was in 1930.[1] Much of that growth occurred in the expansion that accompanied World War II. The longer-run picture also reveals that the slower growth linked to most recessions is short-lived and that per capita income levels rose faster than inflation in 59 of the past 75 years.

States that had lower incomes in 1930 have tended to grow at a faster pace than those whose incomes were greater at that time. For example, the poorest state—Mississippi—had a per capita income that was roughly one-fifth of the highest-income state at the time, New York. By 2003, the per capita income of the lowest-income state—still Mississippi—was only a little less than *half* of the highest-income state, Connecticut. The progressively smaller gaps among state incomes since the 1930s result in a decline in the standard deviation (a statistic that reveals how tightly state incomes are clustered around the average), as seen in figure 2. This decline is known as convergence—the notion that, over time, the per capita income of states (or countries) will become closer to average.

Within the Fourth Federal Reserve District, the lower-income states of 1930 have also experienced more rapid growth.[2] Kentucky, which had the lowest per capita income of the Fourth District

Figure 1

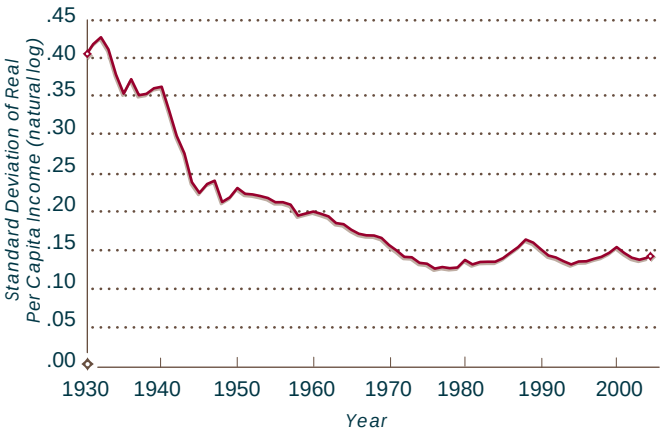
Income Growth



Source: Authors' calculations.

Figure 2

Income Convergence



Source: Authors' calculations.

1 The median is the value below and above which there is an equal number of values or, in this case, where exactly half of the states have higher incomes and half have lower incomes.

2 The Fourth Federal Reserve District includes the entire state of Ohio, western Pennsylvania, eastern Kentucky, and the northern panhandle of West Virginia.

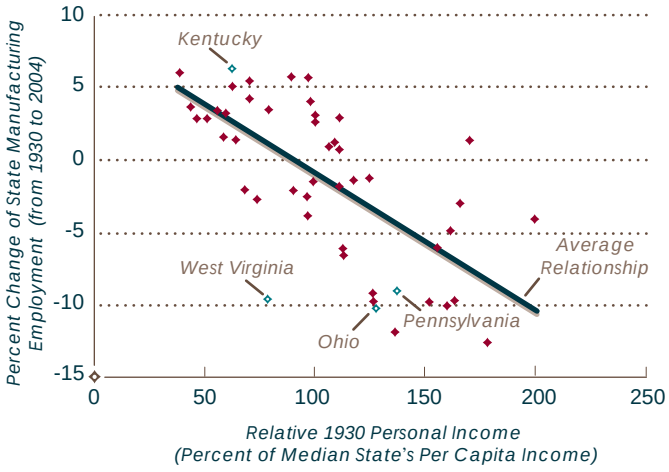
states, experienced the fastest income growth. West Virginia, whose per capita income was low but still well above Kentucky's in 1930, experienced noticeably lower growth than Kentucky. Pennsylvania and Ohio, which had significantly higher incomes than West Virginia and Kentucky, have seen the lowest annual income growth rates in the Fourth District since then.[3]

Does this mean that the economic policies of the lower-income states in the 1930s supported faster income growth than did the policies of the higher-income states? Not necessarily. Economic theory leads us to expect a certain amount of convergence among states.[4] U.S. states share a common set of technologies, and labor and capital are free to locate wherever the return for their services is highest.[5] Over time, the movement of labor and capital should reduce differences in the average amount of capital per worker in a state, a concept known as capital equalization. Applying the basic economic model of total production and growth (see sidebar on Solow and the basics of economic growth), this process should cause incomes to rise in the areas where incomes are lowest.

Evidence shows that capital equalization, which occurs through capital investments in existing plants as well as in the opening and closing of facilities over time, has helped to reduce differences in state income levels. Businesses stand to gain the most when they add capital in places that start with very low relative capital levels (and, therefore, generally lower incomes). Just as the basic economic growth model predicts, the changing location of capital-intensive industries—like

Figure 3

State Manufacturing Employment



Source: Authors' calculations.

manufacturing—in the United States over the past 75 years reveals a clear pattern: States that had lower incomes in 1930 have tended to see, for example, a growing share of total manufacturing employment, while higher-income states have typically seen a declining share (see figure 3). It is exactly this kind of development pattern that should lead to an equalization of capital-per-worker levels within the United States, almost regardless of state policies.

