KENTUCKY
Annual Economic Report

CENTER FOR BUSINESS AND ECONOMIC RESEARCH
GATTON COLLEGE OF BUSINESS AND ECONOMICS
UNIVERSITY OF KENTUCKY

Kentucky Annual Economic Report 2020

Gatton College of Business and Economics

Center for Business and Economic Research
Department of Economics
Gatton College of Business and Economics
University of Kentucky

Center for Business and Economic Research
225M Gatton Business and Economics Building
University of Kentucky
Lexington, KY 40506-0034

Voice: (859) 257-6226
E-mail: cber@uky.edu
Web: http://cber.uky.edu

Dr. Michael W. Clark, *Interim Director*
Center for Business and Economic Research
Dr. William Hoyt, *Chair*
Department of Economics
Dr. Simon Sheather, *Dean*
Gatton College of Business and Economics

Managing Editor
Michael T. Childress

Contributors
Michael T. Childress, **Michael W. Clark**, and **Bethany Paris**

University of Kentucky

The **Center for Business and Economic Research (CBER)** is the applied economic research branch of the Carol Martin Gatton College of Business and Economics at the University of Kentucky. Its purpose is to disseminate economic information and provide economic and policy analysis to assist decision makers in Kentucky's public and private sectors. CBER performs research projects for federal, state, and local government agencies, as well as for private-sector clients nationwide. The primary motivation behind CBER's research agenda is the belief that systematic and scientific inquiries into economic phenomena yield knowledge which is indispensable to the formulation of informed public policy. Recent projects have been conducted on manpower, labor, and human resources; tourism economics; transportation economics; health economics; regulatory reform; public finance; technology use and adoption; education policy; and economic development.

The initial Annual Economic Report was released in 1972 by the Council of Economic Advisors. This five-member council was established by an executive order signed by Governor Wendell Ford in December 1970. The Council was codified by state statute in 1972, with the responsibility to "monitor the economic progress of the Commonwealth and to advise the Office of the Governor on policies and programs for achieving the Commonwealth's full potential for economic growth." The Office of Business Development and Government Services, College of Business and Economics, University of Kentucky, acted as the secretariat, publishing various economic reports, including this Annual Report. In 1984, the Center for Business and Economic Research assumed responsibility as the secretariat for publishing the Annual Report for the Kentucky Council of Economic Advisors. In 1986, KRS 164.738 was passed, which directs CBER to maintain state economic data and produce the annual report. With passage of this statute in 1986, the Center for Business and Economic Research, under the auspices of the Department of Economics, has assumed responsibility for the mission originally set forth in 1970.

From the Director . . .

Dr. Michael W. Clark
Interim Director, CBER

This report is one of the important ways that the Center for Business and Economic Research fulfills its mission to examine various aspects of the Kentucky economy. The analysis and data presented here cover a variety of topics that range from an economic forecast for Kentucky in 2020 to a broad presentation of factors affecting the economy.

As discussed in our forecast section, Kentucky's economy continued to improve in 2019, following national trends. Nonfarm employment grew by 1.6% for the nation and by 1.2% in Kentucky. Kentucky's growth was driven primarily by its education and health services sector, which increased by 3.4%, and its manufacturing sector, which increased by 1.5%. Kentucky outperformed the nation in both of these sectors. This growth pushed the state's unemployment rate to a record low of 4%. The current expansion is now the longest ever recorded, 144 months as of November. Throughout this expansion, inflation has remained low, growing at 1.7% for 2019.

Looking forward to 2020, I anticipate that both the U.S. and Kentucky economies will continue growing but at a slower pace. Real GDP for the U.S., which increased by 2.3% for the first three quarters of 2019, is likely to slow slightly to a rate of 2.1%. I project that nonfarm employment growth for 2020 will slow to 0.9% for the U.S. and 0.8% for Kentucky. While Kentucky's manufacturing sector appears to be well positioned, it might struggle to expand further given an apparent contraction in manufacturing nationally. Workers will likely enter the labor market at a slightly faster pace than they find work, which will push Kentucky's unemployment rate up slightly to 4.5%. While I do not anticipate a national recession in 2020, an escalation in trade tensions or a loss in consumer confidence could further slow U.S. economic growth and increase the risk of recession in 2021.

We present a broad array of data on Kentucky that measure both economic inputs and outputs. We have organized the data into twelve thematic areas: Agriculture, Community, Economy, Economic Security, Education, Energy, Environment, Health, Infrastructure, Innovation, Population, and Public Finance. While representing a diverse array of sectors, a unifying set of themes embedded into these sections is that prosperity is increasingly tied to place and preparation. This report includes data for Kentucky over many years, which allows one to assess change over time. We have included data on the U.S. and the twelve states considered Kentucky's main economic competitors—Alabama, Georgia, Illinois, Indiana, Mississippi, Missouri, North Carolina, Ohio, South Carolina, Tennessee, Virginia, and West Virginia. This enables comparisons on many dimensions of economic prowess and social well-being.

The breadth of the data presented in this report demonstrates that no single factor determines the state's economic prospects—it is the interactions of many distinct factors that shape our economic trajectory. However, one of these factors is the foundation for many of the others, and as such, is singularly important: *education*. Investing in education will improve household incomes, individual health, and the overall quality of life for citizens across the Commonwealth.

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Summary

AT THE END OF 2019, THE COMMONWEALTH'S ECONOMY APPEARS REASONABLY strong by most measures. The three primary measures of Kentucky's economic activity—Gross Domestic Product (GDP), nonfarm employment, and the unemployment rate—all indicate that Kentucky's economy continued to grow in 2019. Kentucky's unemployment rate is low; nonfarm employment is growing; and inflation appears muted. The current economic expansion has shown significant resilience and is now the longest U.S. expansion in history—124 months as of November. However, growing uncertainty over U.S. trade policies, slowing global economic growth, and a slowing manufacturing sector temper expectations for 2020 (see the *Forecast* on page 1).

The Congressional Budget Office estimated that the trade disputes will reduce real U.S. GDP by 0.3 percent in 2020. Exports now account for approximately 15 percent of Kentucky's GDP (page 63), higher than surrounding states and the U.S. as a whole (12 percent). This heavier reliance on export markets could make Kentucky's economy somewhat more susceptible to trade tensions. However, a national recession in 2020 appears unlikely from the vantage point of late 2019, but the risk that the current expansion could end in 2021 has increased. This risk is largely driven by uncertainty with the nation's international trade policy and slowing global economy. Should the trade war continue or escalate, businesses may further delay investments and consumers could lose confidence in the economy. Both of which would slow growth further and push the economy closer to a recession.

Besides the uncertainty of trade policy, there are other, more chronic or long-term challenges, facing the state. For instance, rural America has been on a steady decline for the last three and a half decades. Numerous social, demographic, health, and economic trends paint a picture of widespread community distress across wide swaths of the country. These trends are especially intense in Kentucky, since about 41 percent of Kentucky's population live in somewhat or mostly rural counties, compared to about 14 percent nationally.

While the fragility of rural communities reflects local trends and global forces that have been developing for several decades, the unfolding of their impact has intensified over the last decade. The *Distressed Communities Index* (DCI), developed by the Economic Innovation Group, measures the vitality of communities by drawing from educational, housing, and employment factors (page 21). Their insights suggest that community distress is more common in rural areas, while urban areas tend to be more educated and prosperous.

Since the Great Recession, total wages and salaries increased by 40.5 percent in Kentucky's Urban Triangle, the state's primary economic engine, with the South Central region not far behind at 36.9 percent. Eastern Kentucky trails far behind the rest of the state at 9.3 percent. Similarly, Kentucky's Urban Triangle experienced an 11.2 percent increase in total employment, which exceeds the U.S. average of 9.7 percent. The other

regions in the state grew more slowly, as evidenced by the 0.7 percent increase in Western Kentucky and 6.7 percent increase in South Central Kentucky. In Eastern Kentucky employment is over 10 percent lower—a significant decline that reflects the declining fortunes of the coal industry (pages 49 and 51).

Place, however, is just one of the factors affecting *prosperity*, another is *preparation*. To be prepared, one must have education, training, or skills valued by the market place. Perhaps the most noteworthy economic trend over the last three and a half decades is the growing importance of education for economic success. For example, according to a recent analysis of federal employment data by *The Wall Street Journal*, "College-educated workers are taking over the American factory floor." This is a long-term trend—more than 40 percent of manufacturing workers have two- or four-year college degrees, up from 22 percent in 1991. They project that "within the next three years, American manufacturers are, for the first time, on track to employ more college graduates than workers with a high-school education or less…" As manufacturing employment grows, jobs are being filled by individuals with higher levels of education, training, and problem-solving skills. The reason is simple: factories are increasingly computerized, automated, and highly advanced workplaces that require workers with commensurate levels of sophistication.

Improving educational outcomes and enhancing the skills of Kentucky's prime working-age adults would, no doubt, help to move the needle on the state's labor force participation rate, which is one of the lowest in the country. This is especially true in rural areas where education levels and labor force participation rates are generally lower (page 61). While improving educational outcomes is necessary for increasing the labor force participation rate, it is not necessarily sufficient. For a variety of reasons, including, but not limited to, the changing global energy market, high chronic disease rates, and population loss, many regions around the state are languishing economically.

There are two primary factors that drive economic growth and enhance productivity—education and innovation. Kentucky has experienced progress in both areas. However, virtually every other state has progressed too, so Kentucky's relative position has not changed a lot over the last several years. Kentucky has remained in the middle of the pack in our *Education Index* (see page 98), and in the bottom quintile of the *State Technology and Science Index* (refer to pages 177 and 180). Since many communities across the state lack an advanced telecommunications infrastructure, another factor that would help level the economic playing field for rural communities is enhanced connectivity. To accomplish any of these objectives, however, such as investing in education, health, or infrastructure, it will likely require substantial financial commitments sustained over many years.

Acknowledgments

The inspiration and framework for this report rests, of course, on the foundation constructed by prior CBER staff and the previous forty-seven *Annual Reports* they have produced. Moreover, we have melded their tradition of academic rigor with the intellectual breadth found in the biennial reports on trends affecting Kentucky's future once produced by the staff of the Kentucky Long-Term Policy Research Center—*Michal Smith-Mello, Billie Dunavent, Amy Watts (Burke), Mark Schirmer, Peter Schirmer,* and *Suzanne King*.

Warren Nash, Executive Director of **The Von Allmen Center for Entrepreneurship**, also provided important support. This Center is the epicenter for entrepreneurship at the University of Kentucky. The Center brings together students, mentors, service providers, and regional entrepreneurs to promote the creation of new businesses in the Commonwealth (vace.uky.edu). **Warren Nash** is the Executive Director of the Von Allmen Center and he can be contacted at 859.257.6871 or warren.nash@uky.edu.

Forecast

by Michael W. Clark, Ph.D.

AT THE END OF 2019, THE Commonwealth's economy appears reasonably strong by most measures. Kentucky's unemployment rate is low; nonfarm employment is growing; and inflation appears muted. The current economic expansion has shown significant resilience and is now the longest U.S. expansion in history—124 months as of November. However, growing uncertainty over U.S. trade policies, slowing global economic growth, and a slowing manufacturing sector temper expectations for 2020.

National and State Economies

The three primary measures of Kentucky's economic activity—Gross Domestic Product (GDP), nonfarm employment, and the unemployment rate—all indicate that Kentucky's economy continued to grow in 2019. Figure 1 shows the quarterly percentage change in real GDP, which measures the value of goods and services produced in an area after adjustments for inflation. Nationally, real GDP started 2019 strong—posting growth of 3.1 percent in the first quarter—but slowed to 2.0 and 2.1 percent in the second and third quarters respectively. In Kentucky, real GDP grew by 0.1 and 1.0 percent in the first and second quarters of 2019 (Kentucky's third quarter GDP is not yet available). While this is still growth, it is down from the 1.4 percent Kentucky recorded for 2018.

Kentucky's employment growth picked up in 2019 compared to recent years. In 2017 and 2018, nonfarm employment in the state increased by

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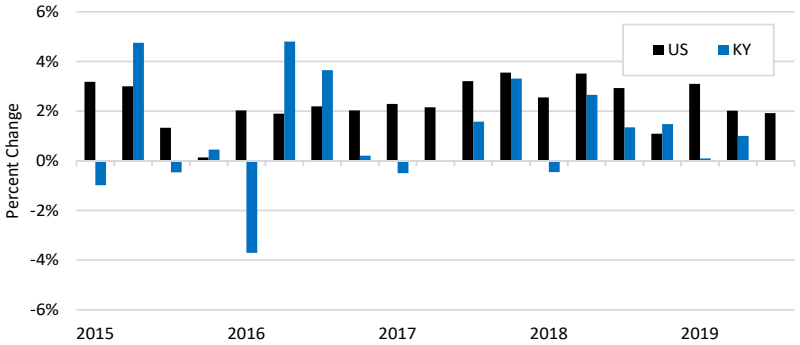
FIGURE 1
Percent Change in Real GDP, Kentucky & the U.S.
(Annual Rates)



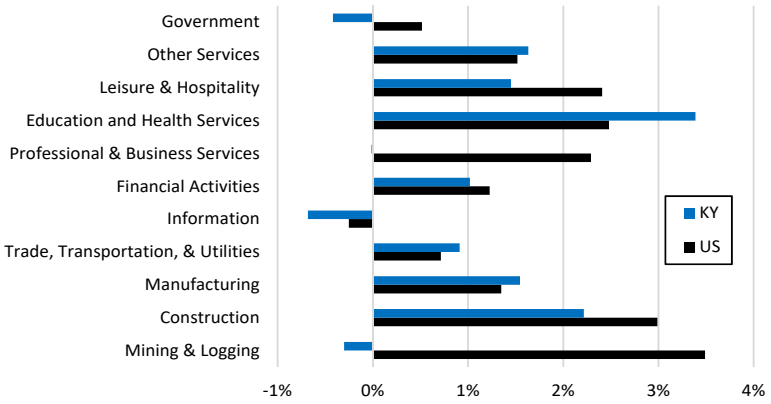
Source: U.S. Bureau of Economic Analysis.
Note: GDP for 2019 Q2 is the most recent available for Kentucky.

only 0.6 percent each year, which amounts to approximately 1,100 additional jobs per month. During the first 10 months of 2019, Kentucky employers added an average of 2,200 jobs to their payrolls each month—for a growth rate of 1.2 percent over the same period in 2018. Nationally, nonfarm employment grew by 1.6 percent in 2017, 1.7 percent in 2018, and 1.6 percent during the first 10 months of 2019.

Much of Kentucky's employment growth occurred in its education and health services sector and its manufacturing sector, which outpaced the rest of the nation. Jobs in Kentucky's education and health services sector grew by 3.4 percent so far in 2019 (2.5 percent nationally) and accounted for 42 percent of the state's nonfarm employment growth. Kentucky's manufacturing firms expanded their payrolls by 1.5 percent (1.3 percent nationally) and accounted for 17 percent of Kentucky's 2019 job gains. Kentucky's job growth in the professional and business services, information, financial activities, construction, and leisure and hospitality sectors underperformed relative to the nation.

Kentucky's unemployment rate has steadily declined since the recession and reached a record low of four percent in March 2019. Much of the decrease in the years immediately following the recession was driven by workers exiting the labor force as emergency unemployment benefits expired and they saw few prospects for employment. As these discouraged workers left the labor force, they no longer counted as unemployed in the official definition, causing the unemployment rate to fall. While a declining unemployment rate is often associated with improving economic conditions, the number of workers employed actually decreased during this period. However, since the fourth quarter of 2015, the number of workers employed has increased and has been the main reason Kentucky's unemployment rate has declined in recent years.

FIGURE 2
Percent Change in Employment 2019, Kentucky & the U.S.



Source: U.S. Bureau of Labor Statistics, Current Employment Statistics.
Note: Figures represents the percent change in average employment during the first 10 months of 2019 from the first 10 months of 2018.

After March 2019, the state's unemployment rate increased slightly. However, the increase was not driven by fewer people working. The number of workers employed still increased, but at a slower rate than the rate at which workers entered the labor market. So, while the increase in the state's unemployment rate does not reflect a downturn, it may suggest that Kentucky's labor market is tightening. This seems to be confirmed by anecdotal reports that employers are finding it increasingly difficult to attract qualified workers. While a tight labor market is challenging for employers, it could benefit workers by putting pressure on employers to increase wages.

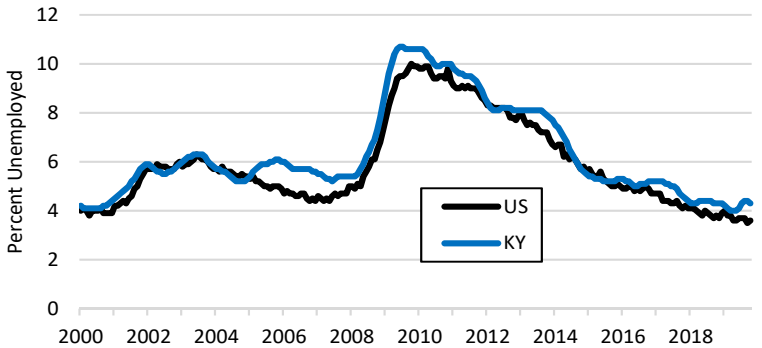
Trade Policy Uncertainty, Slowing Growth, and Consumer Sentiment

Trade policy will likely contribute to slower economic growth in 2020. Uncertainty over these policies causes businesses to postpone investments, particularly investments in supply chains that could be disrupted by further changes in trade policy. While the timing is uncertain, Congress is likely to ratify the USMCA trade agreement, which would replace NAFTA. There is greater uncertainty with the U.S.-China negotiations. While there have been reports that the countries are nearing a deal, when an agreement will be reached and the provisions of the deal are both unknown.

The Congressional Budget Office estimated that the trade disputes will reduce real U.S. GDP by 0.3 percent in 2020. Exports now account for approximately 15 percent of Kentucky's GDP, higher than surrounding states and the U.S. as a whole (12 percent). This heavier reliance on export markets could make Kentucky's economy somewhat more susceptible to trade tensions. China is not Kentucky's

largest trading partner, but accounting for seven percent of Kentucky's exports, China is an important market. Kentucky's 3rd quarter exports to China were down 25 percent compared to the 3rd quarter of 2017. The good news is that, in spite of the decrease in exports to China, Kentucky's total exports increased by eight percent during this time. This suggests that growth in other markets is helping to offset the losses in China. Trade uncertainty will likely contribute to slower economic growth in 2020. However, a quick and clear resolution to trade tensions might be sufficient to encourage business investments and help prolong the expansion.

FIGURE 3
Unemployment Rate, Kentucky & the U.S.
(seasonally adjusted)



Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics.

There is growing evidence that trade tensions and a global economic slowdown are beginning to affect U.S. manufacturing firms. The Institute for Supply Management's manufacturing index suggests that the U.S. manufacturing sector started to contract in August 2019. U.S. manufacturing employment growth has also slowed in recent months. So far, Kentucky's manufacturing firms still appear to be hiring. However, the global forces affecting national manufacturers will likely be felt by Kentucky manufacturers in the near future.

In spite of these headwinds, consumers still have a positive outlook for the economy. The University of Michigan's Consumer Sentiment Index fell in late summer and early fall of 2019 but remains high. A higher index suggests consumers have a better economic outlook. Going into the last recession, which began at the end of 2007, the index average approximately 86. The index averaged 96.9 in 2017 and 98.4 in 2018. For 2019, the index posted its highest level for the year, 100, in May; dropped briefly to 89.8 in August; and was at 96.8 in November. These recent changes suggest consumers are cautiously optimistic about the economy during the coming year.

Outlook

Both the national and state economies fared slightly better than anticipated in last year's CBER forecast. As projected, real GDP for the U.S. grew at 2.3 percent. While inflation was expected to exceed the Federal Reserve's two percent target slightly, so far inflation for 2019 has been muted, increasing by only 1.7 percent. Employment in both Kentucky and the nation grew slightly faster than projected. Kentucky's nonfarm employment grew at 1.2 percent in 2019, up from the 0.6 percent increases in 2017 and 2018. However, the nation's employment continued to grow faster (1.6 percent) than Kentucky's.

I anticipate that the U.S. and Kentucky economies will continue to grow in 2020, but at a slower pace. Growth in real GDP for the U.S. is likely to slow as uncertainty over trade policies causes businesses to postpone investments or alter their supply chains and increase production costs. I project that Kentucky's total nonfarm employment will grow by 0.8 percent in 2020. While U.S. manufacturing employment might contract slightly in 2020, I project Kentucky's manufacturing employment will change little from its 2019 level with a growth rate of 0.1 percent.

Although businesses are expected to add workers to their payrolls, unemployment rates are likely to increase. Over the past few years, unemployed workers were finding jobs more quickly than workers were entering the labor force. However, businesses increasingly report that they face challenges finding qualified workers. I expect that workers will continue to enter or return to the labor market, attracted by the improvements in the economy and higher wages. However, it might take longer for them to find work. This will push the state's unemployment rate up slightly to 4.5 percent.

While I do not anticipate a national recession in 2020, the risk that the current expansion could end in 2021 has increased. This risk is largely driven by uncertainty with the nation's international trade policy and slowing global economy. Should the trade war continue or escalate, businesses may further delay investments and consumers could lose confidence in the economy. Both of which would slow growth further and push the economy closer to a recession.

TABLE 1
Forecast for 2020

	2019 Forecast	2019 Actual or Best Available	2020 Forecast
Real GDP—US	2.3%	2.3%	2.1%
Inflation—US	2.2%	1.7%	2.2%
Unemployment Rate—US	3.9%	3.7%	3.6%
Unemployment Rate—Kentucky	4.2%	4.2%	4.5%
Nonfarm Employment Growth—US	1.5%	1.6%	0.9%
Nonfarm Employment Growth—Kentucky	1.0%	1.2%	0.8%
Manufacturing Employment—Kentucky	n.a.	1.5%	0.1%

Agriculture

POLICY AND MARKET UNCERTAINties are affecting the outlook for U.S. agriculture. The trade war has disrupted sales and exports for the agricultural sector, while wet weather and flooding have created other environmental challenges. Federal government payments to support farmers through the trade war, along with crop insurance indemnities, account for 31 percent of U.S. net farm income in 2019. According to agricultural economists at the University of Kentucky, "without government assistance, U.S. net farm income would have declined to 63.6 billion (-24.3%) in 2019."