This trend suggests that the reason state incomes have become more equalized is that states' initial levels of capital have become more equalized. In the process, living standards have improved throughout the country. In this simplified version of the growth process, the lower-income states could remain fairly passive and still see their fortunes improve.[6]

3 Kentucky's per capita income growth rate from 1930 to 2004 was 3.0 percent per year. West Virginia's was 2.6, while Pennsylvania and Ohio each had a 2.2 percent annual growth rate.
4 For a basic review of the theory and data, see Gomme and Rupert (2004).
5 The simple version of economic theory neglects states' fixed attributes that might also limit convergence, such as natural resources, access to the ocean, and climate.
6 Realistically, though, states could not sit on their hands. They would still need to build and maintain their public capital stocks just to keep in line with changing national practices.

SOLOW AND THE BASICS OF ECONOMIC GROWTH

Good economic research is built on strong economic models. One of the most durable economic models of the past few decades—the Solow model—shows us what we should expect to see as economies grow.

Fifty years ago, Robert Solow developed what would become a Nobel Prize-winning model of economic growth. Beginning with "A Contribution to the Theory of Economic Growth" in 1956, he crafted a basic model that is still considered a workhorse of macroeconomics today.

The Solow model shows what level of economic growth we can expect using a given amount of capital and labor with a particular level of technology. This is like thinking of the economy as a gradually improving factory that produces one product using both people (labor) and machines (capital).

In this model, per capita income growth comes from a single direction—productivity gains—or, in other words, how our ability to generate per capita income evolves. Productivity gains can be achieved in two ways:

- By increasing the amount of capital for each worker through saving and investment
- Through technical progress or innovation—finding a better way to get things done with what you already have

The Solow model has important implications for how economies grow. It tells us that even if two regions start off with different living standards and different amounts of capital and labor, their amounts of capital per worker will converge. This implies that the regions' per capita income levels will also converge.

Not So Fast

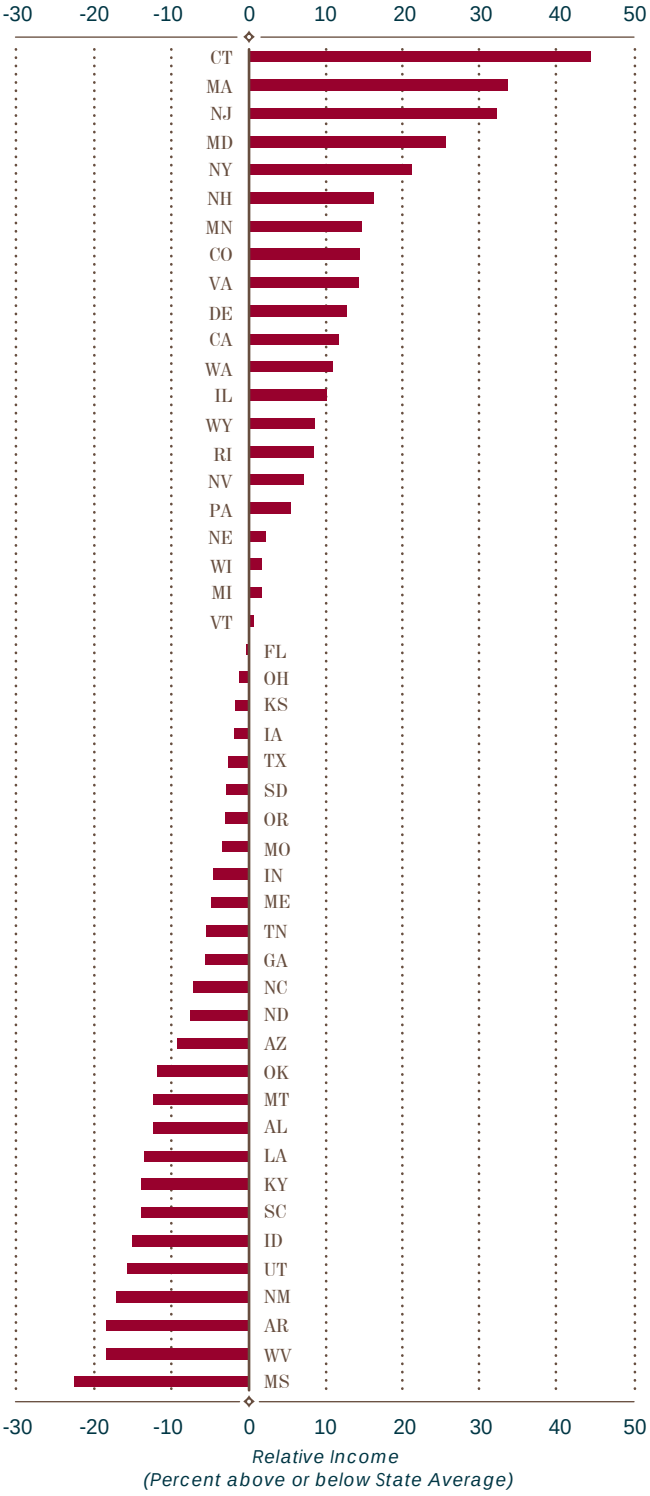
The basic economic model would lead us to expect almost complete convergence by now in state incomes. Has this happened? One way to measure the dispersion of state incomes around the average is with standard deviation; in a country with complete convergence, the standard deviation of state incomes would decline to zero. In fact, the standard deviation of state incomes *has* declined considerably, reaching a minimum in 1976, at roughly 31 percent of the 1930 level. Since then, however, it has risen gradually (see figure 2), with the standard deviation of the 2004 state incomes at roughly 35 percent of the 1930 level. This means that state incomes are now dispersed a bit more widely around the state average than they were in the mid-1970s.[7]

This stalling out of gradual convergence is not evident in all states. Over the past 25 years, lower-income states like Mississippi have actually continued to close in on the median state. But a comparison of state income levels in 2004 (figure 4) shows that substantial income differences remain between low- and high-income states. Why hasn't convergence persisted across the nation? Statistically, the reason is that the income levels reached by our most prosperous states are moving farther away from the median. For example, Connecticut was the highest-income state in both 1976 and 2004: In 1976, it was only 23 percent above the median, whereas it was 47 percent above in 2004.

7 Romer (2000) provides an excellent summary of the basic model and how to calculate the expected rate of convergence.

Figure 4

State Relative Incomes in 2004



Source: Authors' calculations.

The basic economic growth model has no explanation for this divergence of relatively high-income states. Rather, it has a strong prediction that economies sharing technologies should generally tend to converge. In this basic model, states have identical rates of technical progress, and there is no scope for government policies.[8] To help explain the per capita income differences we still observe among states, the basic model must be expanded.

More sophisticated models direct us to recognize that companies and governments might be able to stimulate technical progress through purposeful action. In other words, rather than just relying on labor and capital to move on their own, public officials and private businesses might be able to execute purposeful strategies that expand their abilities to produce goods and services. It is not clear, however, which strategies will best support the evolution of technical progress. We review only the categories that might be particularly relevant within the United States: education levels, taxes and public infrastructure, and patents and technology.[9]

Education Levels. The basic economic growth model does not account for human capital—the accumulated investment in workforce skills. This is important because during the past 75 years, we have seen a tremendous rise in education investment across the country: The share of the U.S. population with college degrees has grown from approximately 4 percent in 1930 to more than 27 percent today.

8 Differing saving rates across states could account for some of this short-run divergence, but if savings move smoothly across state lines, then convergence should be even faster.

9 We did not examine the effects of state programs that offer specific tax breaks or subsidies to businesses in order to attract or retain them. Analysis by the Federal Reserve Bank of Minneapolis (1995) suggests that while such programs benefit the recipients, they do not boost income at the state level.

WHAT CAN EDUCATIONAL ATTAINMENT TELL US?

Just as physical capital is a key determinant of how much an economy can actually produce, human capital is a key determinant of an economy's productive potential. While true human capital can be difficult to quantify, we can use levels of educational attainment as a proxy.

By this measure, U.S. human capital has grown sharply since World War II. For instance, in 1940, less than 25 percent of the U.S. population had completed high school; today, that figure has more than tripled to roughly 85 percent. In the same time span, the percent of college-educated Americans has shot up from less than 5 percent of the U.S. population to more than 25 percent.

Despite this general upward trend, there are still noticeable differences in educational attainment across states, and this has implications for how these economies perform. Among all U.S. states, Massachusetts has the highest proportion of college-educated adults at 36.7 percent and has one of the highest per capita incomes in the United States.

New Hampshire, Minnesota, Georgia, and Alabama have seen some of the largest increases in their share of college-educated citizens in the past 15 years, although Alabama remains one of the states with a relatively low level of bachelor's degree attainment at 22.3 percent. West Virginia—a Fourth District state—has the smallest proportion of college-educated citizens among all states. The other Fourth District states are also below the median, with Kentucky at 21.0 percent, Ohio at 24.6 percent, and Pennsylvania at 25.3 percent. The State-Level Growth Analysis section of the essay addresses the implications of these education patterns for income levels.

More human capital means more productivity, even without incorporating new technology. This may not be the whole story, though. More human capital may also affect which technologies can be adopted. For example, computerization often requires workers to have at least basic programming skills. More human capital may even advance the rate of technological innovation. Empirical studies on international income levels do find a substantial relationship between education levels and income growth, although education differences among countries still fall far short of explaining the remaining income differences.[10] Education differences, large at times, continue to persist and thus may be a factor within the United States as well.

Taxes and Public Infrastructure. What about taxes and public infrastructure? Taxes matter because they lower the amount of money potentially available for private investment, but spending on an improved public infrastructure can also help to boost the economy's productivity. These decisions have potentially offsetting effects on income. In an international study, Kocherlakota and Yi find that U.S. decisions on taxes and public capital have, indeed, been roughly offsetting over a span of many decades.[11] This helps to explain the robust postwar economic growth, despite tax rates that more than doubled during World War II and remained far higher afterward. Public investment also rose dramatically. At the state and local levels, tax and public-spending variations certainly make these factors a plausible source of state differences.