The UK Department of Agricultural Economics is forecasting that Kentucky agricultural cash receipts will total $5.9 billion in 2019, matching the 2018 receipts; they expect receipts to be slightly higher in 2020, coming in at just over $6 billion. The agricultural sector accounts for about 1.3 percent of Kentucky's gross domestic product and has been steadily declining for the last several years. Even though its contribution to the state economy has been generally decreasing, the impact of agriculture in a local or regional economy can be significant.

Agricultural commodities and related activities can have an important economic impact, with studies of the equine and bourbon industries, for example, showing economic impacts in the billions of dollars. Kentucky's farm traditions have long yielded significant economic benefits to the state, but the development of more refined, downstream products that use these raw materials holds the promise

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of even greater returns. In fact, the growth of Kentucky's value-added food production has significantly outpaced the competitor states and the U.S. over the last ten years. Valued-added food production in Kentucky increased from $3.4 billion in 2007 to $5.6 billion in 2016 (in current dollars), representing a 63 percent increase—much higher than the U.S. and competitor states' gains. The continued development of the state's value-added food manufacturing sector will help provide jobs and income to Kentucky's rural communities.

While some form of agricultural enterprise is present in every Kentucky county, many rural communities are relatively more dependent on this industry for jobs and income. Several groups around the state are aspiring to create jobs and increase incomes in the agricultural sector. One strategy is to improve access to locally sourced food through the development of modern community-based farmer's markets. This is a promising strategy since farms that sell directly to consumers are more likely to stay in business. Ten years ago, there were 114 farmers' markets registered with the Kentucky Department of Agriculture, and now there are more than 160. Of Kentucky's nearly 76,000 farms, about 3,800 sell agricultural products directly to consumers, up from just over 3,400 in 2012.

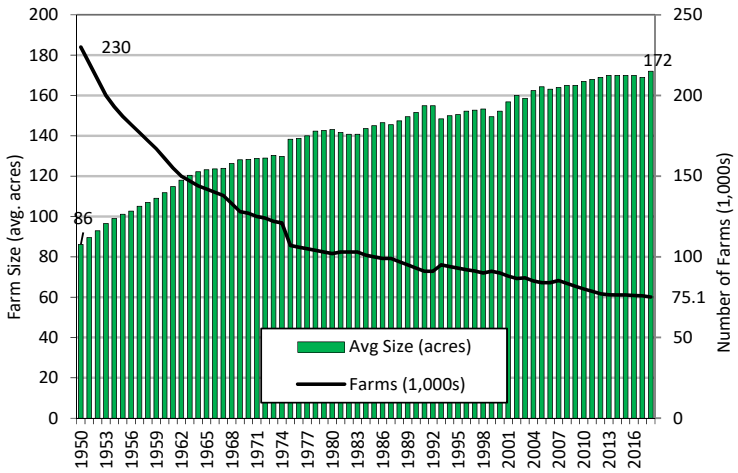
The past three decades have seen significant changes in Kentucky's agricultural profile. In 1990, tobacco was the state's signature commodity and constituted nearly a quarter of Kentucky's farm receipts (23.8%). By 2018, it had declined to 5.7 percent of Kentucky's total farm receipts. While tobacco's value has dropped precipitously, Kentucky's other major crops—corn, soybeans, and hay—have all shown considerable improvement. The most dramatic growth, however, has been poultry—now the state's top farm commodity. In 2018, poultry and eggs accounted for nearly 22 percent of the $6 billion in total farm receipts.

Some are hopeful that industrial hemp will become a significant farm commodity for Kentucky farmers in the future. While the potential economic impact of industrial hemp for Kentucky's economy is uncertain, its production has continued to grow. The Kentucky Department of Agriculture reports that the number of acres planted increased from 33 to 6,700 from 2014 to 2018. And with more than 70 processors adding value to hemp by turning it into various products, there is potential to leverage the plant into a much-needed source of income for individuals living in Kentucky's distressed communities. Kentucky's hemp crop was estimated at $58 million in 2018, up from $17 million in 2017. As the market for hemp products matures, industrial hemp could represent an important economic boost to Kentucky's rural communities. Currently, however, hemp's economic value is somewhat modest. Agricultural economists estimate that Kentucky farm-level hemp sales may total $55 to $65 million in 2019—which is about 1 percent of Kentucky agricultural cash receipts.

FARMS

The family farm has nearly become a quaint ghost of Kentucky's past. Over the last half century, two major trends have transformed the state's countryside: the consolidation of small, family-owned farms into larger enterprises; and the conversion of agricultural land to urban (or suburban) uses. As seen here, roughly one-third as many farms exist today as there were in 1950, while the average size of Kentucky's farms has doubled. Currently, there are approximately 75,100 farms in Kentucky with an average size of 172 acres. Most of the farms in Kentucky are owned by an individual or a family (91%), and 43 percent of Kentucky farmers spend at least 200 days a year off the farm working in other jobs.

Kentucky Farms and Average Farm Size, 1950 to 2018

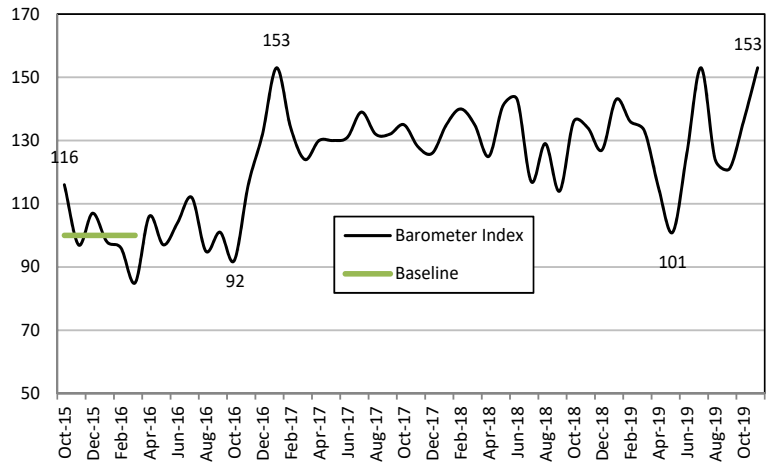


Source: Kentucky Department of Agriculture & USDA

Ag Economy Barometer

The *Ag Economy Barometer*, which is produced by Purdue University agricultural economists, is a survey based assessment of the national agricultural economy. It reflects the beliefs, attitudes, and sentiments of 400 U.S. agricultural producers who are asked five questions on a monthly survey: would you say that your operation today is financially better off, worse off, or about the same compared to a year ago?; do you think that a year from now your operation will be better off financially, worse off, or just about the same as now?; turning to the general agricultural economy as a whole, do you think that during the next twelve months there will be good times financially, or bad times?; which would you say is more likely, U.S. agriculture during the next five years will have widespread good times or widespread bad times?; and, thinking about large farm investments – like buildings and machinery — generally speaking, do you think now is a good time or bad time to buy such items? An overall score is calculated relative to the baseline period from October 2015 to March 2016, which is assigned a value of 100. Clearly, trade tariffs and their potential impact on the national agricultural economy has produced considerable volatility in the barometer over the past year. Nonetheless, the *Ag Economy Barometer* in November 2019 is at a higher level (153) than three years ago (116 in November 2016).

National Ag Economy Barometer, October 2015 to November 2019

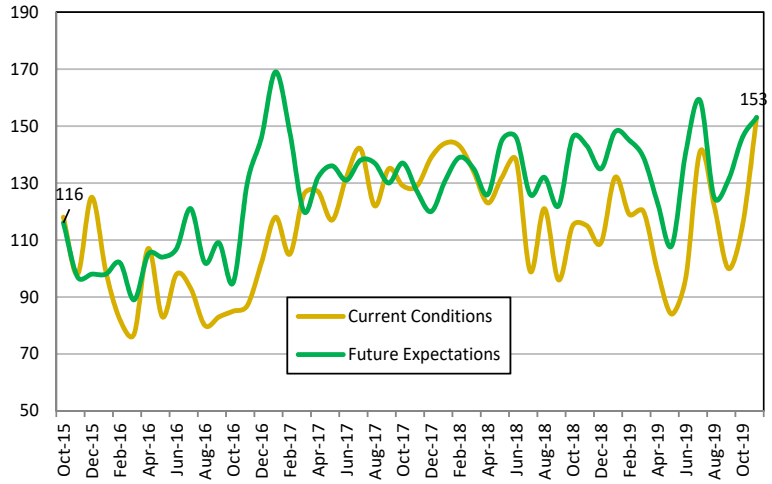


Source: Purdue University Center for Commerical Agriculture, Producer Survey, November 2019

Indices of Current Conditions & Future Expectations

As described on the facing page, the *Ag Economy Barometer* is a survey based assessment of the national agricultural economy. It reflects the collective expectations of 400 U.S. agricultural producers across the country. The *Ag Economy Barometer* can be disaggregated into current and future expectations, as illustrated in the graph below. At the beginning of the Trump Administration three years ago, the index of future expectations was "sky high" at 169. Then, the reality of what trade wars and tariffs mean for the agricultural economy fueled considerable volatility in these indices. Despite the uncertainty of trade policy and its impact on the agricultural economy, the index of current conditions is much higher now (153) than it was three years ago (87), as is the index of future expectations (153 compared to 130).

Indices of Current Conditions & Future Expectations, October 2015 to November 2019

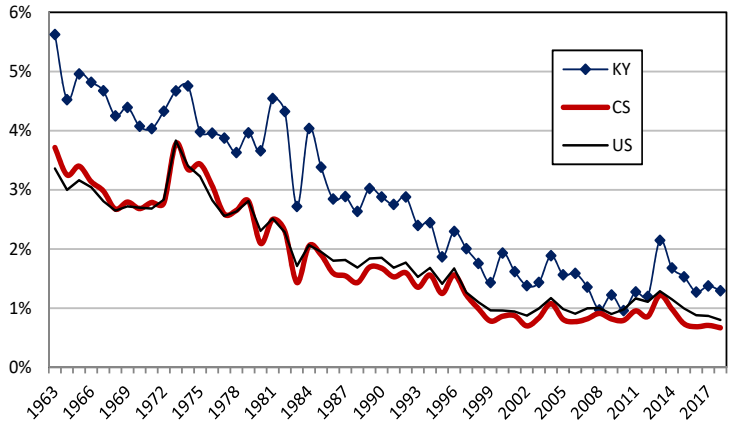


Source: Purdue University Center for Commerical Agriculture, Producer Survey, November 2019

Agriculture and GDP

While still playing an important role in some *local* and *regional* areas around the state, agriculture's role in the larger state economy has been declining for many years. Within the Agriculture, Forestry, Fishing, and Hunting sector, the Bureau of Economic Analysis (BEA) includes "establishments primarily engaged in growing crops, raising animals, harvesting timber, harvesting fish and other animals from a farm, ranch or their natural habitats." The BEA notes that "these establishments are often described as farms, ranches, dairies, greenhouses, nurseries, orchards or hatcheries...(and) the sector includes two basic activities: crop and animal production (farms) and forestry, fishing, and related activities." In 1963 agriculture accounted for about 5 percent of Kentucky's gross domestic product (GDP), compared to about three-and-a-half percent for the U.S. and competitor states. In 2018, this economic sector accounted for 1.3 percent of Kentucky's gross domestic product, compared to 0.8 percent in the U.S. and 0.7 percent in the competitor states. South Dakota has the highest percentage among the states with agriculture accounting for 5.9 percent of its gross domestic product while Connecticut has the lowest at 0.12 percent. Among the competitor states, Mississippi is the highest at 1.93 percent and Virginia the lowest at 0.3 percent.

Agriculture and Related Actvities in Kentucky, Competitor States, and the U.S., 1963 to 2018
(agriculture, forestry, fishing & hunting as a percentage of GDP)

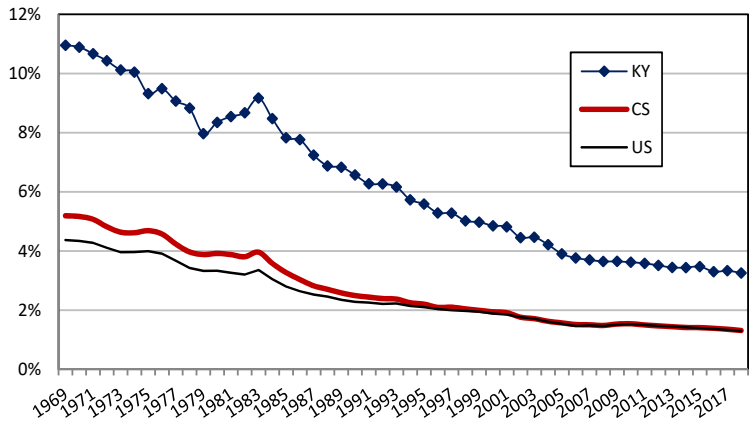


Source: U.S. Department of Commerce, Bureau of Economic Analysis

Farm Employment

Farm mechanization and a changing state economy have resulted in a steady decline in the percentage of Kentuckians working on the farm. Farm employment is the "number of workers engaged in the direct production of agricultural commodities, either livestock or crops; whether as a sole proprietor, partner, or hired laborer." The Bureau of Economic Analysis estimates Kentucky's farm employment at about 84,400, which is around 3.3 percent of total employment or jobs in the state. As one can see on the chart below, this is much higher than either the competitor states or the U.S., both of which are estimated at 1.35 percent. While Kentucky's farm employment is high compared to other states and the nation, it has decreased precipitously since the late 1960s when it was about 11 percent. Kentucky's farm employment has been under 4 percent since 2005 and has remained more or less stable since that time.

Farm Employment as a Percentage of Total Employment, Kentucky, Competitor States, and the U.S., 1969 to 2018
(percentage of total jobs, includes full- and part-time employment)

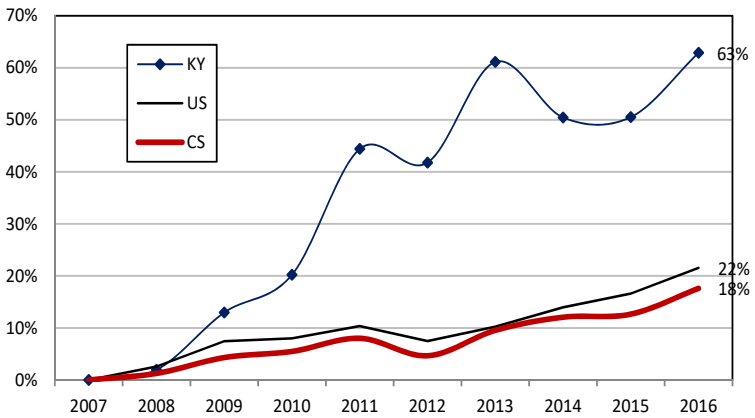


Source: U.S. Department of Commerce, Bureau of Economic Analysis

Value-Added Food Production

Kentucky's farm traditions have long yielded significant economic benefits to the state, but the continued development of more refined, downstream products that use these raw materials holds the promise of even greater returns. The idea of increasing agricultural-based incomes by developing value-added food production has been embedded in the Kentucky Department of Agriculture's strategic plans going back to the mid-1990s. Salsa, not tomatoes, is an example of a value-added food product that can enrich and sustain a farm economy. There are any number of value-added food products—from salsa to wine to jerky to jam—that provide opportunities to enrich individuals as well as communities and generate new economic opportunities that help sustain Kentucky's rural areas. The chart below illustrates how the growth of Kentucky's value-added food production has significantly outpaced the competitor states and the U.S. over the last ten years. Valued-added food production in Kentucky increased from $3.4 billion in 2007 to $5.6 billion in 2016 (in current dollars), representing a 63 percent increase. By comparison, the U.S. and competitor states value-added food production grew by 22 and 18 percent, respectively, over the same time period. The continued development of the state's value-added food manufacturing sector will help provided jobs and income to Kentucky's rural communities.

Value Added to Food Products, Kentucky, Competitor States, and the U.S., 2007 to 2016
(percentage change from 2007)



Source: U.S. Department of Commerce, Bureau of Economic Analysis

Farm Commodities

The past three decades have seen significant changes in Kentucky's agricultural profile. In 1990, tobacco was the state's signature commodity and constituted nearly a quarter of Kentucky's farm receipts (23.8%). By 2000, tobacco ranked second and accounted for 18.5 percent of farm receipts, and by 2018 it had declined to sixth and 5.7 percent of Kentucky's total farm receipts. While tobacco's value has dropped precipitously, Kentucky's other major crops—corn, soybeans, and hay—have all shown considerable improvement. The most dramatic growth, however, has been poultry—now the state's top farm commodity. In 1990, farm chickens, broilers (chickens raised for food), and chicken eggs constituted less than 1 percent of total farm receipts (0.82%). In 2018, poultry and eggs accounted for nearly 22 percent of the $6 billion in total farm receipts. The dramatic swings in receipts for Kentucky's various farm products underscores the necessity of agricultural diversity, so that farmers' fortunes do not rise and fall based on the market for a single commodity.

Kentucky's Leading Farm Commodities, 2018 (2019 constant dollars)

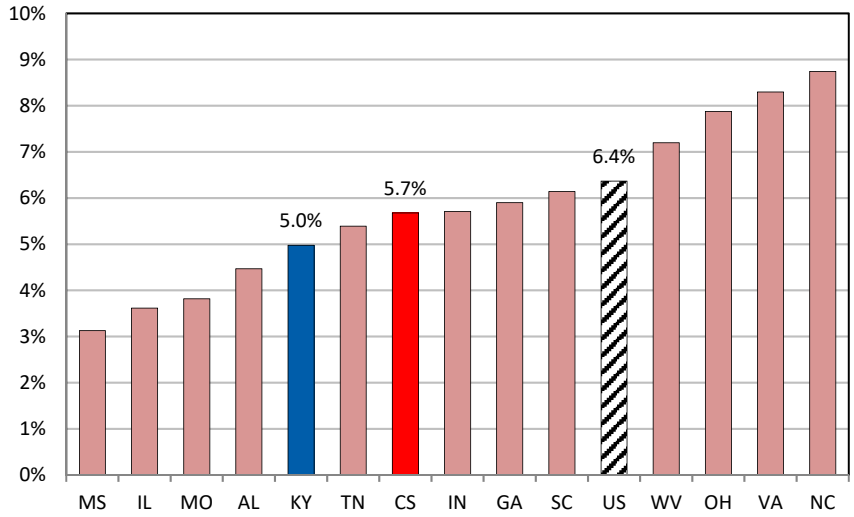
RANK	COMMODITY	VALUE OF RECEIPTS ($1,000s)
1	Poultry and eggs	1,301,940
2	Misc. animals and products	1,077,774
3	Feed crops	994,354
4	Oil crops	952,137
5	Meat animals	868,818
6	Tobacco	342,966
7	All other crops	186,538
8	Dairy products, Milk	178,459
9	Food grains	105,819
Total	All commodities	6,008,805

Source: USDA Economic Research Service.

Local Food Suppliers

Internationally, the "slow food" movement has grown exponentially, providing a boost to small farm profits in an era of industrialized agriculture and making fresher food, often organically grown, more readily available. Kentuckians are embracing the movement of foods grown closer to home, giving rise to an increasing number of bustling farmers' markets that have helped advance agricultural diversification and make healthy fare more readily available. Farms can sell directly to consumers through farmers' markets, on-site stores, online, and through a CSA, community-supported agriculture, which permit consumers to buy a portion of a farmer's output—fruits, vegetables, and other farm products delivered weekly—at the beginning of the growing season. Research shows that farms engaged in selling directly to consumers are more likely to stay in business. Ten years ago there were 114 farmers' markets registered with the Kentucky Department of Agriculture, and now there are more than 160. Of Kentucky's nearly 76,000 farms, about 3,800 sell agricultural products directly to consumers, up from just over 3,400 in 2012. This represents 5 percent of Kentucky farms, which is lower than the competitor states (5.7%) and the U.S. (6.4%). The New England states lead the nation in selling farm goods directly to consumers, evidenced by New Hampshire (28.9%), Vermont (26.9%), and Maine (26.9%).

Farms Selling Directly to Consumers, 2017
(percentage of all farms)

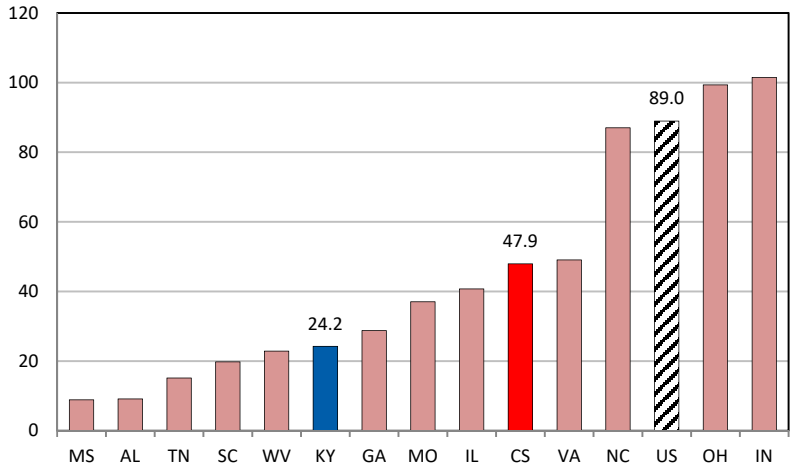


Source: 2017 Census of Agriculture
Note: CS is the weighted average of the competitor states.

ORGANIC FARMING

The outlook for organic products appears strong, as consumers continue to embrace organic and locally produced commodities. According to the U.S. Organic Trade Association (OTA), consumer demand for organic has grown by double-digits nearly every year since the 1990s, with sales increasing from $3.6 billion in 1997 to $50 billion in 2018. Citing 2016 Nielsen data, the OTA reports that 82 percent of U.S. households purchase organic products (78% in Kentucky). Nationally, the number of organically certified or exempt farms increased from 14,326 to 18,166 during the five-year period from 2012 to 2017, and sales of organically produced commodities increased by 133 percent, from $3.12 billion to $7.28 billion. While the value of sales (244% increase) and number of farms (114%) has increased in Kentucky during this time period, other states appear to be pursuing organic farming with greater enthusiasm. While Kentucky's network of small farms would seem to be an ideal place for the organic movement to flourish, the chart shows that—at least by this metric, the number of organic farms—Kentucky lags the U.S. and most competitor states. Kentucky has 24.2 organic farms per 10,000 total farms, compared to 47.9 for the competitor states and 89 for the U.S.

Certified or Exempt Organic Farms, 2017
(per 10,000 total farms)

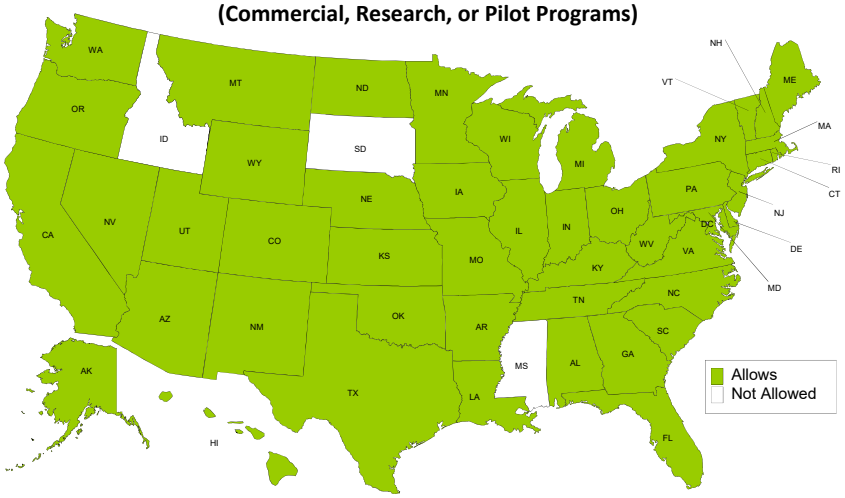


Source: USDA 2017 Census of Agriculture
Note: Although exempt operations (e.g., small producers) are not required to obtain organic certification in order to represent their products as "organic," they still need to comply with all USDA organic standards.

Hemp

The cultivation of hemp began near Danville in 1775, nearly two decades before statehood in 1792. Used for food, oil, rope, cloth, and paper, Kentucky was the largest hemp producer in the United States in the mid-19th century. The importance of industrial hemp for Kentucky's agricultural economy has waxed and waned through the years with changing federal laws. With the passage of the 2014 Farm Bill—that allows state departments of agriculture and universities to grow hemp for research or pilot programs—industrial hemp is clearly waxing. By August of 2019, 47 states had passed legislation allowing commercial, research, or pilot programs related to industrial hemp. While the potential economic impact of industrial hemp for Kentucky's economy is uncertain, its production has continued to grow. The Kentucky Department of Agriculture reports that the number of acres planted increased from 33 to 6,700 from 2014 to 2018. And with more than 70 processors adding value to hemp by turning it into various products, there is potential to leverage the plant into a much needed source of income for individuals living in Kentucky's distressed communities. Kentucky's hemp crop was estimated at $58 million in 2018, up from $17 million in 2017. As the market for hemp products matures, industrial hemp could represent an important economic boost to Kentucky's rural communities.

States Allowing the Cultivation of Industrial Hemp
(Commercial, Research, or Pilot Programs)



Source: National Conference of State Legislators (NCSL), as of August 2019

Community

AN ECONOMIC DIVIDE BETWEEN urban and rural America has been deepening for the last three and a half decades. Numerous social, demographic, health, and economic trends paint a picture of widespread community distress across wide swaths of the country. These trends are especially intense in Kentucky, since about 41 percent of Kentucky's population live in somewhat or mostly rural counties, compared to about 14 percent nationally. And while chasms deepen between geographic areas, the wider community remains tethered together—which ensures that distress in one area is felt in another.

In a study of the state's labor market recovery since the Great Recession, for example, Mercatus Center researchers at George Mason University found that "rural areas in Kentucky are recovering more slowly than Kentucky's metropolitan areas and therefore are dragging down overall private employment in the state."

While the fragility of rural communities reflects local trends and global forces that have been developing for several decades, the unfolding of their impact has intensified over the last decade. The Distressed Communities Index (DCI), developed by the Economic Innovation Group, measures the vitality of communities by drawing from educational, housing, and employment factors. Their insights include the following: since the Great Recession, population and prosperity have become more intertwined; community distress is more common in rural areas; fewer than a

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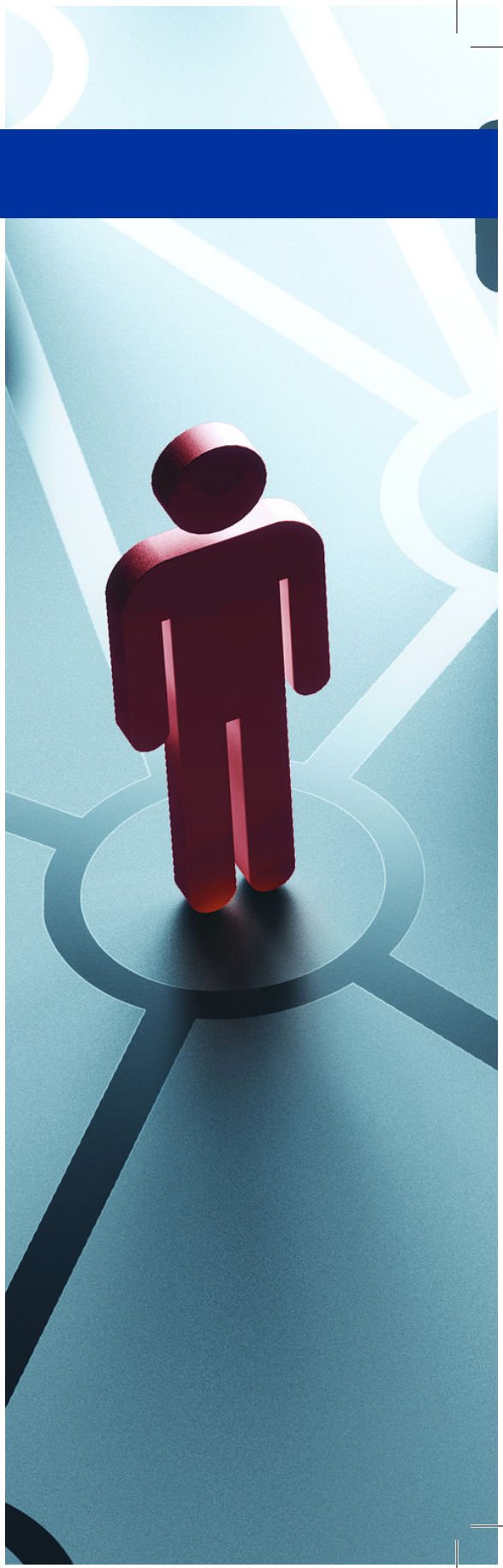

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quarter of the counties nationally have recovered from the business closures of the Great Recession; prosperity is increasingly focused in urban areas; prosperous communities tend to be more racially and ethnically diverse; and prosperous areas tend to have higher levels of educational attainment.

Community characteristics exert a strong influence on economic outcomes. Studies have long found that individual economic success is associated with neighborhood or community quality. Research published in 2015 by economists Raj Chetty and Nathaniel Hendren, *The Impacts of Neighborhoods on Intergenerational Mobility: Childhood Exposure Effects and County-Level Estimates*, concludes that the quality of a child's neighborhood can have a long-lasting effect into adulthood on college attendance, teenage birth rates, poverty status, and income. Based on related research from economist Eric Chyn published in 2016, the effect of a neighborhood on one's future economic well-being is even stronger than what Chetty and Hendren found.

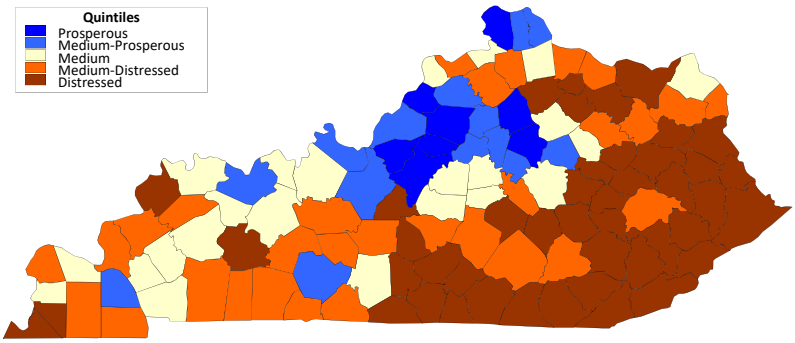
Concepts like community development and economic development are linked so tightly that the terms are frequently used interchangeably. Economic activities take place in our communities, so characteristics that measure community connections, strengths and weaknesses, and resiliency are vital for understanding economic conditions and future economic prospects. Having a strong and robust civil society has many benefits. As was noted in a report from the University of Kentucky Nonprofit Leadership Initiative, *More than Charity*, "Nonprofits provide access to the arts, protect the environment, feed the hungry, assist the disabled in finding meaningful employment, provide affordable mental health services, teach the illiterate to read, provide quality child care for working parents and hundreds of other services that strengthen our communities and enhance our quality of life."

Measuring a concept as amorphous as community strength and social capital is difficult. Nonetheless, except for the crime rate, Kentucky lags on many measures of community strength, including the number of hours volunteered, level of charitable giving, and number of nonprofits, lag behind the national average. The level of social capital is unevenly spread across Kentucky—as the map on page 23 reveals. Efforts to enhance social capital will likely take on renewed emphasis in the future as governments search out community-based organizations, non-profits, businesses, and citizens to forge partnerships in order to meet new and existing challenges facing our communities.

Distressed Community Index

Kentucky reflects the broad national trends identified by the Economic Innovation Group in its assessment of economic changes occurring in the wake of the Great Recession. Their insights include the following: population and prosperity have become more intertwined; community distress is more common in rural areas; fewer than a quarter of the counties nationally have recovered from the business closures of the Great Recession; prosperity is increasingly focused in urban areas; prosperous communities tend to be more racially and ethnically diverse; and prosperous areas tend to have higher levels of educational attainment. The Distressed Communities Index (DCI) was developed by the Economic Innovation Group as a tool for measuring the vitality of U.S. communities. Each county in the United States is assessed using seven factors: high school diploma attainment; housing vacancy rate; adults not working; poverty rate; median income; change in employment from 2011 to 2015; and the change in business establishments over the same time period. As the map below illustrates, counties with less diversity, lower education levels, higher poverty rates, and fewer economic opportunities are more likely to be categorized as "distressed" by this Index. These counties are concentrated in the state's rural areas, particularly in Eastern Kentucky, while the Urban Triangle tends to be more prosperous.

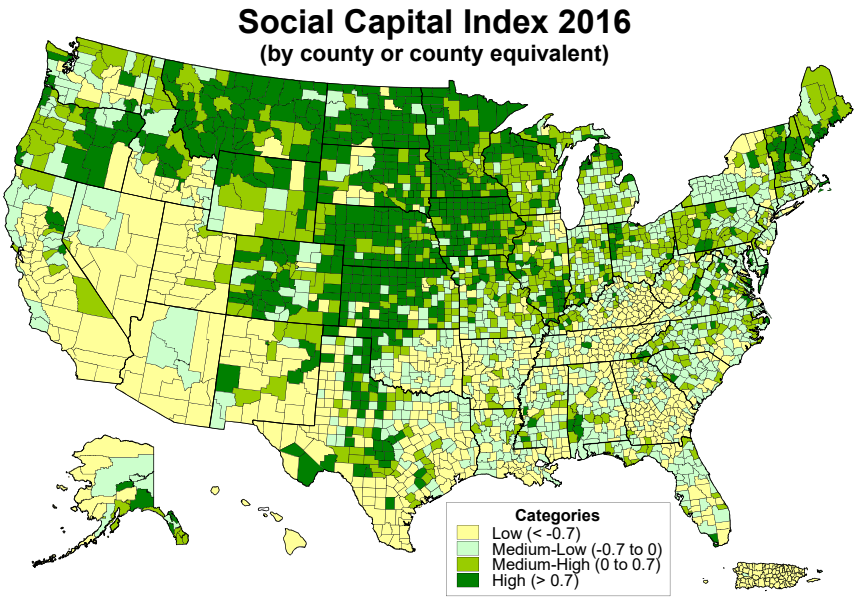
Distressed Communities Index by Kentucky County, 2017



Source: Distressed Communities Index (DCI), Economic Innovation Group, www.eig.org

Social Capital Index

Many influential scholars have advanced the idea that strong community structures are beneficial to economic health (e.g., James Coleman, 1990; Robert Putnam, 1993; Francis Fukuyama, 1995). We know that strong communities are important for several reasons, but the relationship between social capital—which the OECD defines as the "networks together with shared norms, values and understandings that facilitate co-operation within or among groups"—and economic growth is still being explored and studied. Pulling from the existing economic development literature, The World Bank notes that "development and growth specialists are uncovering the importance of social cohesion for societies to prosper economically and for development to be sustainable." Rupasingha, Goetz, and Freshwater (2000, 2006) operationalize the concept of social capital by using variables that include, but are not limited to, voting rates, the number of nonprofit organizations, and the presence of community-based membership organizations. Using the same method, we have produced updated county-level estimates—as shown in the map below. The darker areas of the map indicate denser networks of social connections while the lighter areas suggest lower levels of social capital. Kentucky is located in a region of the country where networks of social connections are less dense.

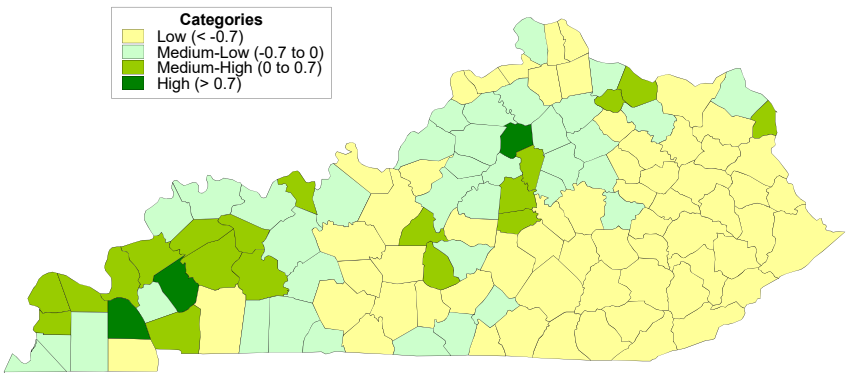


Source: Author's analysis of multiple data sources, various years (see Notes & Sources).

Social Capital Index

Strong, resilient, and vibrant communities are created and nurtured by engaged and connected citizens. The economic development literature linked to social capital suggests that areas with dense networks of citizens who are invested in their communities derive economic benefits. For example, Rupasingha, *et al.,* (2000, 2006) find that "social capital has a statistically significant, independent positive effect on the rate of per-capita income growth." These authors have developed an approach for constructing a county-level social capital index (see the facing page) which we have updated with more current data and present in the map below. These estimates reveal a relatively dense concentration of social capital in Western Kentucky (darker areas), but much less in Eastern Kentucky (lighter areas).

Social Capital in Kentucky, 2016

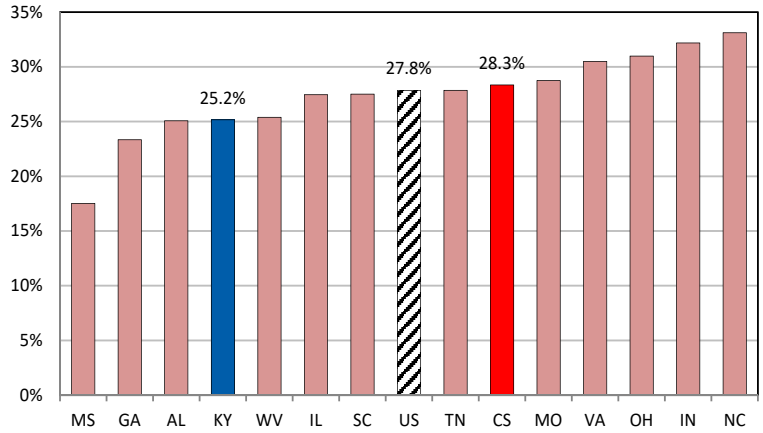


Source: Author's analysis of multiple data sources, various years (see Notes & Sources).

Volunteer Rate

Some studies have linked participation in civil society—volunteering for example—to higher levels of community prosperity, higher achievement in schools, and improved individual health. Volunteers can tackle problems such as poverty, illiteracy, and drug abuse that public or private sectors have not adequately addressed—making a community more attractive for economic development. Some research even suggests that members of communities with high levels of civic participation enjoy better health and live longer. An estimated 25.2 percent of Kentucky residents volunteered at some point in 2017; this is statistically no different from the U.S. (27.8%) or competitor states (28.3%) averages. Nationally, the highest volunteer rate belongs to Utah (47%), while the lowest is found in Mississippi (17.5%).

Residents Who Volunteer, 2017,
Kentucky, Competitor States, and the U.S.
(percentage of individuals 15 and older)

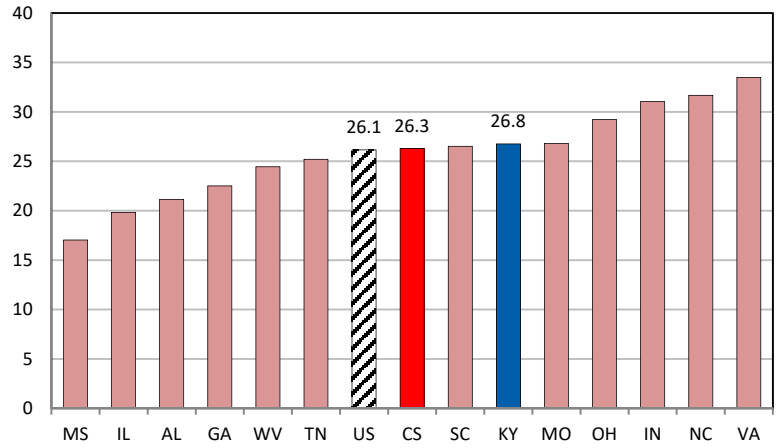


Source: Author's analysis of data from Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [dataset]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V6.0

Volunteer Hours

The Corporation for National and Community Service estimates that 978,627 Kentuckians contributed 96.6 million hours of volunteer service in 2017, with an estimated value of $2.3 billion. These numbers are significantly higher than the estimates of two years ago. Kentuckians contributed almost 27 hours per resident 15 years and older in 2017. The total annual estimated value of volunteer service in Kentucky is based on the Independent Sector's annual estimate of a volunteer hour in Kentucky at $21.17. The average number of volunteer hours in Kentucky (26.8) was about the same as the competitor states (26.3) and U.S. (26.1) averages. At 57.6 volunteer hours per resident 15 years old and older, Utah ranks first in the country (Mississippi is last with 17 hours). Volunteers, community groups, and nonprofit organizations add essential social and economic value to Kentucky's economy and society.

Volunteer Hours, 2017,
Kentucky, Competitor States, and the U.S.
(average hours served in a year, per resident 15 and older)

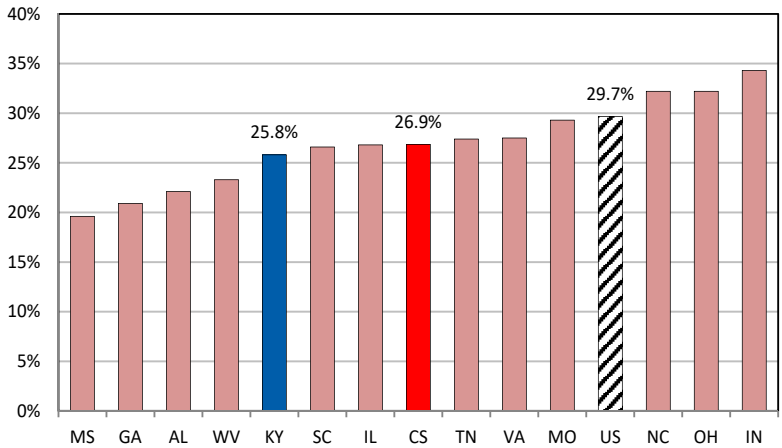


Source: Author's analysis of data from Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [dataset]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V6.0

Participation in Local Groups

As we noted in the social capital discussion, strong, resilient, and vibrant communities are created and nurtured by engaged and connected citizens. The economic development literature linked to social capital suggests that areas with dense networks of citizens who are invested in their communities derive economic benefits. Some measures of this include the presence of community-based membership organizations. These include establishments like religious, civic, social, business, political, professional, labor, and sports organizations. An estimated 25.8 percent of Kentucky residents participate in a local group or organization. This is slightly lower than the competitor state average (26.9%), and much lower than the U.S. average (29.7%). Nationally, the highest participation rate belongs to Oregon (43.1%), while the lowest is found in Florida (19.2%).

Participation in Local Groups or Organizations, 2017, Kentucky, Competitor States, and the U.S.

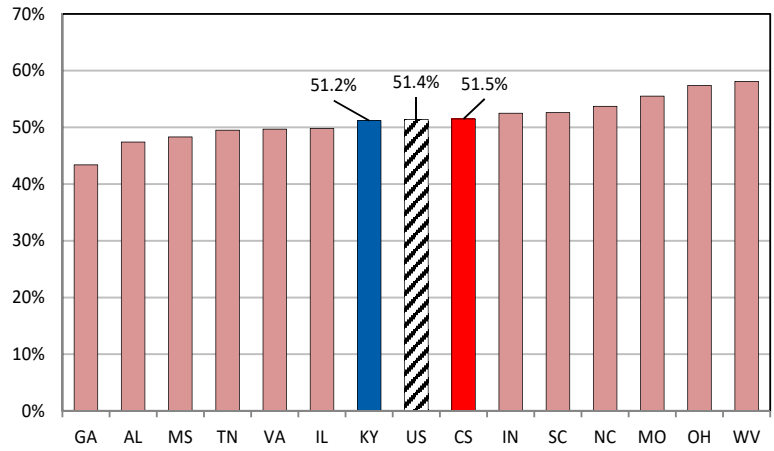


Source: https://www.nationalservice.gov

Favors for Neighbors

An indicator of community strength, social capital, and neighborhood cohesiveness is the extent to which neighbors do favors for each other. These favors include things like watching each others children, helping with shopping, house sitting, lending garden or house tools, and other small acts to lend a helping hand. About half of Americans do occasional favors for neighbors, with an estimated 51.4 percent indicating they do so with varying frequency. There are virtually no differences between Kentucky, the competitor state average, and the U.S. in the frequency with which neighbors do favors for each other. Nationally, the highest participation rate belongs to Utah (70.4%), while the lowest is found in Nevada (43.2%).

Residents Doing Favors for Neighbors, 2017, Kentucky, Competitor States, and the U.S.