10 Bosworth and Collins (2003) provide recent research accounting for the role of international human-capital differences.
11 Kocherlakota and Yi (1997).

Patents and Technology. Finally, it stands to reason that research and development activity might differ among the states, and this creates a channel through which per capita incomes diverge. Just think about the tremendous effect of electrification—the spread of electricity to nearly universal usage—on twentieth-century society.[12] Advances of this scale cannot help but alter how the economy develops, and they may, at least initially, be unevenly spread through the economy. Smaller increments to our technological base, when cumulated over time, will also improve living standards substantially. Consider the advances of the telephone:

- Early in the twentieth century, operator-assisted rotary phones were still attached to big boxes that housed the ringer.
- The mid-twentieth century saw the telephone become more compact, and modular connections finally allowed phones to be plugged directly into the wall.
- Small, fast, and functional cell phones began replacing many standard phones in the later part of the century and continue to evolve today.

Patents, the most consistent measure of new technical advances, have been employed at each stage of the telephone's progress to protect the many inventors' intellectual property. Patent statistics are typically regarded as an indicator of a broad range of innovative activities rather than as direct producers of income. Past research has connected patent data to more general forms of research and development activities that could vary substantially from state to state.[13]

State-Level Growth Analysis

Even if factors such as human capital, patents, and taxes are likely to have an impact, it remains to be seen just how important these factors are in explaining the differences evident today in state incomes. A recent research project completed at the Federal Reserve Bank of Cleveland by Bauer, Schweitzer, and Shane examines a variety of factors that could influence the evolution of state per capita incomes over time.[14] They use a model grounded in growth theory to consider factors that contributed to per capita income growth in the 48 contiguous U.S. states from 1939 to 2004. This model estimates both the general pattern of convergence among states and the roles of a variety of growth factors like education, patents, taxes, and infrastructure spending.

Part of the model's accuracy stems from including information on the relative income five years earlier, which allows both past investments and past factors outside the model to boost (or lower) state income levels. The model estimates imply that approximately 66 percent of that relative income differential will remain after five years: High-income states will, on average, remain higher-income, and low-income states will remain lower-income.

However, the fact that this estimate is less than 100 percent of the income differential means that the difference between the highest- and lowest-income states should decline each year unless other factors intervene. Without these other factors, income differentials should have shrunk to less than a half of one percent of their starting values over the 65-year period starting in 1939. This pattern is consistent with the income

12 The National Academy of Engineering cites electrification as the most important technical advance of the twentieth century.
13 Griliches (1990) discusses the interpretation of patent statistics as a general economic indicator.
14 Bauer, Schweitzer, and Shane (2006).

INNOVATION IN THE FOURTH DISTRICT

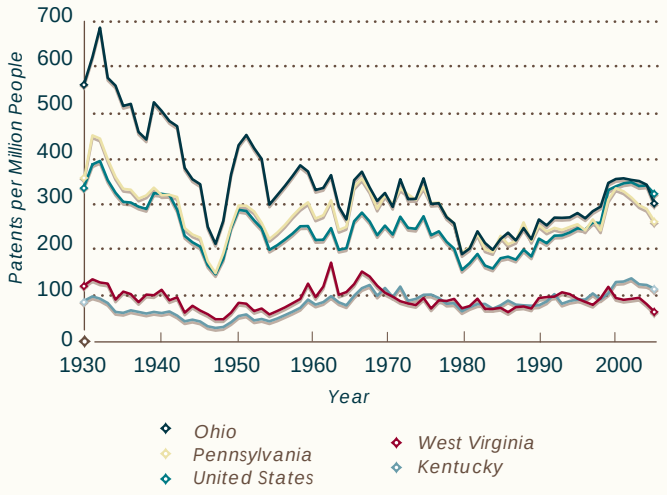
The Fourth District has been the birthplace of many of our nation's inventions: the vacuum cleaner, aluminum, and the Ferris wheel, to name a few. In 1999 alone, our region was granted 4,614 utility patents—that is, "patents for invention." How does our region stack up against the national average, and just who is receiving these Fourth District patents?

In 1930, applicants from Kentucky, Ohio, Pennsylvania, and West Virginia were awarded 7,673 total patents—nearly 20 percent of all patents originating in the United States. After 1930, the number of patents issued to Fourth District residents fluctuated greatly, but by 2004, the total granted was 7,216—nearly the same number issued 75 years earlier. However, the 2004 total amounted to only 7.7 percent of all patents originating in the United States.

The share of the population involved in research and development activities is better approximated by looking at per capita patents. In 1930, Ohio had significantly more patents per person than the United States as a whole. However, after significantly outpacing the nation for decades, Ohio's per capita patents fell from 566 for every million residents in 1930 to 299 in 2004. Kentucky and West Virginia still have significantly fewer patents per person than the nation, as has been the case since 1917. On a positive note, the number of per capita patents originating in Fourth District states is higher than it was 10 years ago.