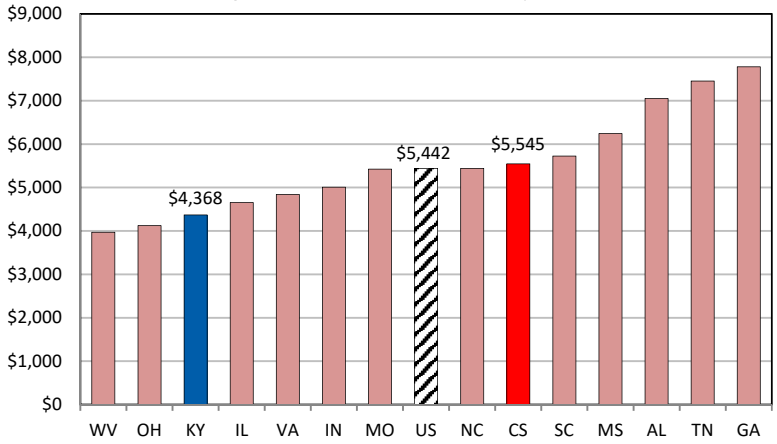


Source: https://www.nationalservice.gov

Charitable Contributions

America's giving spirit continued to rise in 2018 with giving by individuals, bequests, foundations, and corporations increasing by an estimated 4.3 percent according to *The Giving Institute*. At $292 billion, charitable giving by individuals in 2018 was equal to about 68 percent of the estimated total contributions from all sources, $428 billion. Nationally the average charitable contribution among those who itemize deductions—which is 30.9 percent of those who file an income tax return—equaled $5,442 for the 2017 tax year, compared to $4,368 in Kentucky. Among the competitor states, Georgia has the highest amount at $7,780 and West Virginia the lowest at $3,972. Nationally, Rhode Island is the lowest at $2,871 and Wyoming is the highest at $10,987. Obviously those who do not itemize deductions on their tax returns also make charitable contributions, but it is estimated that itemizers account for about 80 percent of all charitable contributions from individuals. Overall, *The Giving Institute* reports that in 2017 per capita giving by U.S. adults was $1,165, and average U.S. household giving was $2,271.

Charitable Contributions in 2017,
Kentucky, Competitor States, and the U.S.
(average contribution of itemizers, tax year 2017)

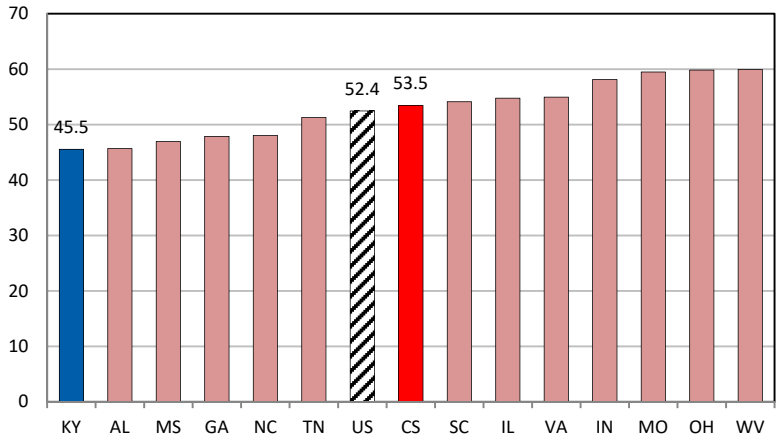


Source: Internal Revenue Service, Statistics of Income, Historical Table 2
Note: CS is the competitor state weighted average

NONPROFITS

Like the number of volunteers or the amount of money donated to charity, the number of nonprofits is an indicator of a community's social capital. The nearly 1.7 million nonprofits in the U.S. include social organizations (e.g., art, health, education, and advocacy groups), labor unions, business and professional organizations, and religious congregations. Nonprofits also have a direct economic impact. According to a 2019 report from the Urban Institute, *The Nonprofit Sector in Brief*, "The nonprofit sector contributed an estimated $985.4 billion to the US economy in 2015, composing 5.4 percent of the country's gross domestic product (GDP)." The average number of nonprofits per 10,000 population in the U.S. is 52.4, compared to Kentucky's 45.5. Among the competitor states, Kentucky has the fewest number of nonprofits per 10,000 population. At 60 per 10,000 population, West Virginia has the most among competitor states. Nationally, Montana has the highest number overall with 102.3 while Utah has the lowest at 33.1. As of October 2019, Kentucky had 20,350 registered nonprofit organizations with $30.2 billion in annual revenue and $54.6 billion in assets.

Registered Nonprofit Organizations, 2019, Kentucky, Competitor States, and the U.S.
(per 10,000 population)

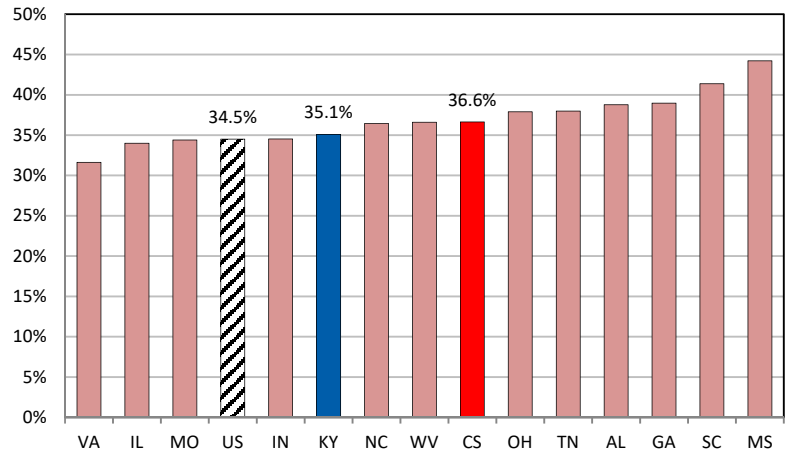


Source: Internal Revenue Service, Exempt Organizations Business Master File (2019, October) & U.S. Census, 2018
Note: CS is the weighted average of the competitor states

Children in Single-Parent Families

Recent research shows that intergenerational (economic) mobility can be muted by the constellation of factors associated with growing up in a single-parent family (Chetty, *et al*., 2014). In 1960, approximately 12 percent of children under 18 in the U.S. lived with only one parent; in 2018, however, over one third of this county's children lived in a single-parent family (34.5%). As a country we went from about one in ten children to over one in three—a substantial demographic shift. The research shows that children living in single-parent households tend to face more significant obstacles in life, which present emotional, health, economic and academic challenges for many of these children. And there can be lifelong economic consequences. As Raj Chetty and his colleagues have noted, "the United States is better described as a collection of societies, some of which are 'lands of opportunity' with high rates of mobility across generations, and others in which few children escape poverty." Nationally, Louisiana has the highest rate of children living in single-parent families at 45.6 percent and Utah has the lowest rate at 19.3 percent. Both the Kentucky and competitor state percentages are around 35 to 37 percent, which is similar to the U.S. average.

Children in Single-Parent Families, 2018, Kentucky, Competitor States, and the U.S.
(percent of children under 18)



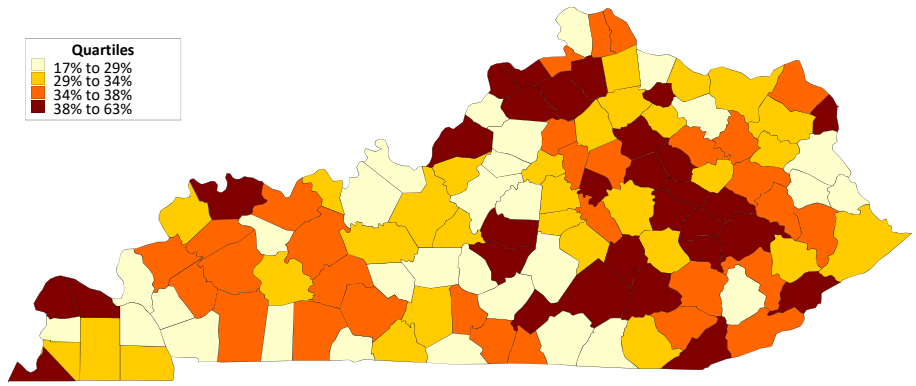
Source: Census Bureau, 1-year estimate, 2018, Table B23008

Children in Single-Parent Families by County

As noted on the facing page, an estimated 35.1 percent of children in Kentucky live in single-parent families. Yet, there is wide variation among Kentucky counties, bounded by Oldham County at 17 percent and Fulton County at 62 percent. Some have written that America has become two nations—not divided by class so much as by whether one comes from a single- or two-parent household. As James Q. Wilson, the eminent political scientist asserted two decades ago: *Children in one-parent families, compared to those in two-parent ones, are twice as likely to drop out of school. Boys in one-parent families are much more likely than those in two-parent ones to be both out of school and out of work. Girls in one-parent families are twice as likely as those in two-parent ones to have an out-of-wedlock birth. These differences are not explained by income....children raised in single-parent homes [are] more likely to be suspended from school, to have emotional problems, and to behave badly.* Of course, one's family environment does not determine one's future, but it can create significant obstacles for children that last into adulthood, with clear implications for the state's economy.

Children in Single-Parent Families, by Kentucky County, 2014-2018

(percent of children under 18 years old)



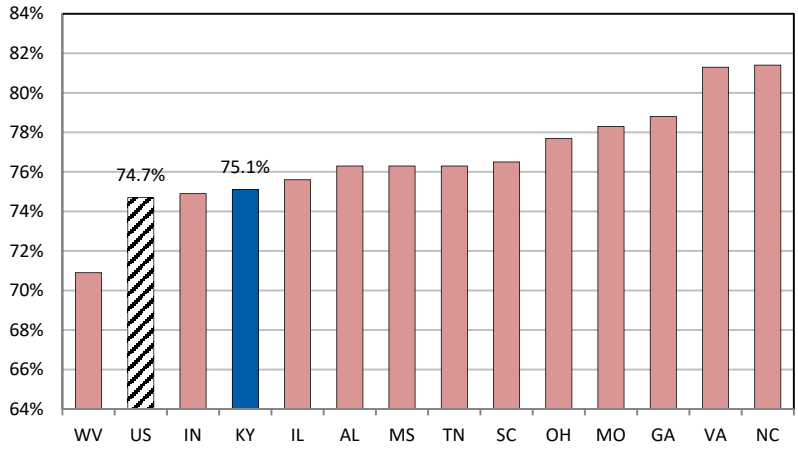
Source: American Community Survey, 2018 5-Year Estimate, Table B23008

Neighborhood Quality

The incidence of crime is one way to measure the quality of a neighborhood. Other factors that detract from neighborhood quality include graffiti, dilapidated housing, and litter. To gauge the quality of neighborhoods in which children live, the National Survey of Children's Health posed several questions to survey respondents, including "In your neighborhood, is there litter or garbage on the street or sidewalk?," "Does the neighborhood contain poorly kept or dilapidated housing?," and "In your neighborhood is there vandalism such as broken windows or graffiti?" The numbers in the chart below are estimates of the percentage of children living in neighborhoods where none of these three detracting elements are present. Kentucky's percentage (75.1%) is not statistically different from the U.S. percentage (74.7%) or any of the competitor states. Minnesota has the highest value among the states (83.2%) and New York the lowest (61.1%).

Children Living in Neighborhoods Without Detracting Elements, KY, Competitor States, and the U.S., 2016-2017

(percent living in areas with no graffiti, dilapidated housing, or litter)

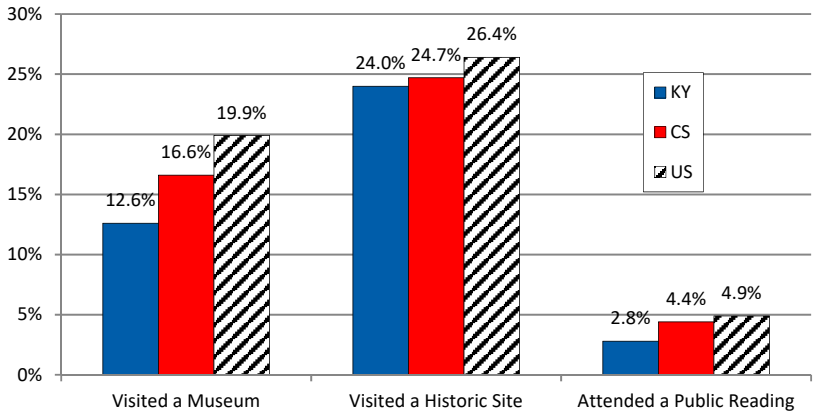


Source: 2016-2017 National Survey of Children's Health

PUBLIC PARTICIPATION IN THE ARTS

A thriving local culture represents a cornerstone of quality of life, allowing citizens to enrich and educate themselves by experiencing the arts and learning about history. Cultural amenities can constitute an integral role in site selection decisions, evidenced by the list of factors Amazon will consider in the siting of its second headquarters. The so-called "creative class" places a premium on living in locations that offer enriching and compelling lifestyles. From music to museums, the arts matter. The chart below shows three items included in the Survey of Public Participation in the Arts that offer insight about the availability of the arts and whether individuals participate in them. They are: whether one has visited an art museum or gallery during the last 12 months; whether one has visited a historic park or monument, toured buildings or neighborhoods for historic or design value during the last 12 months; and whether one has attended a live book reading or a poetry or storytelling event during the last 12 months. Kentucky is statistically lower than the competitor states and the U.S. on museum visitation and public readings, but statistically no different on historic site visitation. As the competitive pressures of a highly skilled global workforce rise, it becomes increasingly important for the Commonwealth to cultivate an environment that will help to attract a creative and entrepreneurial labor force.

Public Participation in the Arts, 2012-2015
Kentucky, Competitor States, and the U.S.
(percent participating in previous 12 months)

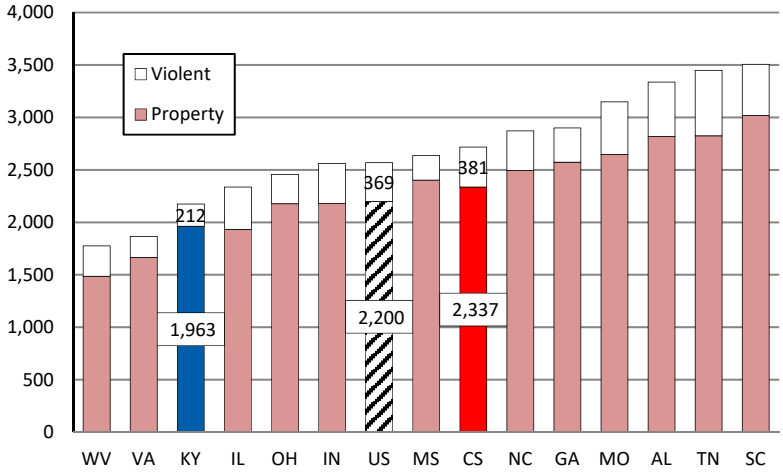


Source: Authors' analysis of data from Sarah Flood, Miriam King, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 5.0 [CPS Public Art Supplement]. Minneapolis, MN: University of Minnesota, 2017. https://doi.org/10.18128/D030.V5.0

CRIME RATE

According to the FBI *2018 Uniform Crime Report*, the violent crime rate fell 3.3 percent when compared with the 2017 rate; the property crime rate declined 6.3 percent—the sixteenth consecutive year the property crime rate estimates have declined. In the U.S. overall, the estimated rate of violent crime was 369 offenses per 100,000 inhabitants, and the property crime rate was 2,200 offenses per 100,000 inhabitants. The number of reported property crimes per 100,000 persons in Kentucky is 1,963, a rate lower than all competitor states except for Virginia, West Virginia, and Illinois. Reports of violent offenses, including murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault, also were well below the national rate here and below the rates reported by eleven of twelve competitor states (Virginia's rate is lower). Kentucky's comparatively low crime rate remains a strong asset that contributes to a sense of well-being and trust which, in turn, helps create caring places that nurture productive lives.

Crime Rate,
Kentucky, Competitor States, and the U.S., 2018
(rate per 100,000 persons)



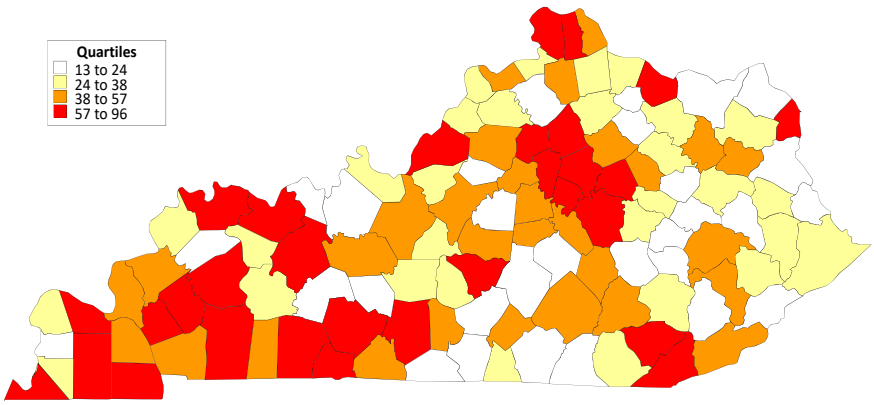
Source: US Federal Bureau of Investigation, 2018 Crime in the United States

Criminal Offense Rate by County

Any discussion of community would be incomplete without consideration of the role of crime, which can instill fear, undermine trust, and fray connections—and impact economic development decisions and outcomes. Around 80 percent of Group A offenses in Kentucky fall into one of five categories: larceny/theft (26%), drug/narcotic (25%), assault (15%), burglary/breaking and entering (7%), and destruction/damage/vandalism of property (8%). Group A offenses are serious crimes that include the categories listed above as well as arson, homicide, and sex offenses. The total number of Group A offenses increased by only 0.8 percent from 2016 to 2017, but then decreased by 2.3 percent from 2017 to 2018. Perhaps it is no surprise that Kentucky's metro areas have the highest rates of serious crime, but rural areas of the state are certainly not immune to the same types of serious criminal offenses taking place in the largest cities. This map shows the number serious criminal offenses (Group-A) per 1,000 population at the county level. At a rate of 13.4, Breckinridge County has the lowest rate of Group-A offenses per 1,000 population in the state while Daviess has the highest at 95.2. By comparison, Kentucky's overall rate is 61.8. The rate for Kentucky's 35 urban counties is 71.1, which is higher, of course, than the rate for slightly rural (58.1) or mostly rural (40.3) counties.

Kentucky Criminal Offense Rates by County, 2018

(Group-A Offenses per 1,000 Population)

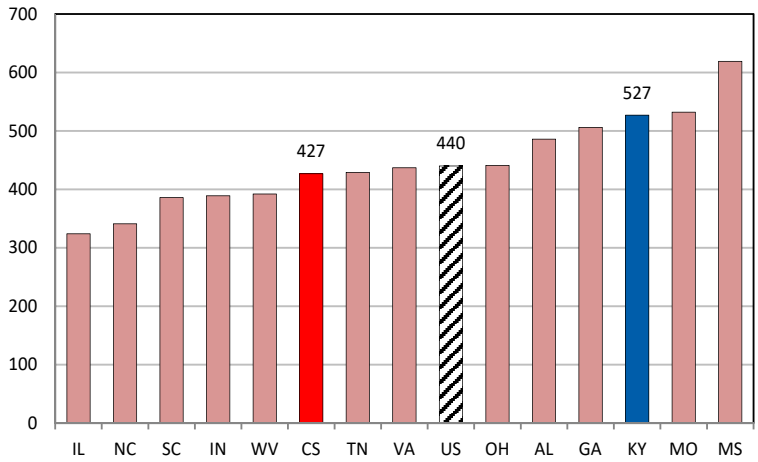


Note: Author's calculations from Kentucky State Police, Crime in Kentucky, 2018

Incarceration Rate

Incarceration rates are windows through which one can assess the nature, quality, and character of a community. According to a April 2019 report from the U.S. Department of Justice, *Prisoners in 2017*, the United States had an estimated 1,489,363 prisoners under the jurisdiction of state and federal correctional authorities as of December 31, 2017. This is equivalent to 440 prisoners per 100,000 population. Kentucky's rate, by comparison, was somewhat higher at 527. The state with the highest incarceration rate in 2017 was Louisiana (719), while Massachusetts was the lowest (120). As one can see in the chart below, Kentucky's incarceration rate is toward the high end when comparing it to the nearby states. Indeed, it is 23 percent higher than the competitor state average (427). Kentucky's prison population steadily increased from 3,588 in 1980 to 21,823 in 2007. It declined, however, to 20,330 by 2013. Unfortunately, fueled by the opioid epidemic, it has started to trend upward again and was just over 23,540 in 2017.

Prison Incarceration Rate, 2017,
Kentucky, Competitor States, and the U.S.
(per 100,000 population)

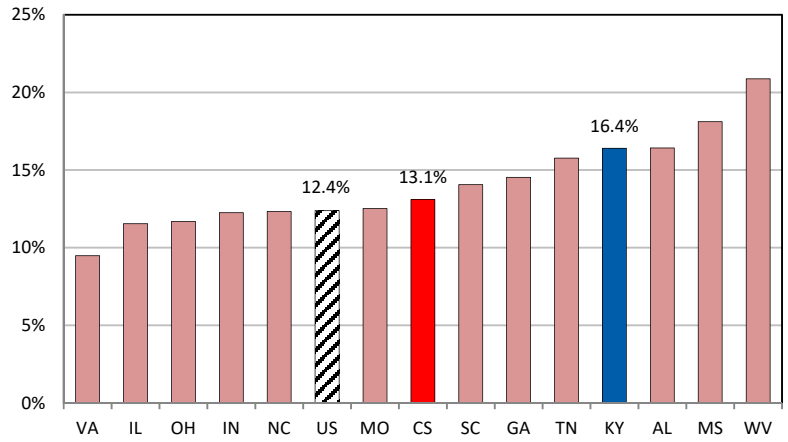


Source: U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics, Prisoners in 2017

Disconnected Young Adults

Strong, resilient, and vibrant communities are created and nurtured by actively engaged, invested, and connected citizens. The figure below shows the percentage of young adults (18 to 24 years old) who are "disconnected." These young adults are *not* enrolled in school, are *not* currently employed, and have *no* degree beyond a high school diploma or GED. Collectively these factors could indicate that a young person is having difficulty making a successful transition to adulthood. Kentucky's 16.4 percent is not statistically different (using a 95% confidence interval) from Tennessee, Georgia, Alabama, or Mississippi. However, Kentucky is statistically higher than the competitor state (13.1%) and U.S. (12.4%) averages, as well as most of the remaining competitor states (i.e., VA, IL, OH, IN, NC, MO & SC). West Virginia's 20.9 percent is the second highest in the country, and statistically higher than Kentucky's. Alaska has the highest percentage of disconnected young adults at 21.6 percent, and North Dakota has the lowest percentage at 5.5 percent. Among all states and the District of Columbia, 3 are higher, 38 are lower, and 9 are statically the same as Kentucky.