Individual companies play a large role in a region's level of patent activity. In just the past five years, more than 35,367 utility patents were awarded to residents of Fourth District states; of these, almost 18 percent were assigned to just 10 companies.

Patents Per Capita



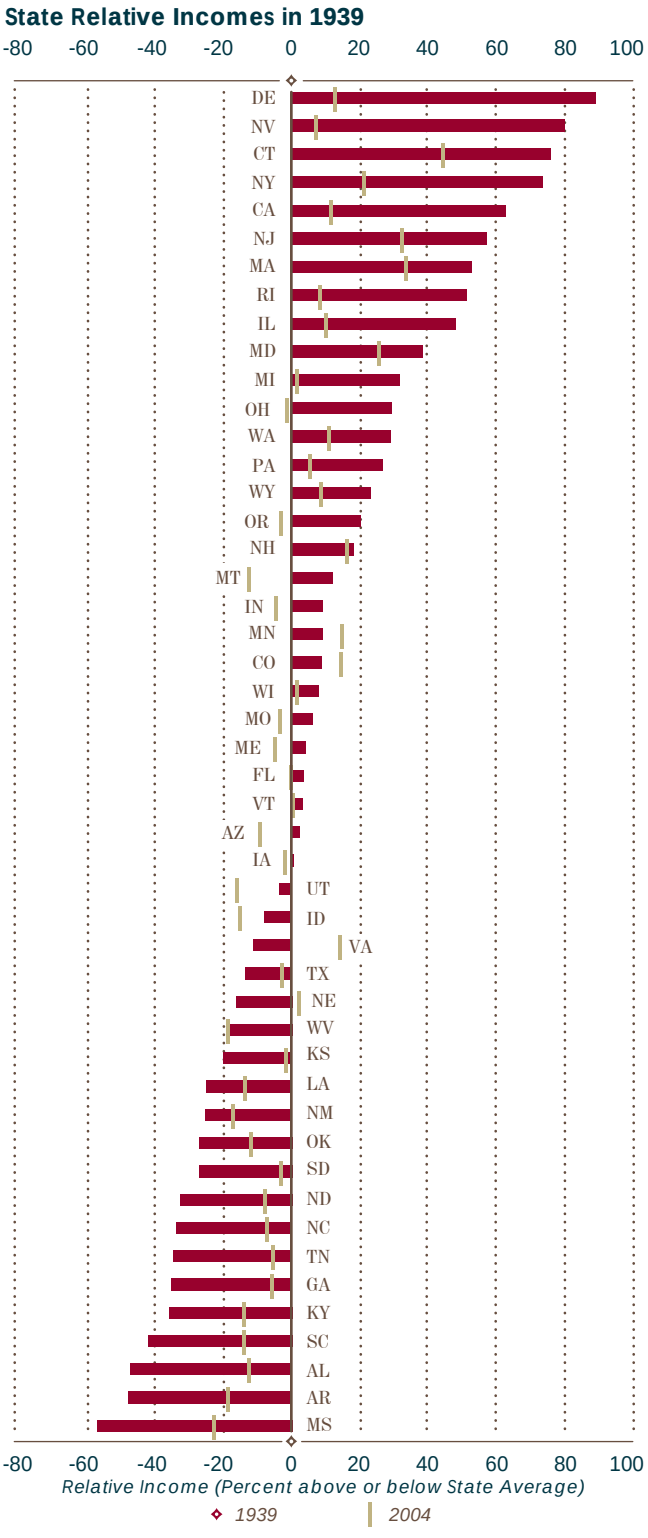
Sources: U.S. Department of Commerce, Bureau of the Census; *Annual Report of the Commissioner of Patents* (various years); *www.uspto.gov/index.html;* and authors' calculations.

Rank		Company*	Industry	Fourth District States' Patent Total, 2000–2004
1	◆	Procter & Gamble	Nondurable Household Products	1,463
2	◆	General Electric Company	Diversified Industrials	1,245
3	◆	SmithKline Beecham Corporation	Pharmaceuticals	604
4	◆	Lexmark International, Inc.	Computer Hardware	558
5	◆	The Goodyear Tire & Rubber Company	Tires	536
6	◆	Lucent Technologies Inc.	Telecommunications Equipment	474
7	◆	Delphi Technologies, Inc.	Automobile Parts	405
8	◆	PPG Industries Ohio, Inc.	Specialty Chemicals	347
9	◆	Air Products and Chemicals, Inc.	Specialty Chemicals	345
10	◆	Rohm and Haas Company	Specialty Chemicals	324

Sources: *www.uspto.gov/web/offices/ac/ido/oeip/taf/asgstc/oh_stc.htm; www.money.cnn.com;* and authors' calculations.

* Patent origin is determined by the residence of the first-named inventor listed on the patent grant.