Disconnected Young Adults, 2018,
Kentucky, Competitor States, and the U.S.
(percent of young adults, 18 to 24 years old)



Source: Estimated by the author using data from 2018 1-Year U.S. Census ACS PUMS

Economy

IN THE 18-MONTH PERIOD FROM December 2007 to June 2009—the peak of the last economic expansion to the trough of the Great Recession—Kentucky lost over 103,000 jobs or about 6.7 percent of its total. This was not, however, the low point for job losses. Kentucky, along with the rest of the nation, continued to shed jobs for another 8 months and finally reached the low point in February 2010. By this time, the state had lost 120,900 jobs, down 7.8 percent—and the state's unemployment rate was over 10 percent. Digging out of the recession was slow going, taking until November 2014 to reach the same level of employment it had in December 2007.

Currently, the unemployment rate is hovering at historic lows (4.3% in Kentucky, 3.6% in the U.S.), inflation is muted at about 2 percent, and average weekly wages increased in the state by 3.3 percent from 2018 (Q2) to 2019 (Q2). Census data released in 2019 show that Kentucky's median household income increased by 3.9 percent to $50,250 from the previous year, evidence of an improving economy. The Commonwealth's economy appears reasonably strong by most measures. The current economic expansion has shown significant resilience and is now the longest U.S. expansion in history—124 months as of November 2019.

Despite this relatively good news, growing uncertainty over U.S. trade policies, slowing global economic growth, and a slowing manufacturing sector temper expectations for 2020. Kentucky continues to trail behind the U.S. and

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competitor states' per capita and median household income levels. Moreover, the growth rates in private wages and employment, from the peak of the last economic expansion in 2007 to the present, have been uneven across the state. While the urban triangle region has enjoyed strong, private sector wage and employment growth during this period, Eastern Kentucky has experienced tepid growth in wages and a decline in employment.

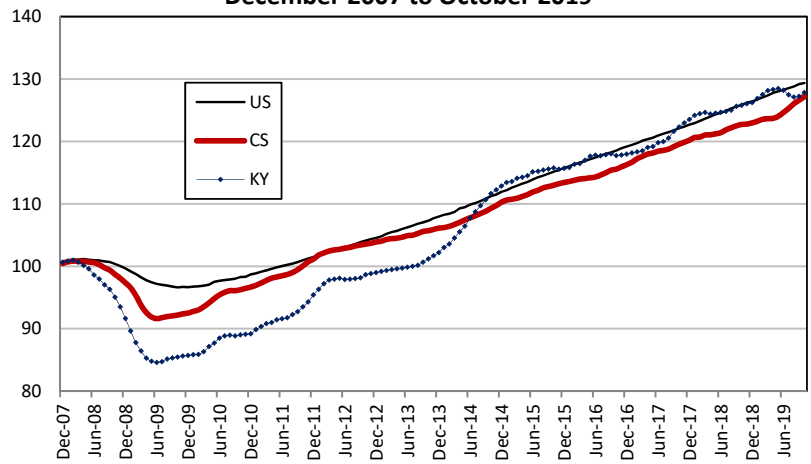
In this section, we refocus the lens on the wider economic landscape and present data on a broader collection of economic indicators. We describe how Kentucky's economy has gradually changed, such as the movement away from goods-production and toward service-providing—something that has important implications for tax policy in Kentucky. We also present data on the extensive and continuing reliance on transfer payments—especially in Kentucky's 60 mostly rural counties, the importance of international trade and foreign direct investment, and the broadening disparity in wages between urban and rural regions.

Indeed, as noted by the Economic Innovation Group in its October 2018 report, *From Great Recession to Great Reshuffling: Charting a Decade of Change Across American Communities*, there have been "deeply divergent experiences of the recovery." Overall, they have observed that "urban areas are ascendant, rural areas are in flux, and suburbs retain their out-sized claim on the map of U.S. prosperity." The national trends they describe are on full display in Kentucky. Creating abundant high-paying jobs in Kentucky's rural areas has been, and continues to be, a challenge for policymakers, economic development professionals, and civic leaders.

COINCIDENT INDEX

The Coincident Index (CI), which was developed by economists at the Federal Reserve Bank of Philadelphia, combines four state-level economic indicators into a single statistic summarizing a state's *current* economic conditions. The four economic indicators are: nonfarm payroll employment; average hours worked in manufacturing by production workers; the unemployment rate; and wage and salary disbursements. The chart below begins in December 2007—the peak of the last economic expansion. The trough of the Great Recession was in June 2009, and one can see that Kentucky was hit harder by the recession than competitor states and the nation overall, evidenced by its lower Coincident Index value. More recently Kentucky's economic activity, as measured by the Coincident Index, increased 5.9 percent over the 12-month period from October 2018 to October 2019, which is a higher percentage change than the competitor states median (2.4%) and the U.S. (3.9%). Among all the states, Michigan's year-over-year percentage change during this period was -0.7 percent—the lowest of any state—while California had the largest (9.6%). The bottom line is this: since the peak of the last economic expansion, Kentucky has made up considerable economic ground, and has more or less kept pace with the competitor state CI median value since 2014.

Coincident Index,
Kentucky, Competitor States, and the U.S.,
December 2007 to October 2019

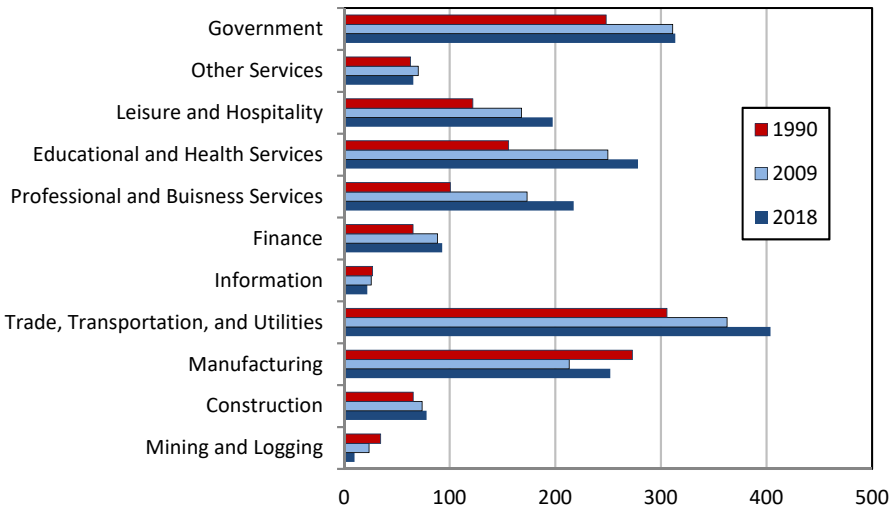


Source: Federal Reserve Bank of Philadelphia
Note: CS is the median value of the twelve competitor states.

EMPLOYMENT BY SECTOR

Kentucky's economy has changed since 1990. There were, for example, about 471,500 more people employed in 2018 compared to 1990—an increase of 33 percent. And, the state gained 172,000 jobs from the trough of the Great Recession in 2009 to 2018—an increase of 9.8 percent. Moreover, the distribution of employment among the eleven major economic sectors has changed significantly—reflecting the fundamental forces impacting all states. Focusing on the period between 2009 and 2018, the mining and logging sector lost 13,600 jobs (a 58% decline). Conversely, five sectors experienced double-digit percentage increases during this time period: professional and business services (44,100 more jobs for an increase of 25%); leisure and hospitality (29,600 more jobs—18% increase); manufacturing (39,000 more jobs—18% increase); trade, transportation, and utilities (41,200 more jobs—11% increase); and Educational and Health Services (28,600 more jobs—11% increase). Kentucky's manufacturing sector exhibits the most interesting pattern over these three time periods. It is the only sector to experience a decline from 1990 to 2009, and then an upturn from 2009 to 2018. With the addition of 20,500 manufacturing jobs since 2009, Louisville accounts for just over half of the statewide increase of 39,000 jobs.

Kentucky Employment by Major Economic Sectors, 1990, 2009 & 2018

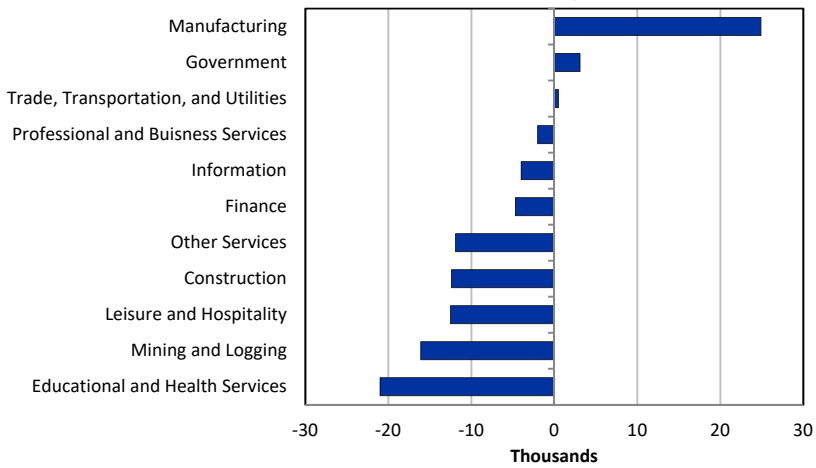


Source: U.S. Department of Labor, Bureau of Labor Statistics

REGIONAL EMPLOYMENT SHIFT

The graph below shows Kentucky's regional competitive effect from a shift-share analysis. A shift-share analysis is one way to identify broad economic sectors that are particularly strong, or weak, in a state or regional economy. This type of analysis takes into account broad national employment trends, as well as trends within an industry, to determine the degree to which state or regional factors change employment. It can be used to identify a state's leading, or lagging, economic sectors. A state's leading economic sector is one that outperforms the same sector at the national level. Here we examine the period from June 2009, the trough of the Great Recession, to the present (June 2019). How then, did Kentucky's major economic sectors perform relative to their national counterparts during this period? Kentucky's manufacturing sector outperformed the national manufacturing sector during this ten-year economic expansion. Conversely, given the job losses in the coal industry, it is no surprise that Kentucky's mining and logging sector is "lagging." However, it might be somewhat surprising that the economic sector lagging the most is educational and health services. This might seem counter-intuitive since the sector grew just over 15 percent during this period, but had it grown at the same pace as the national level, which was nearly 24 percent, there would be roughly 21,000 more jobs here.

Employment Changes, June 2009 to June 2019,
Kentucky Specific Regional Shift
(based on a shift-share analysis)

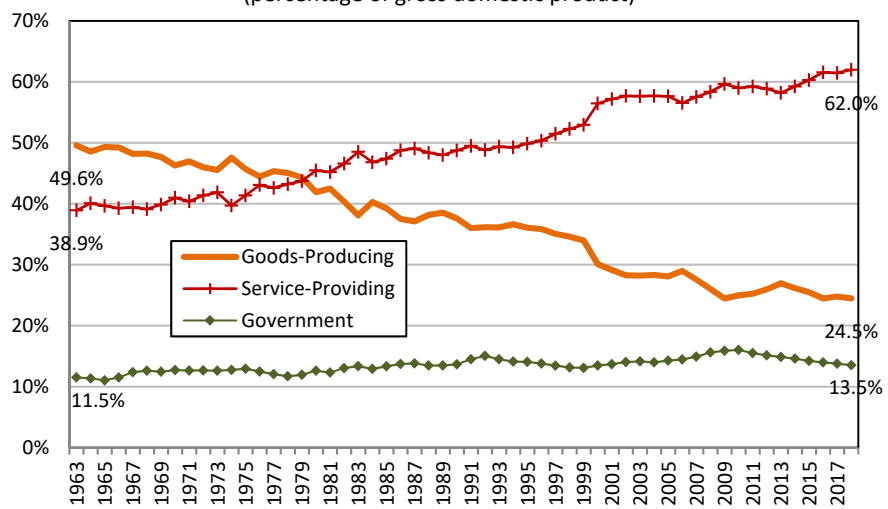


Source: Estimated by the author using data from the U.S. Bureau of Labor Statistics (BLS), all employees, not seasonally adjusted

Transition from Goods to Services: GDP

Economic activity in Kentucky has been changing for the last several decades. Specifically, economic activity has been shifting away from the production of goods and toward the provision of services. These data illustrate in this figure the major sectors in Kentucky's economy as components of the total state gross domestic product (GDP). In the early 1960s, services accounted for about 40 percent of Kentucky's economic output and goods amounted to about 50 percent. However, around 1980 the provision of services contributed more to the state's economy than the production of tangible goods. Currently, services account for 62 percent of Kentucky's economy while goods amount to 24.5 percent. Government has increased as a percentage of the economy during this time period too, growing from 11.5 to 13.5 percent. Changes in consumption patterns have followed a similar trajectory. As the state's economy and consumption tilt away from goods and toward services, the sales and use tax base has slowly diminished. This is because most services have not been subject to the sales tax. The result has been a gradual reduction in the elasticity of the sales and use tax. However, the tax law was changed in the 2018 session of the Kentucky General Assembly and several services are now required to collect sales tax, including automobile repair to pet grooming.

Goods, Services, and Government,
Kentucky Gross Domestic Product, 1963-2018
(percentage of gross domestic product)

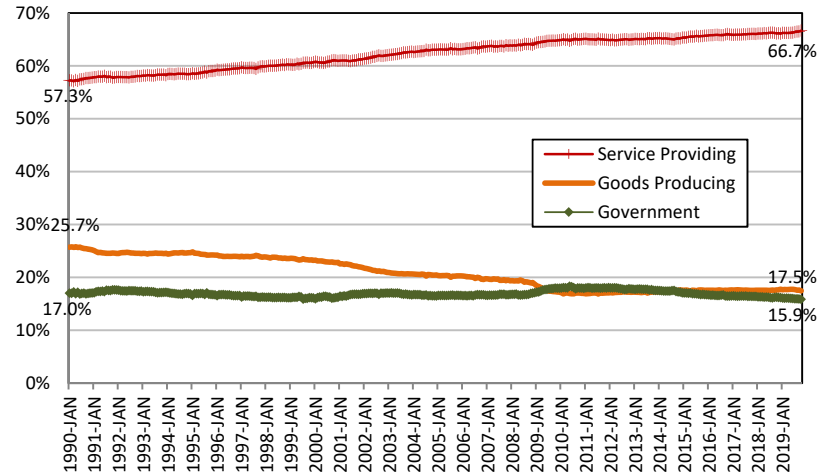


Source: Bureau of Economic Analysis

TRANSITION FROM GOODS TO SERVICES: EMPLOYMENT

Similar to the changing distribution of Kentucky's gross domestic product (see the preceding page), employment has been shifting away from the production of goods and toward the provision of services. These data illustrate the distribution of total nonfarm employment from January 1990 to October 2019; total nonfarm employment represents the total number of paid workers, and excludes those who work in general government, private households, nonprofit organizations serving individuals, and farms. A growing percentage of Kentuckians are working in service-providing industries (i.e., trade, transportation, and utilities; information; financial activities; professional and business services; education and health services; leisure and hospitality; other services), while the number working in the goods-producing industries (i.e., manufacturing, construction, and natural resources and mining) is shrinking. An estimated 66.7 percent were employed in service-providing industries, 17.5 percent in goods-producing industries, and about 15.9 percent worked in government. This trend does not bode well for Kentucky wage earners since, on average in 2018, weekly wages in Kentucky's private service-providing sector are lower ($732) than wages in the goods-producing sector ($941).

Kentucky Employment,
Goods, Services, and Government, 1990-2019
(percentage of total nonfarm employement)

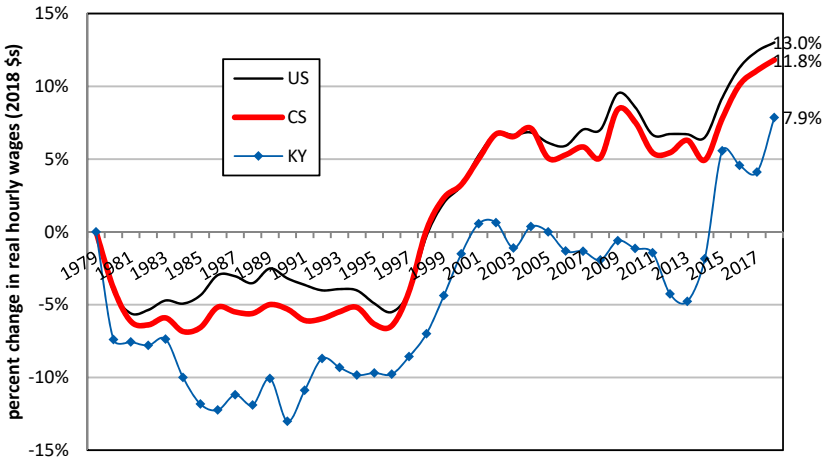


Source: Bureau of Labor Statistics, seasonally adjusted estimates (January 1990 to October 2019)

HOURLY WAGES

While the bar chart on hourly wages in the Economic Security Section examines the change in *median* hourly wages, this line chart shows the percentage change in real *average* hourly wages from 1979 to 2018 in Kentucky, the competitor states, and the U.S. The average real hourly wage in Kentucky, compared to 1979, has been lower or unchanged for most of this time period except for the last few years when average real hourly wage growth moved up to 7.9 percent; real wages reflect changes after inflation has been taken into account. Kentucky's real increase of nearly 8 percent is lower than the increases experienced by the competitor states and the U.S., which show 11.8 and 13.0 percentage increases, respectively. A major reason for Kentucky's slower real hourly wage growth is the state's lower average educational attainment rates. Continuing to invest in the state's human capital, which will help to attract, retain, and create more high-paying jobs, will ensure that wages in Kentucky are more in line with those from competitor states and the U.S. overall.

Cumulative Change in Average Real Hourly Wages, 1979 to 2018, Kentucky, Competitor States and the U.S.

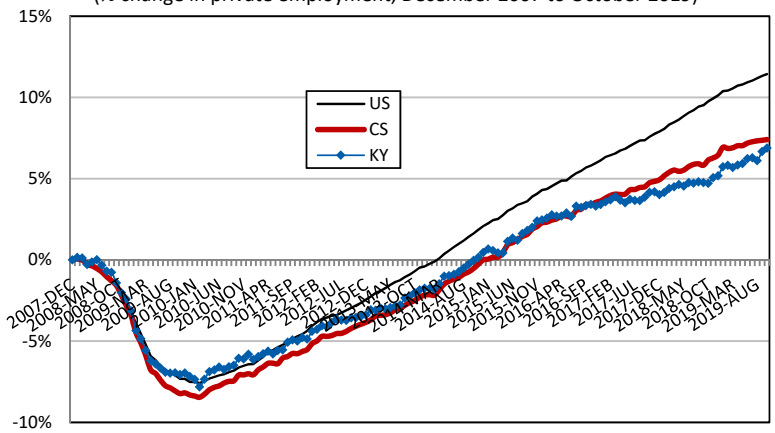


Source: Author's analysis of CPS Outgoing Rotation Group (ORG) data using files created by the Center for Economic Policy Research (CEPR), available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/.

JOB GROWTH

In the 18-month period from December 2007 to June 2009—the peak of the last economic expansion to the trough of the Great Recession—Kentucky lost over 103,000 (seasonally adjusted) jobs or about 6.7 percent of its total. By comparison, the U.S. job total was down 6.5 percent and the competitor states lost 7.4 percent. This was not, however, the low point for job losses. Kentucky, along with the rest of the nation, continued to shed jobs for another 8 months and finally reached the low point in February 2010. By this time, the state had lost 120,900 jobs, down 7.8 percent, compared to 8.5 percent in the competitor states and 7.6 percent nationally. Digging out of the recession has been slow, taking nearly seven years until November 2014 to reach the same level of employment it had in December 2007. Kentucky's seasonally adjusted unemployment rate in October 2019 was 4.3 percent, ranking it 43th among the states. Vermont had the lowest unemployment rate (2.2%) and Alaska the highest (6.2%). The U.S. unemployment rate in October 2019 was 3.6 percent.

Job Growth, Kentucky, Competitor States, and the U.S., Peak of Last Economic Expansion to the Present,
(% change in private employment, December 2007 to October 2019)

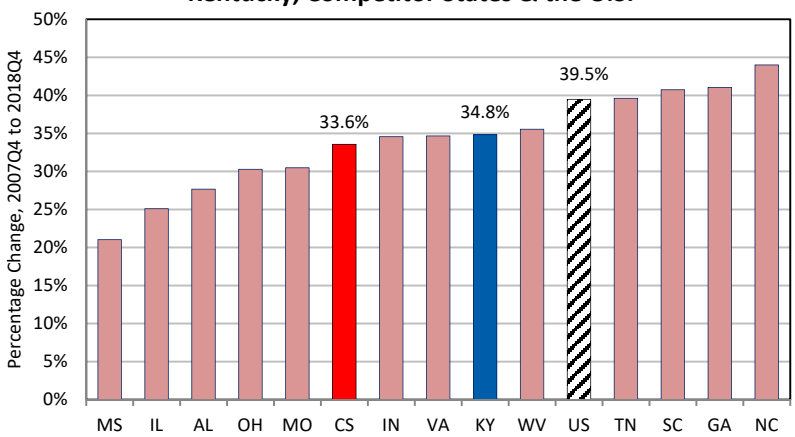


Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment, Hours, and Earnings from the Current Employment Statistics survey, total number of private employees, seasonally adjusted

Wage & Salary Growth by State

Private sector growth of *total* wages and salaries in a state over time is indicative of its economic energy. Here we look at the growth between the peak of the last economic expansion, which was during the fourth quarter of 2007, and the fourth quarter of 2018. By the final quarter of 2018, *total* wages and salaries in the U.S. were about 39.5 percent higher compared to the peak of the last economic expansion. In our region of the country, Tennessee, Georgia, North Carolina, and South Carolina increased at a pace similar to the U.S. Meanwhile, wage and salary growth was somewhat lower in Kentucky, evidenced by the state's 34.8 percent growth. Overall, the competitor state average is slightly lower at 33.6 percent. On the national level, North Dakota has the highest wage and salary growth during this period—registering an enviable 94.4 percent increase—and Wyoming has the lowest rate with a 13.6 percent increase.