Figure 5



Source: Authors' calculations.

convergence predicted by the basic growth model with factor mobility and is also consistent with past studies.[15]

This estimated rate of convergence implies that essentially no part of the 1939 state-income distribution remains today. Yet considering the 1939 state relative incomes, shown in figure 5, it is evident that some states have retained their relative status while others have moved substantially. Connecticut, New Jersey, and Massachusetts were all relatively high-income states, and they ended 2004 as the three highest-income states. Mississippi and Arkansas, the lowest-income states in 1939, are still among the lowest-income states today. On the other hand, Nevada's relative income has fallen, while Tennessee's and Alabama's incomes have moved up considerably in the distribution.

Bauer, Schweitzer, and Shane identify several factors as statistically reliable indicators for growth: education levels, patents, and industry specializations.[16] Figure 6 shows the model's predicted 65-year impact of these factors on state incomes in 2004 (see figure 4 to compare these predicted incomes to the actual 2004 incomes). Each factor is represented by a colored bar specifying how much that factor boosted or reduced the income prediction of each state. Take Ohio as an example: Ohio's history of above-average patent levels boosts its income prediction by almost 10 percent, while its slightly below-average levels of education and industry specialization have small negative effects on Ohio's predicted income in 2004. In cases where one of the factors offsets the others (states with both positive and negative bars), the

15 See Barro and Sala-i-Martin (1995) for examples and for citations to earlier work on the topic.

16 They also identify a statistically significant role for climate variables, although the effect of climate on income is not nearly as large a factor as the others.

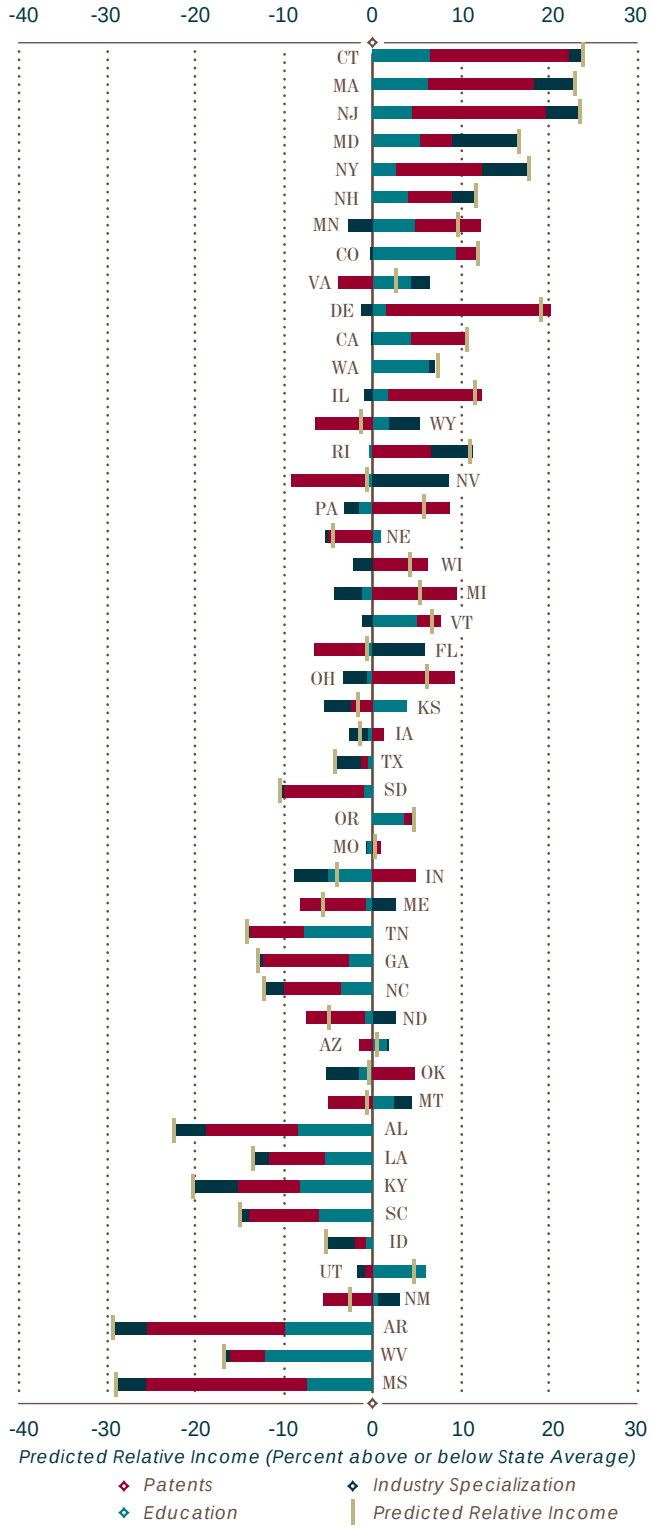
predicted relative income is the sum of the positive and negative effects, marked by the gold lines. This means that although it looks like Ohio's predicted 2004 income is almost 10 percent above average, it is really only approximately 6 percent above.