Wage and Salary Growth,
Peak of the Last Economic Expansion to 2018 (Q4),
Kentucky, Competitor States & the U.S.

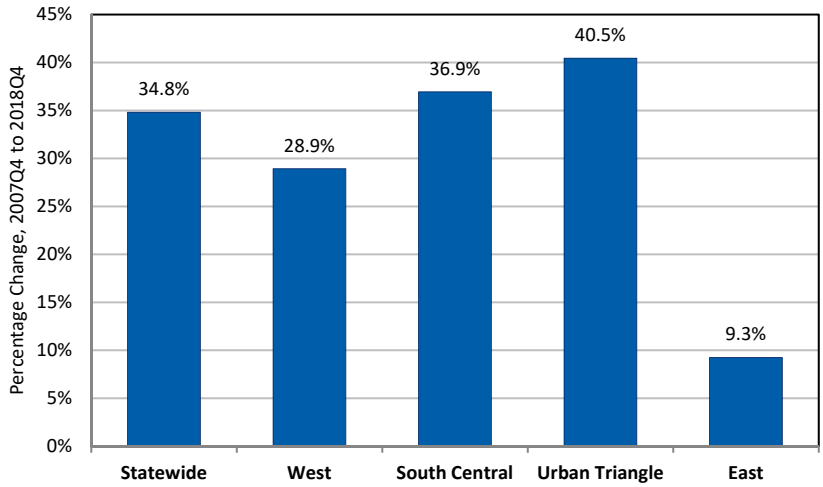


Source: Author's calculations using data from the Bureau of Labor Statistics, Quarterly Census of Employment and Wages (private, all industries, all sizes). The U.S. estimate is constructed from state data.
Note: CS is a weighted average of the competitor states

WAGE & SALARY GROWTH BY KENTUCKY REGION

Using the same data and approach that is described on the preceding page, the growth rate of total wages and salaries for Kentucky and its regions from the peak of the last economic expansion to the fourth quarter of 2018 is shown below (i.e., 2007Q4 to 2018Q4). One of Kentucky's regions—the Urban Triangle—experienced a growth rate above the U.S. average of 39.5 percent (a county-level map of these four regions is available in the glossary). Wages and salaries increased by 40.5 percent in the Urban Triangle, the state's primary economic engine, with the South Central region not far behind at 36.9 percent. Eastern Kentucky trails far behind the rest of the state at 9.3 percent.

Wage and Salary Growth in Kentucky Regions, Peak of the Last Economic Expansion to 2018 (Q4)

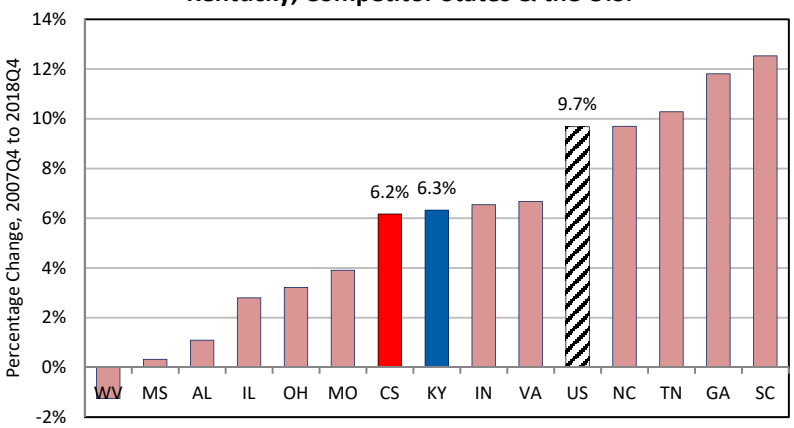


Source: Author's calculations using data from the Bureau of Labor Statistics, Quarterly Census of Employment and Wages (private, all industries, all sizes). See glossary for map of Kentucky regions by county.

Employment Growth by State

The private sector growth rate of *total* employment is indicative of a state's economic energy. Here we look at the growth rate between the peak of the last economic expansion, which was during the fourth quarter of 2007, and the fourth quarter of 2018. The U.S. average is 9.7 percent growth during this period. While not among the top states in the region (i.e., NC, TN, GA, & SC), Kentucky still outperformed many of its competitors in employment growth with a 6.3 percent increase (virtually the same as the competitor state average of 6.2%). Kentucky has the 26th highest employment growth rate among the 50 states and DC over this eleven year period. North Dakota has the highest total employment growth, experiencing a 24.4 percent increase. Wyoming, on the other hand, experienced a 4.8 percent *decrease* in total employment, the largest decline among the states.

Employment Growth,
Peak of the Last Economic Expansion to 2018 (Q4),
Kentucky, Competitor States & the U.S.

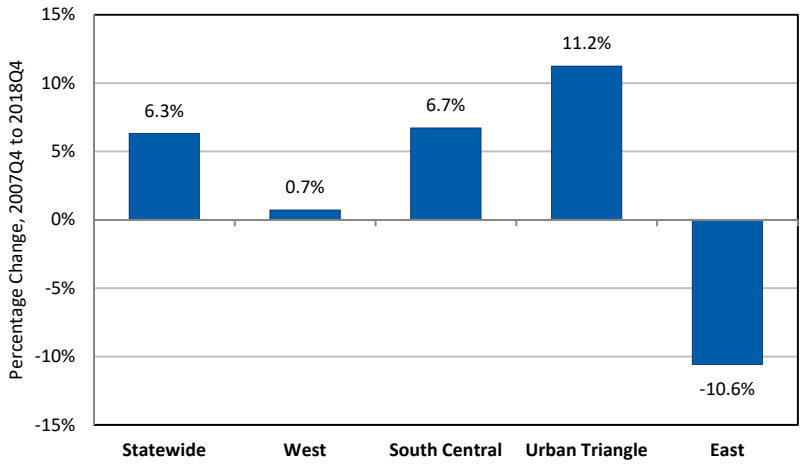


Source: Author's calculations using data from the Bureau of Labor Statistics, Quarterly Census of Employment and Wages (private, all industries, all sizes). The U.S. estimate is constructed from state data.
Note: CS is a weighted average of the competitor states

EMPLOYMENT GROWTH BY KENTUCKY REGION

Using the same data and approach that is described on the preceding page, the growth rate of total employment for Kentucky and its regions from the peak of the last economic expansion to the fourth quarter of 2017 is shown below (a county-level map of these four regions is available in the glossary). Kentucky's Urban Triangle experienced a 11.2 percent increase in total employment, which exceeds the U.S. average of 9.7 percent. The other regions in the state grew more slowly, as evidenced by the 0.7 percent increase in Western Kentucky and 6.7 percent increase in South Central Kentucky. In Eastern Kentucky employment is over 10 percent lower—a significant decline over the eleven year period that reflects the declining fortunes of the coal industry.

Employment Growth in Kentucky Regions, Peak of the Last Economic Expansion to the 2018 (Q4)

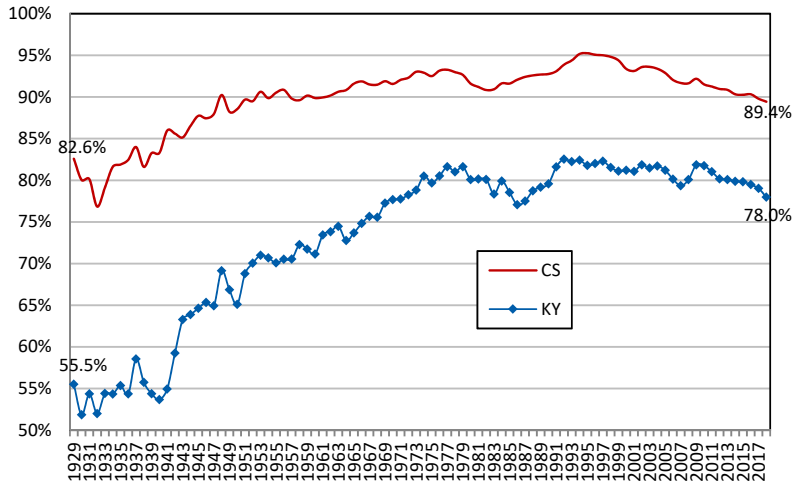


Source: Author's calculations using data from the Bureau of Labor Statistics, Quarterly Census of Employment and Wages (private, all industries, all sizes). See glossary for map of Kentucky regions by county.

PER CAPITA PERSONAL INCOME

While Kentucky's per capita personal income has grown significantly over the years, its position relative to the nation has not demonstrably improved since around 1974. Indeed, Kentucky's per capita income has oscillated around 80 percent of the national average since the mid-1970s. In 2018 it was 78 percent of the U.S. average while the average of the competitor states was around 89 percent. Lagging growth in per capita income has kept Kentucky ranked in the bottom tier of states (i.e., 46th in 2018). Within Kentucky, there are marked differences between urban, somewhat rural, and mostly rural counties—as reflected in their respective 2018 per capita income levels of approximately $47,430, $37,275, and $33,690.

Per Capita Personal Income as a Percentage of the U.S. Average, Kentucky and Competitor States, 1929 to 2018

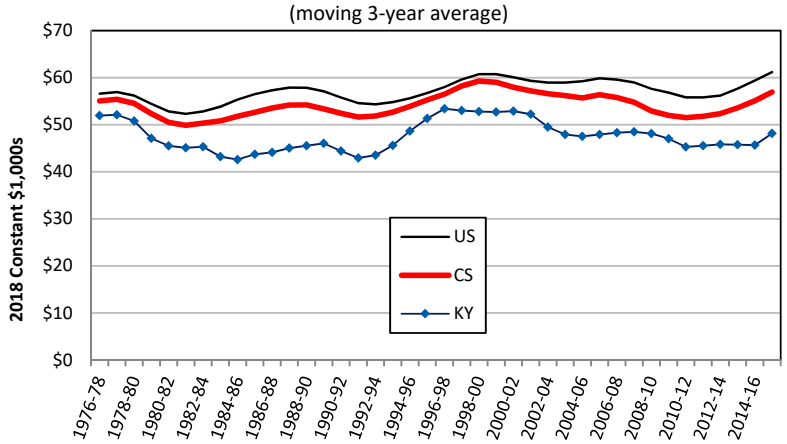


Source: U.S. Department of Commerce, Bureau of Economic Analysis

HOUSEHOLD INCOME

At $51,500, median household income in Kentucky is 83 percent of the U.S. median; at 94 percent of the U.S. median, the competitor states median is higher than Kentucky. The median level is the point at which half the households are lower, and half are higher. In real dollars, Kentucky's high point was in the late 1990s when median household income was around $53,000; real dollars factor out inflation and are expressed as constant dollars. Kentucky's median household income, in real dollars, is now about $2,000 less compared to the late 1990s. Researchers at MIT estimate that, in Kentucky, two working parents with one child need to earn about $52,000 a year for a living wage. This assumes both parents work full-time, 2,080 hours per year, and each earn $12.48 per hour. About half of the households in Kentucky do not generate sufficient income to meet minimum standards given the state's average cost of living. The U.S. Census Bureau, which estimates that the average family size in Kentucky is 3.1 people, has two main surveys to collect data on incomes in America. According to the Census Bureau American Community Survey estimates, about 862,000 Kentucky households made less than $50,000 in 2018.

Median Household Income, 1976-2018
Kentucky, Competitor States, and the U.S.
(moving 3-year average)

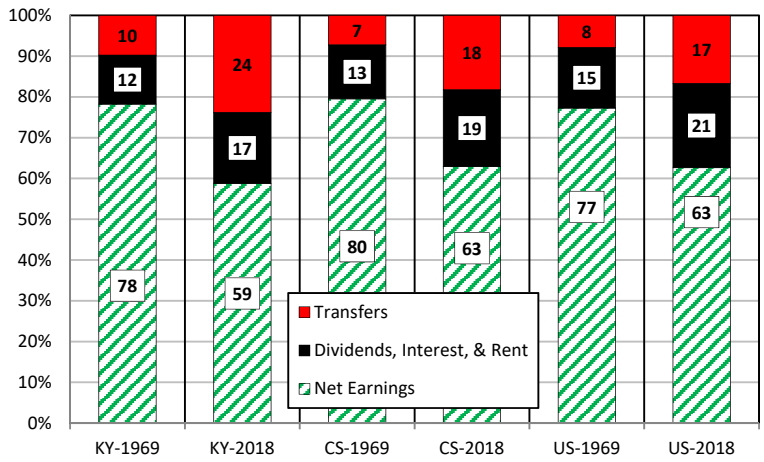


Source: Author's analysis of IPUMS-CPS data, courtesy of Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [dataset]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V65.0

SOURCES OF PERSONAL INCOME

The composition of personal income and its changing nature can exercise a large effect on state and local revenue growth since the personal income tax combined with the occupational tax constitutes the largest portion of Kentucky's state and local revenue receipts. Over the last several years, Kentucky, like the competitor states and the U.S., has experienced a shift in the composition of personal income that has affected revenue adequacy. In 1969, net earnings comprised 78 percent of total personal income in Kentucky. Dividends, interest, and rent, made up another 12 percent. Transfer payments, which consist of government programs like Social Security, Medicare, Temporary Assistance for Needy Families (TANF), and Supplemental Security Income (SSI) payments (to name a few), are essentially untaxed and made up the remaining 10 percent. By 2018, however, net earnings had declined to 59 percent of total personal income while transfer payments increased to 24 percent. By comparison, in 2017 transfer payments constituted 18 percent and 17 percent of personal income in the competitor states and the U.S., respectively.

Sources of Personal Income, 1969 and 2018, Kentucky, Competitor States, and the U.S.
(percent of total personal income)

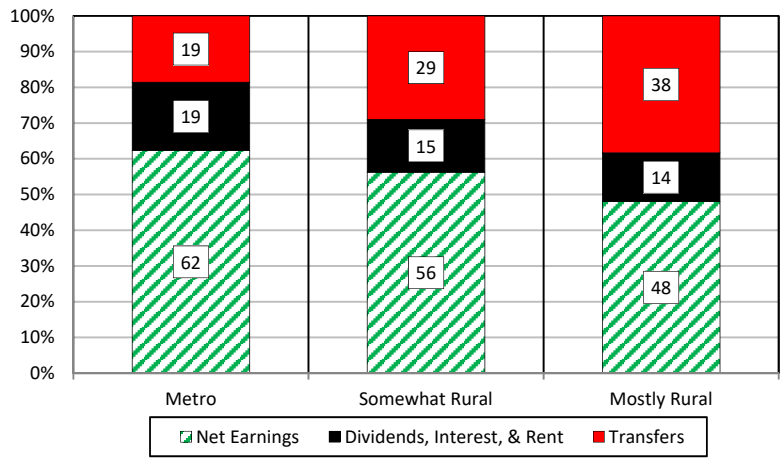


Source: U.S. Department of Commerce, Bureau of Economic Analysis

INCOME SOURCES BY LOCATION

There are significant differences across Kentucky's urban, somewhat rural, and mostly rural counties in the composition of income. In 2018 there were 14 rural counties where transfer payments as a share of total personal income topped 50 percent, and 17 counties where transfer payments are between 40 and 49 percent of personal income. Among the 35 urban counties, transfer payments constituted 19 percent while net earnings made up 62 percent of total personal income. These percentages shift away from net earnings and toward transfer payments for the 25 somewhat rural and 60 mostly rural counties. Well over one-third (38%) of total personal income comes from transfer payments in Kentucky's mostly rural counties. Clearly, there are systemic, deep-seated development hurdles in these counties that are difficult to clear despite the multiple attempts to do so over the last several decades.

Kentucky Sources of Personal Income, 2018,
Urban, Somewhat Rural, & Mostly Rural Counties
(percent of total personal income)

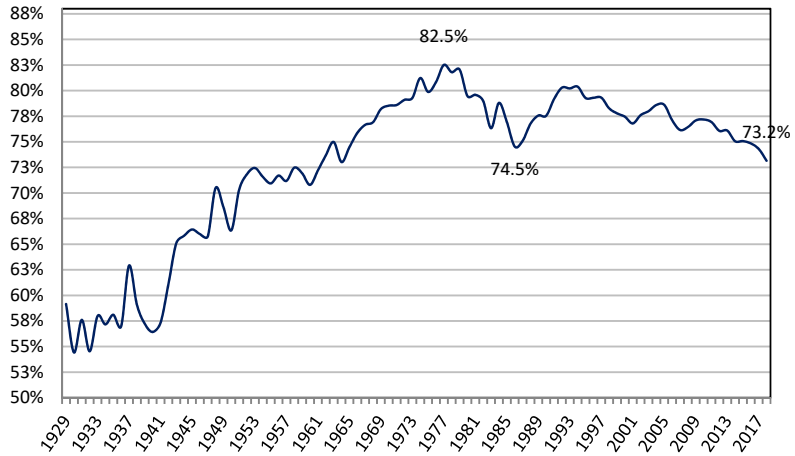


Source: Estimated by author using data from U.S. Department of Commerce, Bureau of Economic Analysis and USDA Rural Urban Codes.

NET EARNINGS PER CAPITA

Because net earnings is the portion of personal income that does not include transfer payments from various social assistance or public welfare programs or income from dividends, interest, or rent, it is a good indicator of the underlying economic vitality of a state, county, or region. Kentucky's net earnings per capita relative to the U.S. average increased steadily from 1929 to 1977; it hit its high point of 82.5 percent in 1977. Since 1977, Kentucky's net earnings per capita relative to the U.S. has dropped and is currently at 73.2 percent. This places Kentucky at 45th compared to other states, and is its lowest percentage since 1964 (approximately 73 percent). Kentucky's current net earnings per capita is $24,952, significantly below the highest state, Connecticut ($49,153) and above the lowest state, Mississippi ($21,819).

Net Earnings Per Capita in Kentucky as a Percentage of the U.S. Average, 1929 to 2018

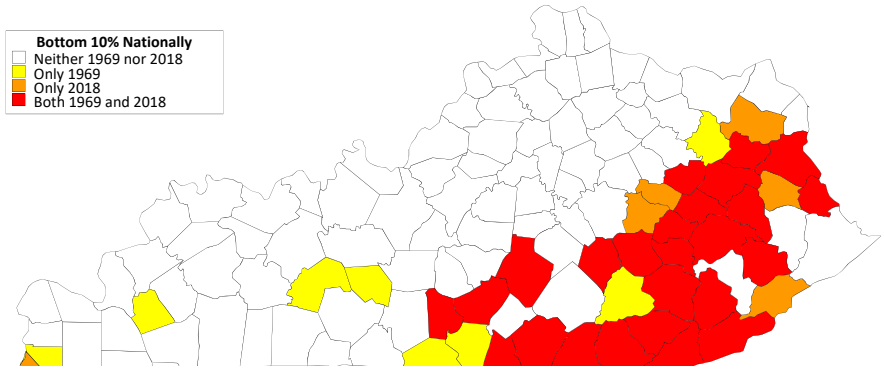


Source: U.S. Department of Commerce, Bureau of Economic Analysis.

NET EARNINGS PER CAPITA BY COUNTY

When President Johnson's War on Poverty was gathering steam in late 1960s, 33 of Kentucky's 120 counties had per capita net earnings placing them in the bottom ten percent of the 3,000-plus counties in the United States. As we note on the previous page, net earnings is the portion of personal income that does not include transfer payments from various social assistance or public welfare programs or income from dividends, interest, or rent, and therefore is a good indicator of the underlying economic vitality of a region. By 2018—49 years later—25 of these counties, or 76%, were still in the bottom ten percent. Nearly two-thirds of the counties nationally (63%) and in the dozen nearby competitor states (61%) that were in the bottom ten percent in 1969 were still there in 2018. While most of these persistently poor counties are in Eastern Kentucky, the map shows several counties in the south central part of the state. An important public policy question is why the percentage of persistently poor counties is so much higher in Kentucky, especially compared to the competitor states.

Kentucky Counties by Net Earnings Per Capita
(Bottom 10 Percent Nationally, 1969 and 2018)



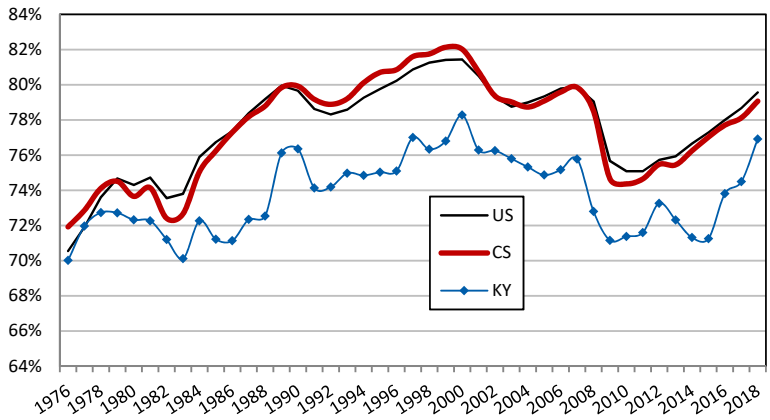
Source: Estimated by the author using data from the Bureau of Economic Analysis
Note: Net earnings is calculated by subtracting current transfers, dividends, interest, and rent from personal income and dividing by the total population.

Employment-Population Ratio

This ratio is the proportion of the civilian non-institutional population that is employed. According to the U.S. Department of Labor, Bureau of Labor Statistics (BLS), some believe the employment-population ratio is a better indicator of economic activity and economic performance than the more frequently referenced unemployment rate. Here, we focus on the prime working-age population, which includes those individuals between 25 to 54 years old. In 2018, Kentucky had one of the lowest employment-population ratios in the country at 76.9 percent. In fact, only three states had a ratio that is statistically significantly lower (i.e., Alabama, New Mexico, & West Virginia); there are twelve states statistically the same as Kentucky while the remaining 35 states and DC are statistically higher. In 1976, Kentucky and the United States had nearly identical employment-population ratios for this age group at about 70 percent. Since that time, as evidenced in the figure below, both the competitor states and the U.S. have employment-population ratios consistently higher than Kentucky. Key factors necessary for increasing the economic growth rate, both in Kentucky as well as in the U.S. overall, are to draw more individuals into the labor force (i.e., increasing the employment-population ratio) and maximizing their overall productivity.