Long-run variations in state education levels, patents, and industry specializations explain much of the 2004 income differences. If the predicted rankings from the authors' model were perfect, the bars in figure 6 would *steadily* shift from the bottom-left to the top-right. This is not the case, but, in line with the model's prediction, negative bars are typically seen toward the bottom (lower-income states), while positive bars are almost exclusively seen toward the top. Also note that the scale of the predicted effects is generally smaller than the actual 2004 values (shown in figure 4) but not by a large amount. Collectively, this visual evidence shows that the model does account for much of the current differences in state income levels.

The authors conclude from figure 6 that the largest factor underlying relative income differences in 2004 is patents, followed by education then industry specialization. This is supported by the predominance of the red bars and their strong positive association with 2004 incomes. Patent data are particularly informative, even though most estimates of profits accruing to firms that hold patents are not particularly high. Bauer, Schweitzer, and Shane interpret the strong patent result shown in figure 6 as income accruing to places that are relatively innovative and produce more patented inventions than other places.

Figure 6

Predicted Impact of Key Factors on 2004 State Incomes



Source: Authors' calculations.

Listing the states with the highest levels of patents per capita at the end of the sample reveals why this variable works so well: Delaware ranks first, New Jersey second, and Connecticut third. In terms of income, Connecticut is first and New Jersey is third; both have shown surprising income growth. Most lower-income states have very low levels of patenting per capita. Delaware deviates from the pattern noticeably in that its income level is not among the top states, but the overall correlation is clear in the data.

Bauer, Schweitzer, and Shane suggest that these differences likely reflect higher (or lower) levels of knowledge-building activities (which are correlated with patents) within these states. In their interpretation, something about Connecticut and New Jersey makes them more active in generating innovation, although the specific sources of these advantages are not identified. For example, patents might be a proxy for success in commercialization of technology.

The education factor in figure 6 comes from combining high school and college completion statistics. Colorado, Connecticut, and Massachusetts are the current education leaders; again, their income levels stand out. Education is also a fairly reliable indicator of lower income levels and weak convergence, with West Virginia and Arkansas having the lowest education scores. It is important to see that while patents and education levels are correlated, the statistical procedure used by the authors indicates that these factors are distinct from one another.

Industry specialization is yet another reliable indicator of state growth differences. For instance, states with larger-than-usual mining incomes tend to grow more slowly than states with other specialties. States with higher levels of manufacturing also tend to grow more slowly, even though these states initially had higher incomes. Indeed, both the familiar manufacturing centers, like Ohio and Indiana, and the new manufacturing centers of the South, like Mississippi and Kentucky, are estimated to have lower income levels due to their industry specializations. Today, the states with larger-than-average service sectors are the ones estimated to have experienced more income growth (see the dark-blue bars in figure 6).

State tax differences and investments in infrastructure (in the form of roads) play smaller roles in interstate income differences and typically are statistically insignificant, as are banking deposits. Climate differences are statistically valid for predicting income growth, with warmer and drier states showing more income growth, yet the effects of the climate variables are substantially smaller and more-erratic predictors of 2004 income levels.

Overall, Bauer, Schweitzer, and Shane's study emphasizes the role of knowledge building—through research and education—in aiding income growth. A separate study (see sidebar on dashboard indicators) analyzing the growth patterns of U.S. metropolitan areas during the past 10 years corroborates this role: Although this study differs considerably in its methodology, it agrees that patents and education are associated with higher incomes in metropolitan areas.[17]

17 Eberts, Erickcek, and Kleinhenz (2006).

DASHBOARD INDICATORS

Not surprisingly, experts in many metropolitan areas have sharpened their focus on increasing regional growth prospects. A good example is "Dashboard Indicators for the Northeast Ohio Economy," a paper by Randall Eberts, George Erickcek, and Jack Kleinhenz. This study analyzes which local economic indicators have contributed to growth in terms of output, employment, per capita income, and productivity in more than 100 metro areas.

The authors' research was supported by The Fund for Our Economic Future, which seeks to advance a regional economic development agenda that can lead to long-term economic transformation.[1]

The "Dashboard" study considers a broad set of state-income-growth variables. Forty economic indicators were combined into eight summary measures of related variables: skilled workforce, assimilation center (a set of variables focused on recent immigrants), racial inclusion, legacy of place, income equality, locational amenities, business dynamics, and urban/metro structure.[2] The statistically derived factors combine the effects of underlying variables that are highly correlated among the metro areas.

The authors then analyze these factors for their effect on economic growth measures, including per capita income. The four factors that contribute to higher income growth are—in order of importance—skilled workforce (which includes patents), urbanization/metro governance (which focuses on the governmental structure), income equality, and locational amenities (as evaluated in *Places Rated Almanac*).[3] They also find that the legacy-costs factor (which includes their measures for industry specialization) is significantly associated with lower income growth.

The skilled-workforce factor is consistent with both general education results and growth in the technology base in the Bauer–Schweitzer–Shane project (see the State-Level Growth Analysis section); these two distinct measures are highly correlated in recent metropolitan-level data and thus are combined into one measure. The "Dashboard" study estimates that the skilled-workforce factor is at least twice as important as the other explanations of income differences.