Employment-Population Ratio, Kentucky, Competitor States, and the U.S., 1976 to 2018

(percentage of prime working-age adults, 25 to 54 years old)

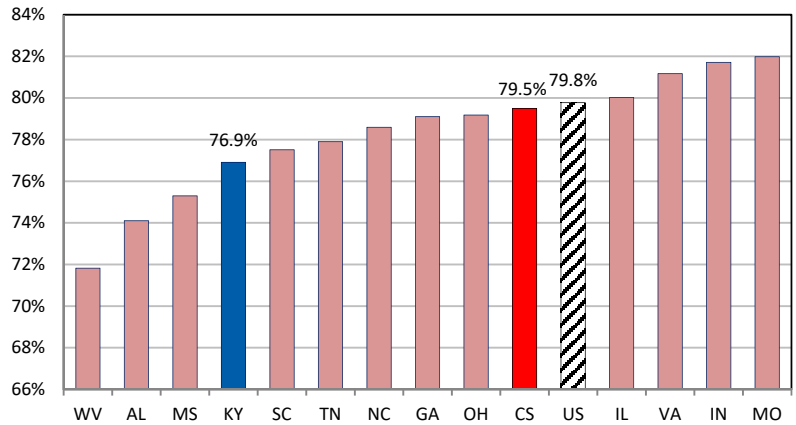


Source: Author's analysis of U.S. Census CPS data from Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [CPS Basic Monthly]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V6.0

Employment-Population Ratio

Only two competitor states—Alabama and West Virginia—have (statistically significant) lower employment-population ratio than Kentucky among the prime working-age adults (25 to 54 years old). Mississippi, South Carolina, Tennessee, and North Carolina are statistically no different from Kentucky, while the balance of the competitor states are statistically higher—as are the competitor state and U.S. averages. West Virginia has the lowest employment-population ratio for prime working-age adults in the U.S. (71.8%) while Iowa has the highest (86.8%). A key for Kentucky's future economic growth is to identify and successfully implement programs that increase the employment-population ratio, particularly for prime working-age adults. These strategies include, but are not limited to, increasing the transition from high school to post-secondary education, improving the skills of non college-educated workers, and addressing the substance abuse problem.

Employment Population Ratio, 2018,
Kentucky, Competitor States & the U.S.
(percentage of prime working-age adults, 25 to 54 years old)

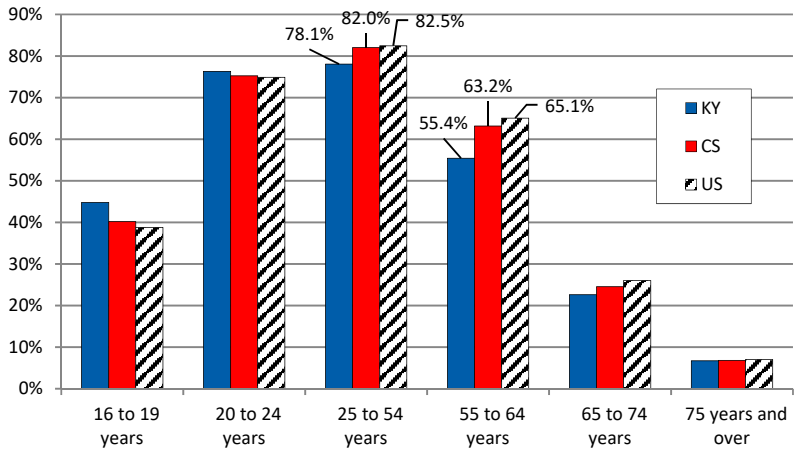


Source: Author's analysis of U.S. Census CPS data from Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [CPS Basic Monthly]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V6.0

LABOR FORCE PARTICIPATION

The labor force participation rate is the proportion of the civilian noninstitutional population that is in the labor force, which is slightly different from the employment-population ratio described on the previous page. The labor force is comprised of individuals who are employed *as well as* individuals who are unemployed but searching for a job. The national labor force participation rate increased from around 60 percent in 1970 to about 67 percent in 2000, driven in large part by the increased participation of women. In 2017, the U.S. labor force participation rate for individuals 16 and older was 63.3 percent and Kentucky's was 59.3 percent. Kentucky's labor force participation rate for those 20 to 24 looks very similar to both the competitor states and the U.S. However, the labor force participation rate for Kentuckians 25 to 54—the prime working years—is 78.1 percent compared to 82.5 percent for the United States. And, in the 55 to 64 age group, Kentucky is significantly lower, as evidenced in the chart below.

Labor Force Participation by Various Age Groups, Kentucky, Competitor States, and the U.S., 2018
(percent of individuals in the labor force)

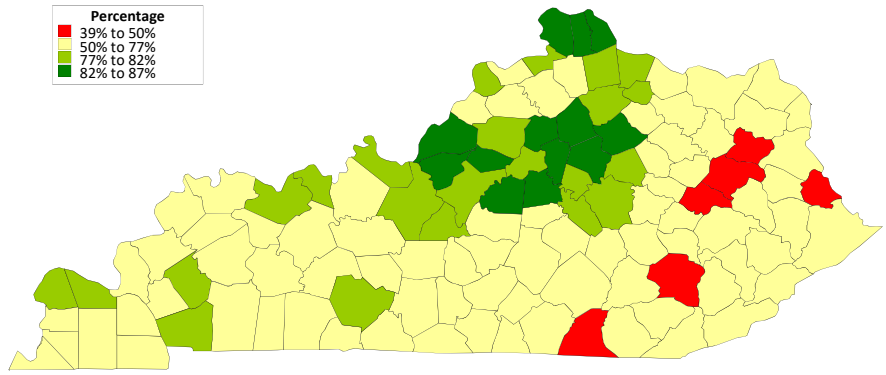


Source: 2018 American Community Survey 1-Year Estimate

Labor Force Participation by County

There are 13 Kentucky counties with a labor force participation rate among prime working-age adults (25 to 54 years old) that is equal to or greater than the U.S. average (86.6%). On the other hand, there are six counties with a labor force participation rate below 50 percent: Martin, Elliott, Clay, Morgan, McCreary, and Wolfe. Most of the counties in the urban triangle have labor force participation rates that are at least as high as the Kentucky average (77.3%), with several that are above the U.S. average. A critical factor that will determine the state's future economic growth is to identify and successfully implement programs that increase the labor force participation rate, particularly for prime working-age adults. These strategies include, but are not limited to, increasing the transition from high school to post-secondary education, improving the skills of non-college educated workers, and addressing the substance abuse problem. Research published in 2017 by Princeton University economist Alan Krueger found that from 1999 to 2015 up to 20 percent of the national drop in the labor force participation rate among prime working-age men and 25 percent of the drop among women *might be* due to the use and abuse of opioids. Dr. Krueger is quoted in the *Wall Street Journal* as saying "The opioid epidemic and labor-force participation are now intertwined."

Kentucky Labor Force Participation Rate by County, Prime Working-Age Adults, 25 to 54 Years Old

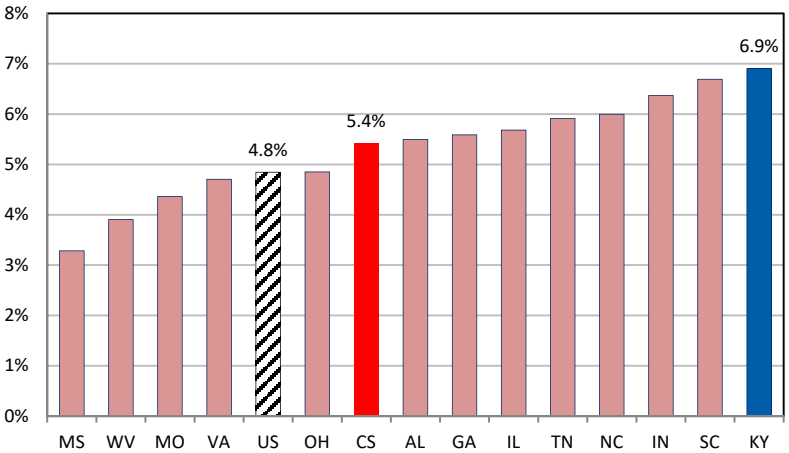


Source: American Community Survey, 2018 5-Year Estimate, Table S2301

Employment by Foreign Companies

Foreign companies create important economic benefits for the American economy. These companies invest billions of dollars in the U.S. economy and create hundreds of thousands of jobs. Kentucky has worked hard to capitalize on the opportunities presented by globalization—reflected by the presence in the state of more than 400 international companies from nearly 30 countries. A majority-owned U.S. affiliate is an American business enterprise in which there is a foreign direct investment that accounts for at least 50 percent of the ownership. In Kentucky there are an estimated 139,000 individuals employed by majority-owned U.S. affiliates. As a percentage of total full- and part-time wage and salary employment, it is 6.9 percent in Kentucky. This is higher than the U.S. average of 4.8 percent as well as the competitor state average of 5.4 percent.

Employment of Majority-Owned U.S. Affiliates, 2017, Kentucky, Competitor States, & the U.S.
(percentage of total full- & part-time wage and salary employment)

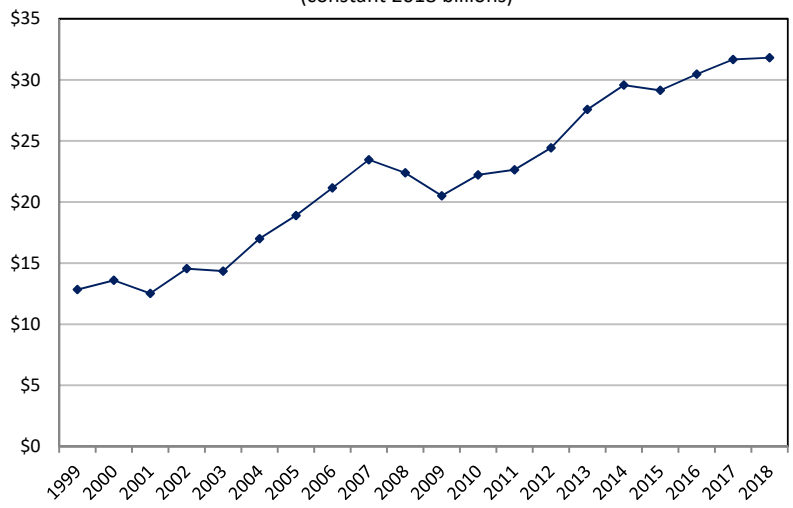


Source: Author's calculations using data from the Bureau of Economic Analysis, Regional Economic Accounts & International Data.
Note: CS is a weighted average of the competitor states

EXPORTS

Exports are a vital piece to the state's economic prosperity. Kentucky's exports of goods have more than doubled in real dollars over the last two decades. From 1999 to 2018 the compound annual growth rate of Kentucky's exports is 7.3 percent; this is higher than the U.S. (5%) and competitor states (5.6%). The value of Kentucky's exports of goods in 2018 was $31.8 billion, which is equivalent to 15.3 percent of Kentucky's gross domestic product; it was 7.6 percent for the competitor states and 8.1 percent for the U.S. Most of Kentucky's exported goods go to Canada, which accounted for 24 percent of the total. France was second (10%), followed by the United Kingdom (9%), Brazil (8%), Mexico (7%), and China (7%). Kentucky's businesses exported to nearly 200 different countries in 2018, but the top six and top ten countries received 66 percent and 80 percent, respectively, of the total value. Some traditional Kentucky products, like "beverages & tobacco products," which includes distilled products like bourbon, accounted for $530 million in exports, or 1.7 percent of the total. However, over half (55%) of the value of exported goods is accounted for by transportation equipment (e.g., aerospace and motor vehicle industries), followed by chemicals (14%), computer and electronic products (6%), and machinery-except electrical (5%). Combined, the four largest sectors accounted for 80 percent of Kentucky's exports in 2018.

Kentucky Exports of Goods, 1999-2018
(constant 2018 billions)

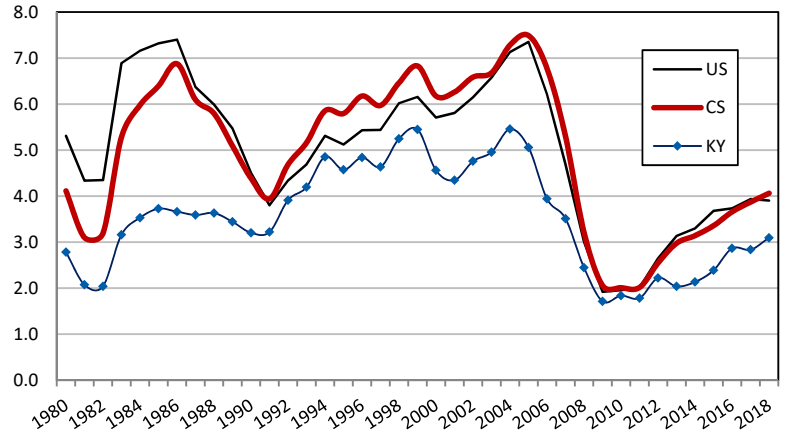


Source: Office of Trade and Industry Information (OTII), Manufacturing and Services, International Trade Administration, U.S. Department of Commerce.

HOUSING STARTS

A housing start is when a new foundation is laid. Because housing starts represent the first step in a series of cascading future purchases, such as furniture, appliances, and landscaping, a housing start is considered a leading economic indicator and a foundation of determining future economic trends. Going back to 1980, Kentucky's housing starts peaked in 2004 with 22,623 and declined steadily until hitting its nadir of about 7,400 in 2009. Following the U.S. and competitor state trend, Kentucky housing starts have stabilized since then and increased to nearly 13,830 in 2018. The overall trends nationally have seen relatively strong gains in multifamily housing, such as apartment buildings, and somewhat lackluster growth in single-family homes, which is a much bigger driver of economic growth. In Kentucky, single family homes accounted for 7,780 of the new starts in 2018, or about 56 percent of the total market. *The Wall Street Journal* reported in a May 2018 article, entitled "Rural America Has Jobs. Now It Just Needs Housing," that a lack of housing across *rural* America has become an obstacle for economic development and growth. Increasingly, new housing is being built in urban areas, not rural regions. And rural areas face new difficulties recruiting new industry and keeping younger workers because of insufficient housing stock.

Number of New Residential Housing Units,
Kentucky, Competitor States, and the U.S., 1980 to 2018
(Per 1,000 Population)

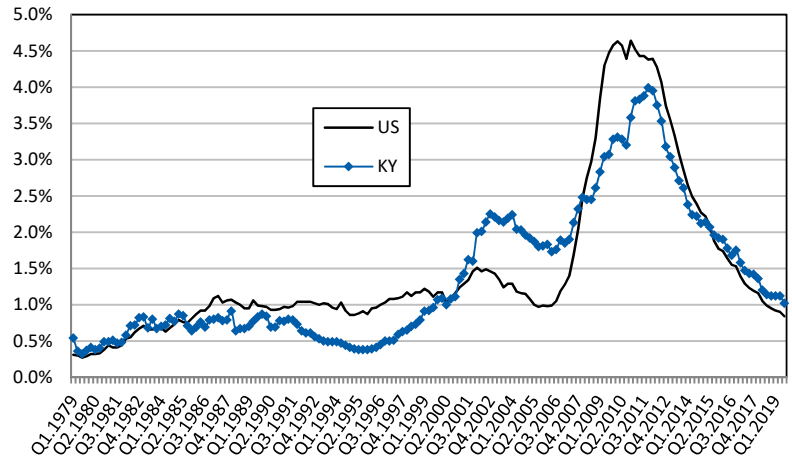


Source: U.S. Census Bureau

FORECLOSURES

Leading up to the Great Recession, the federal government and the private sector undertook extensive efforts to increase the number of homeowners by keeping mortgage rates low and by allowing small, or nonexistent, down payments. By the fourth quarter of 2007—the peak of the last economic expansion—the homeownership rate was 69 percent nationally and 75 percent in Kentucky. It became clear, however, that many of these new homeowners could not afford their homes, as evidenced in the figure below by a sharp increase in foreclosures beginning in 2008. In Kentucky, the percentage of mortgage loans in foreclosure peaked in the fourth quarter of 2011 at 4 percent. The foreclosure rate has declined since then and currently stands at 1.02 percent; the national rate is 0.84 percent. Kentucky's 1.02 percent is its lowest foreclosure rate since the second quarter of 2000 when it was 1 percent. By the third quarter of 2019, the homeownership rate was 68.4 percent in Kentucky and 64.8 percent nationally.

Mortgage Foreclosure Inventory,
Kentucky and the U.S., 1979 (Q1) to 2019 (Q3)
(foreclosures as a % of all mortgages, not seasonally adjusted)

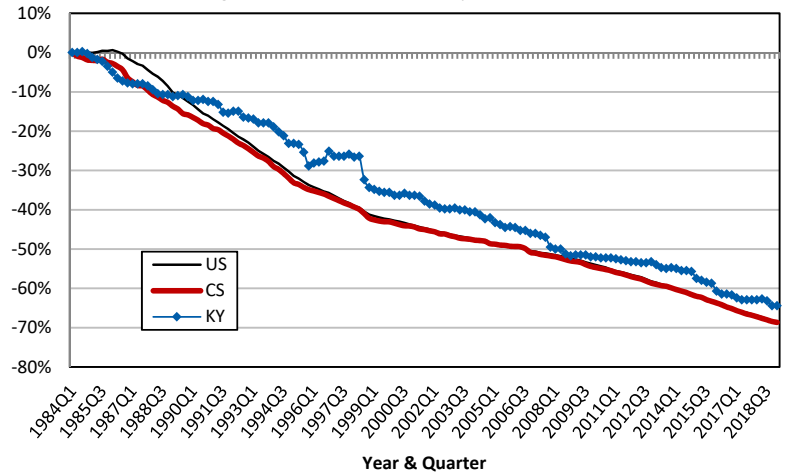


Source: Mortgage Bankers Association

COMMUNITY BANKS

Community banks—financial institutions with assets less than $10 billion—are fundamentally important for the economic vibrancy of many regions. According to a Council of Economic Advisors Issue Brief in August 2016, community banks provide "the only local source of brick-and-mortar traditional banking services for many counties, as well as key sources of credit for rural communities and small business loans." Indeed, as Esther George, the President and CEO of the Federal Reserve Bank of Kansas City wrote in 2017, "traditional banks are essential to thousands of communities across the country." Moreover, the leaders of these banks are integral members of their communities. As President George notes, "these bankers serve on the boards of local schools, hospitals and other civic organizations, providing a key source of leadership in the community." However, the number of community banks has been declining for many years. There were, for example, 402 community banks in Kentucky at the beginning of 1984, but only 143 at the beginning of 2019—a 64 percent decline. As the figure below illustrates, there has been a similar downward trend in the competitor states and the U.S. overall. While the market forces affecting banking are felt in all regions, analyses by the Federal Reserve Board show that, at least since 2005, the nation's rural areas and small towns have been disproportionately affected.

Community Banks
in Kentucky, Competitor States, & the U.S.
(% change in number of community banks, 1984 to 2019)



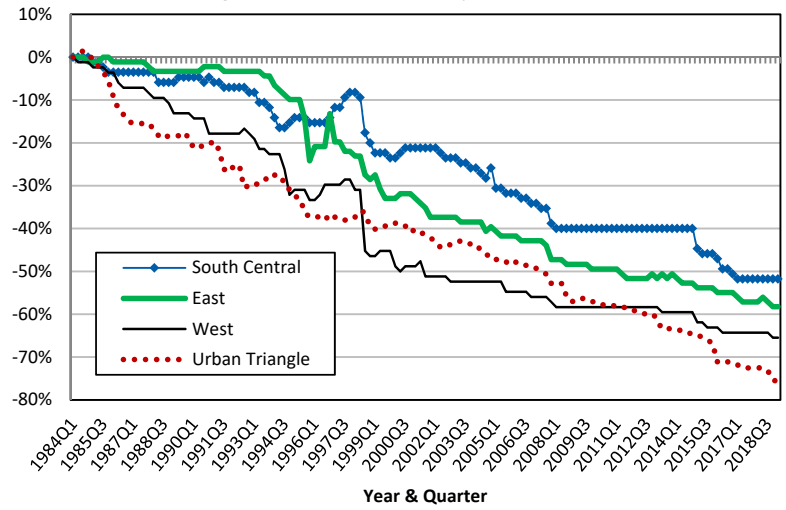
Source: Author's analysis of FDIC Community Banks Study Reference Data

Community Banks by Kentucky Region

Citing the Federal Reserve Board banking data, the *Wall Street Journal* reported in 2017 that since the Great Recession small bank loans of less than $1 million, once adjusted for inflation, have not recovered in the nation's rural areas. At the same time, however, from 2010 to 2016, loans in large metropolitan areas, their suburbs, and medium-to-small metropolitan areas rebounded to pre-recession levels. Across Kentucky's regions, there has been a significant decrease in the number of community banks from 1984 to 2019. Our analysis of FDIC Community Banking Study Reference Data reveals that the number of community banks with a *commercial and industrial loan specialty* (e.g., business loans) declined from 23 banks in the fourth quarter of 1984 to only one bank by the first quarter of 2019. Total outstanding loans (e.g., mortgages, commercial real estate, commercial and industrial, etc.) by these 23 banks at the end of 1984 totaled $8.9 billion (in inflation adjusted 2018 dollars), compared to $50 million in total outstanding loans by the ***one*** bank specializing in commercial and industrial loans at the beginning of 2019. Community banks that do not specialize in commercial and industrial loans still make business loans, but the precipitous decline in the number of community banks specializing in business loans, as well as the decline in total outstanding loans, is indicative of the challenges facing rural businesses.

Community Banks in Kentucky, by Region

(% change in number of community banks, 1984 to 2019)

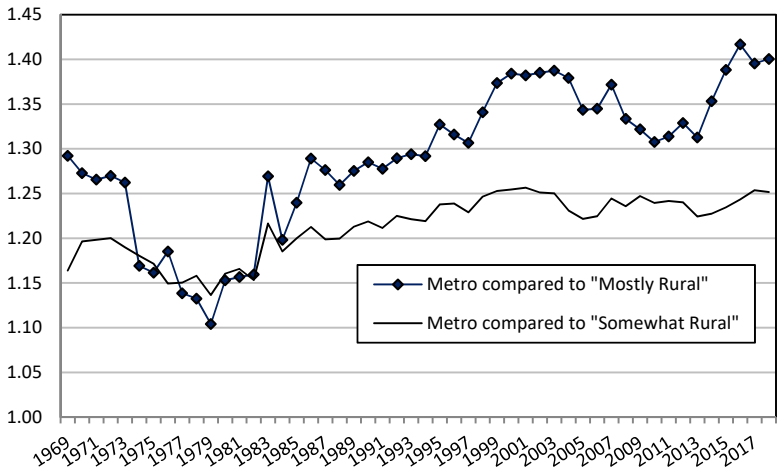


Source: Author's analysis of FDIC Community Banks Study Reference Data

Earnings Gap

Creating abundant high-paying jobs in Kentucky's rural areas has been and continues to be a challenge for policymakers, economic development professionals, and civic leaders. This figure illustrates the gap in wages between workers in Kentucky's metro counties and those in "somewhat rural" or "mostly rural" counties. Going back to 1969, earnings in metro areas have been consistently higher than those in rural counties—especially when compared to Kentucky's 60 "mostly rural" counties. In 2018, for example, earnings in metro counties were about 25 percent higher than those in "somewhat rural" counties and about 40 percent higher than wages in "mostly rural" counties. While the current urban-rural earnings difference is notable, the growing gap over the last three and a half decades is perhaps more significant. The earnings differential between the 35 metro counties and 85 rural counties increased steadily from the late 1970s to the present—suggesting new approaches to rural community and economic development are needed. Based on numerous studies of rural communities across the country, economists have outlined approaches for rural America to improve rural prosperity by thinking and acting regionally, finding new economic niches in high-value knowledge industries that leverage a region's strengths, and placing a premium on homegrown entrepreneurs.