The authors' legacy-cost variable largely reflects the share of the workforce in manufacturing, which the Bauer–Schweitzer–Shane study also noted as a factor that held back income growth. The additional factors that the authors identify as statistically significant point to issues that local economic development economists have observed as appearing to be new, potential growth sources.

These two studies bring new empirical findings to the question of how communities can boost their income levels. As is true with most growth models in the national and international arenas, education levels stand out as important factors, but both of these studies also help to direct attention to other factors that matter. As such, they help to push the focus of economic development beyond just the recruitment and retention of capital investments.

1 The Fund for Our Economic Future (2006).

2 For example, "legacy of place" combines the number of government units in the metropolitan area, a crime index, a climate index, the percent of houses built before 1940, and the total number of layoffs and hires within the economy (a measure of how dynamically an economy is adapting to either positive or negative shocks). For descriptions of the other factors, please refer to Eberts, Erickcek, and Kleinhenz's report, which can be found at *www.clevelandfed.org/Research/Workpaper/2006/index.cfm*.

3 Savageau (1999).

Lessons for the States

Does the rising importance of knowledge in the economy necessarily mean that industries like manufacturing—a prominent one in the Fourth District—no longer have a place? After all, the results show that a manufacturing concentration negatively affects a state's income, at least when the model holds the state's other characteristics—most importantly its income history—constant. As it turns out, in the 1930s, manufacturing and high state income levels tended to go together.[18] But in the model estimates, the negative effect of manufacturing and the general pattern of income convergence have largely eliminated the income advantage that manufacturing once had. The negative estimates for the industry-specialization factor likely reflect the importance of circumstances that have particularly affected manufacturers over this 75-year period.[19]

Statistically speaking, little correlation remains today between a state's manufacturing share and its income level. This leaves us close to the premise that manufacturing's expected return to investment should be equalized across the economy. In this case, there is no reason for states to avoid manufacturing, but there is also no reason to favor it over other economic activities.

A SHIFT IN FOURTH DISTRICT OCCUPATIONS

Goods-producing industries such as steel and farming have historically been the lifeblood of the Fourth District economy. But since the 1930s, shifts in the labor force have caused this region to reevaluate its place in the national economy.

In 1930, the Fourth District's three largest occupations—laborer, operative worker, and farmer—accounted for nearly 30 percent of its labor force. While these occupations remain significant to the Fourth District's vitality, they accounted for just over 10 percent of its labor force in 2004, and farmer dropped from the third-most-common job to the forty-ninth.

At the same time, health-care occupations have seen a significant increase, with nurses, hospital attendants, and medical technicians accounting for nearly 5 percent of employment today, versus only about $^1/_2$ percent in 1930. This trend in occupational employment shows a movement in Fourth District states toward a more service-based economy, similar to the trend in the rest of the country.

18 The correlation in 1930 was 0.57.

19 International trade may have played an increasingly important role in manufacturing activity's value to a state's income during our sample period, but we did not examine this proposition directly.

The results suggest a possible exception for at least some manufacturing companies: the exceptional innovators. Many states with high levels of patents over the past 10 years generate a large fraction of their patents in companies with a manufacturing link to the state, even if their manufacturing facilities are now often located elsewhere. Several of the companies listed as top producers of patents in Fourth District states between 2000 and 2004 are global companies with relatively few local manufacturing sites. Innovative companies like this appear to offer benefits to their states potentially beyond the direct value of their activities, even though these benefits are often thought of as supplemental.

Innovation and education certainly stand out in the Bauer–Schweitzer–Shane study; and past research has also pointed in this direction, although the scale of the factors was less certain.[20] However, it is one thing to establish that being a center of innovation or having a large number of highly educated residents—or both—promotes faster income growth. It's another to determine which state and local policies can be most effective.

Policy initiatives should be evaluated on cost–benefit criteria, and states can differ in their abilities to get the most out of any policy initiative. For these reasons, growth-promoting strategies should not be blindly pursued. For example, subsidizing companies that register their patents in particular states or localities would probably not promote much growth, unless the companies also relocated their research activities. Furthermore, any realistic plan should take into account the activities of other areas: Not every region can be the preeminent center of the latest hot technology.

To be effective, all policies require careful thought and planning. Research evaluating specific policy options will necessarily be more focused on the details that make policies successful. We intend to follow up this work with additional research on how the identified factors can be boosted in a state or region. Indeed, conferences hosted by the Federal Reserve Bank of Cleveland on the economics of education policy over the past two years have been focused on reaching a better understanding of the economic policy issues of education reform.

Caveats aside, the evidence provided by the growing study of expanded growth models suggests pursuing policies that increase the knowledge base of the region. This may sound like the mantra of the Internet age, but the results presented here show that innovation has been pivotal to income growth at the state level since the 1930s.

20 For example, see Glaeser and Saiz (2004).

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