Kentucky's Urban-Rural Earnings Gap, 1969-2018
(average geograhically based per job earnings ratio)



Source: Bureau of Economic Analysis, CA30, Economic Profile
Note: Author estimate by taking ratio between Urban-Rural Continuum Codes 9-8-7 (mostly rural), 6-5-4 (somewhat rural), and 3-2-1 (metro).

Economic Security

THE BOUNTY OF THE ECONOMIC expansion since the Great Recession has been distributed unevenly across industries, geographies, and individuals. Many have found themselves on the wrong side of globalization, mechanization, and technological change—as well as having first-hand experience with numerous other social and economic factors like low-performing schools, the disintegration of the nuclear family, and the community distress wrought by substance abuse.

The four tickets to the middle class—higher education, good health care, a house, and a retirement nest egg—are increasingly beyond the financial reach of too many Americans. In this report, we present our analysis of how middle-class families have become less economically secure. For at least 40 years, household income levels have changed at uneven rates depending upon whether one is "rich," "poor," or somewhere in-between. For Kentucky families, incomes at the 25th percentile—what some might consider "lower middle class"—declined 4.9 percent in real dollars. By comparison, incomes at the 75th percentile, or "upper middle class," increased for Kentucky and the U.S. by around 15.8 and 24.7 percent, respectively, in real dollars, from the late 1970s to the mid-2010s.

A series of reports, studies, and books released over the last few years have focused on the plight of the working class. *The Economic Report of the President*, for example, points out that the share of pretax income going to the top 1 percent increased from 8 percent to 18 percent

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from 1975 to 2014. Toward the end of 2015, the Pew Research Center released a report entitled *The American Middle Class is Losing Ground*. They present statistics showing how the size of the American middle class has been slowly contracting since the early 1970s. For example, 61 percent of American adults lived in middle-income households in 1971, but this has steadily decreased since then and is estimated to be 50 percent in 2015. The Census Bureau estimates that in 2018 the "richest" 20 percent of households had 52 percent of the income—more than in 1967 when the upper 20 percent of Americans had 43.6 percent of the income.

The Federal Reserve released the results of its sixth annual *Survey of Household Economics and Decisionmaking* in May 2019. The goal of the survey is to share the wide range of financial challenges and opportunities facing individuals and households in the United States. The results show that, for many, the findings are positive; however, areas of distress and fragility remain. For example, it was widely reported that nearly four out of ten Americans would not have the cash readily available to pay an unexpected $400 expense, such as a car repair bill; an estimated 27 percent would borrow or sell something to pay for the expense, and 12 percent would not be able to cover the expense at all.

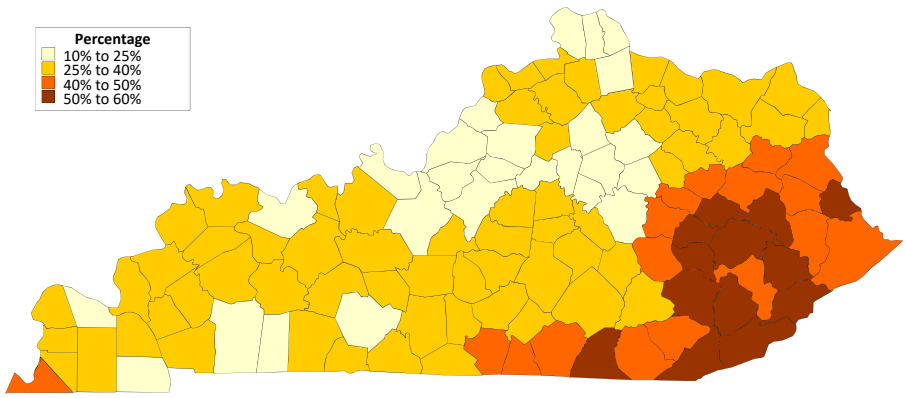
Meanwhile, many Americans are going into high levels of debt, such as mortgages, student loans, auto loans, and credit cards, to finance a middle-class lifestyle. Nonetheless, consumers aren't nearly as debt-burdened today as they were just before Great Recession. According to an analysis of Federal Reserve data by *The Wall Street Journal*, "In the fourth quarter of 2007, the last year before the financial crisis struck, households devoted 13.2% of their disposable income to debt service. In the first quarter of 2019, that number was 9.9%, largely due to low interest rates."

Many individuals still do not feel economically secure a decade after the Great Recession ended. In addition to uneven income growth, the poverty rate, as well as public assistance program participation, is higher in Kentucky than in many of the competitor states, evidence of continued economic uncertainty for many. The growth rate in wages, salaries, and employment, and therefore economic security, is not uniform across the state. The best antidote to decreasing or stagnant wages and income is the pursuit of education.

Transfer Payments by County

Transfer payments are benefits transferred from local, state, or federal governments to an individual. These payments include, but are not limited to, retirement and disability insurance benefits like Social Security, medical benefits such as those provided through Medicaid and Medicare, income maintenance benefits like TANF and SNAP, unemployment insurance compensation, and veterans' benefits. Transfer payments account for about 17 percent of total personal income for the U.S. (24 percent for Kentucky statewide)—but several Kentucky counties are significantly higher than the national and state averages. There are thirteen Kentucky counties over 50 percent, and 17 counties where transfer payments are between 40 and 49 percent of personal income; there are 64 counties between 25 percent and 40 percent. The percentages for Kentucky's metro, slightly rural, and mostly rural counties are, respectively, 19, 29, and 38. By comparison, the percentages for metro, slightly rural, and mostly rural counties nationally are, respectively, 16, 25, and 26. There are several counties that are heavily dependent on transfer payments as a source of personal income, with the highest percentages concentrated in Eastern Kentucky.

Transfer Payments by County, 2018
(as a percentage of total personal income)

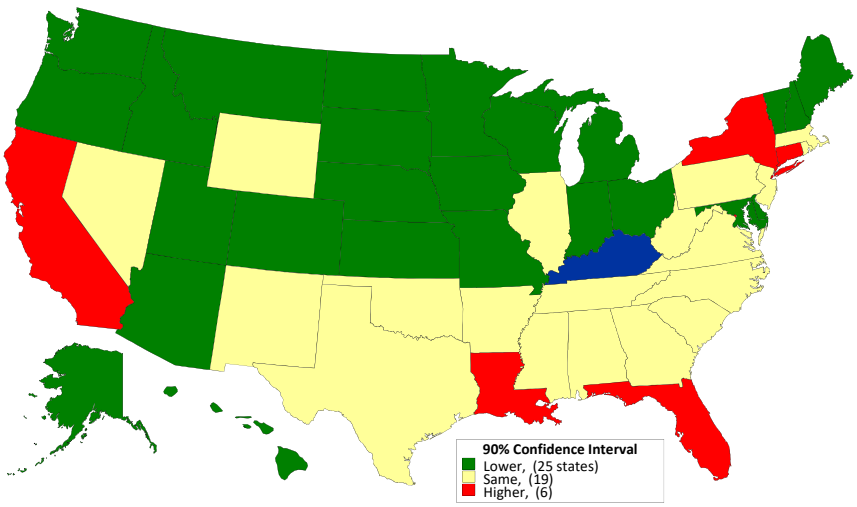


Source: Bureau of Economic Analysis

Gini Index by State

The Gini Index is a measure of income dispersion. A higher number indicates more concentration of income in fewer hands, with a value of "1" indicating that one person holds all the income. The Gini index for the United States in 2018 (0.485) is higher than a year earlier (0.482). The Census Bureau estimated that in 2018 the "richest" 20 percent of households had 52 percent of the income—more than in 1967 when the upper 20 percent of Americans had 43.6 percent of the income. The focus on the income distribution has been an important part of the political discourse for at least the last few decades, and it arguably reached new levels of intensity among the political, economic, academic, and journalistic cognoscenti in 2013 with the publication of Thomas Piketty's opus, *Capital in the Twenty-First Century*. These debates have focused on the extent of income inequality, and what, if anything, should be done to address it. The map below shows that Kentucky, with a Gini Index value of (.479), has a higher Gini Index (more inequality) than 25 states, and is lower than 5 states and DC; it is statistically the same as 19 states. The two highest Gini Index values belong to DC (.524) and New York (.513); Utah has the lowest (.427).

GINI Index of Income Inequality, 2018

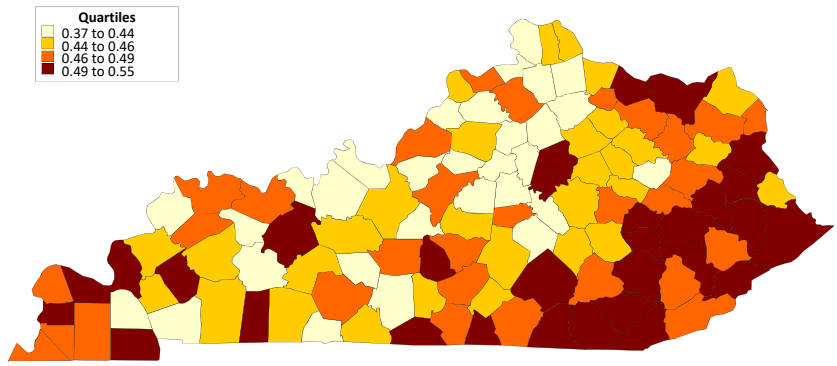


Source: U.S. Census Bureau, 2018 1-Year American Community Survey

GINI INDEX BY COUNTY

This map shows the Gini Index values for Kentucky counties organized into quartiles, or four equal groups. As explained on the previous page, the Gini Index is a measure of income dispersion. A higher number indicates more concentration of income in fewer hands, with a value of "1" indicating that one person holds all the income. The highest Gini Index values (i.e., higher income *in*equality) are concentrated in the poorest areas of Kentucky. Owsley County has the highest Gini Index value (.542) and Hancock County has the lowest (.371).

Kentucky County-Level Gini Index, 2014-2018



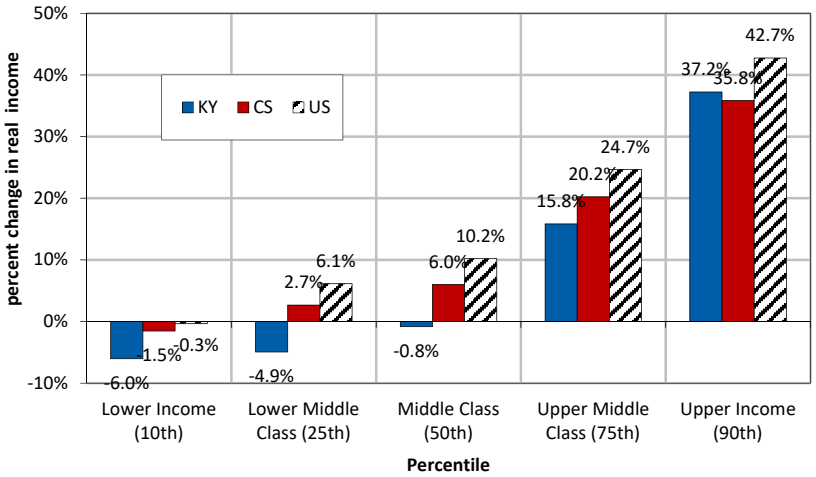
Source: American Community Survey, 2018 5-Year Estimate, Table B19083

HOUSEHOLD INCOME GROWTH

Middle-class families have become less economically secure. Over the last 40 years, household income levels have changed at uneven rates depending upon whether one is "rich," "poor," or somewhere in-between. For Kentucky families, incomes at the 25th percentile—what some might consider "lower middle class"—*declined* by 4.9 percent compared to a 6.1 percent *increase* nationally in real dollars. By comparison, incomes at the 75th percentile, or "upper middle class," increased for Kentucky and the U.S. by around 15.8 and 24.7 percent, respectively, in real dollars, from the late 1970s to the late 2010s. The contrast is the greatest between incomes at the 10th and 90th percentiles, with incomes *declining* in Kentucky by 6 percent at the lower income level and *increasing* by 37.2 percent at the upper income level; a large difference also exists between the 10th and 90th percentiles for the competitor states and the U.S. These data reflect total pre-tax personal income from all sources for all adults in the household. Noncash benefits, such as food stamps, health benefits, or subsidizing housing are not included as household income. Many factors have contributed to the widening gap, including the rise of globalization and outsourcing, increasing returns to high-level skills, job automation, declining unionization, immigration, and tax policies.

Changes in Household Income, by Income Level, 1976-78 to 2016-18, KY, Competitor States and the U.S.

(based three-year averages of 2018 dollars)

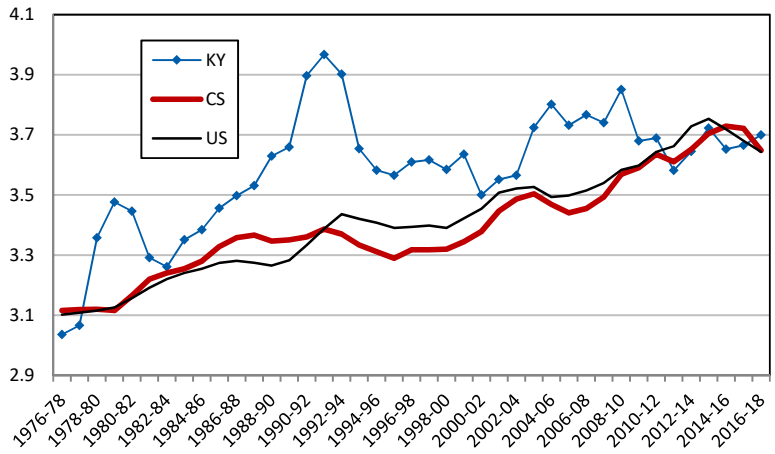


Source: Author's analysis of IPUMS-CPS data, courtesy of Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [ASEC various years]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V65.0

HOUSEHOLD INCOME RATIO

Household incomes at the 25th and 75th percentiles can be viewed as boundaries around America's middle class. In the late 1970s, upper middle class households—those at the 75th percentile—had incomes about 3 times larger than lower middle class households, which are those at the 25th percentile; this is true of Kentucky, its competitor states, and the United States overall, where the ratios were 3, 3.1, and 3.1, respectively, around 40 years ago. However, the gap has widened since then, evidenced by the ratios increasing to around 3.7 for Kentucky, its competitor states, and the U.S. by the late 2010s. The upward trending lines in the figure below are indicative of a widening income gap between those who occupy the upper and lower boundaries of the American middle class. These trends are occurring because household incomes have been increasing for the upper middle class while declining for the lower middle class (in real terms), as illustrated in the bar chart on the facing page. These household income trends suggest that, especially in Kentucky, those in the bottom half of the income distribution are facing relative economic stagnation and decline compared to those in the competitor states and the U.S.

Household Income Ratios, 75th/25th Percentiles, Kentucky, Competitor States, and the U.S.

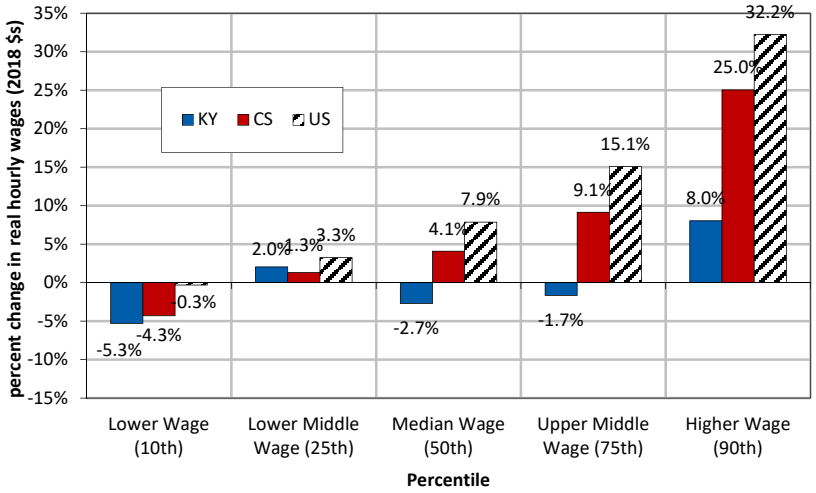


Source: Author's analysis of IPUMS-CPS data, courtesy of Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [ASEC, various years]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V65.0

Hourly Wages

The hourly wage data illustrated in the bar chart below represent a portion of the household income data presented on the preceding two pages. Household income includes, but is not limited to, earnings, interest income, dividend income, public and private pensions, unemployment compensation, public assistance cash benefits (e.g., TANF & SNAP), child support, and alimony. By limiting the focus here to hourly wages, we see a clearer picture of workers' labor market experiences. These data include hourly earnings for workers paid by the hour (*excluding* overtime, tips, commissions, and bonuses), as well as the usual hourly earnings for nonhourly workers (*including* overtime, tips, commissions, and bonuses). Similar to the trends in household income, Kentucky's wage earners at the 10th, 25th, 50th, and even the 75th percentile experienced flat to declining wages, in real dollars, from 1979 to 2018. For example, if we ordered all Kentucky workers from top to bottom according to their hourly wages, took the wage earner in the middle (i.e., the median or 50th percentile), removed the inflationary effect from 1979 to 2018 to get real wages, we would discover that the wage earner had experienced a 2.7 percent *decline* over this time period. Wages earners in the competitor states and the U.S. realized larger increases, especially at the 75th and 90th percentiles.

Cummulative Change in Real Hourly Wages, by Wage Percentile, 1979 to 2018, Kentucky, Competitor States and the U.S.

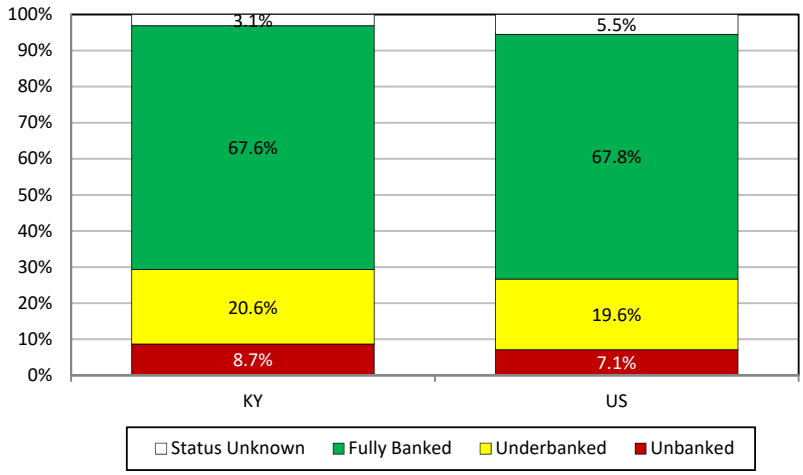


Source: Author's analysis of CPS Outgoing Rotation Group (ORG) data using files created by the Center for Economic Policy Research (CEPR), available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/.

Banking Status

Whether someone has a bank account can have important implications for their financial well-being. According to the Federal Deposit Insurance Corporation (FDIC), "access to an account at a federally insured institution provides households with the opportunity to conduct basic financial transactions, save for emergency and long-term security needs, and access credit on fair and affordable terms." Moreover, it can help protect "households from theft and reduces their vulnerability to discriminatory or predatory lending practices." Surveys done by FDIC find that low-to-moderate income Americans are less likely to "access mainstream financial products such as bank accounts and low-cost loans." At 8.7%, Kentucky households are slightly more likely to be "unbanked" than the U.S. (7.1%). Similarly, Kentucky households are more likely than the U.S. overall to be "underbanked," 20.6 percent compared to 19.6 percent. These are households that use both traditional banks as well as alternative financial services. Nearly identical percentages, however, are believed to be "fully banked" in Kentucky (67.6%) and nationally (67.8%). Factors associated with being unbanked include, but are not limited to, lower levels of education and income, being disabled, and belonging to a minority group.

Household Banking Status, 2013-2017, Kentucky and the U.S.
(percent of households)

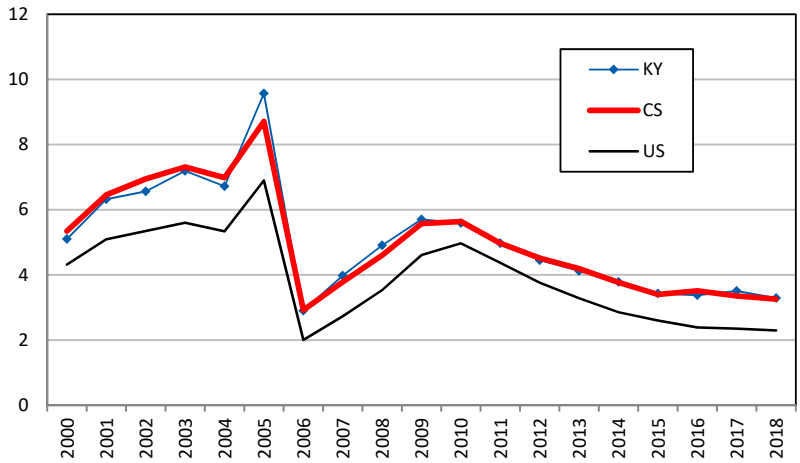


Source: FDIC National Survey of Unbanked and Underbanked Households, 2013-2017, 5-Year Estimate

Personal Bankruptcies

Bankruptcy is defined as "a legal proceeding involving a person or business that is unable to repay outstanding debts." The idea is to develop a plan that enables the individual (or business) to gain a fresh financial start while providing creditors with some prospect of repayment for outstanding debts. The personal bankruptcy rate provides an indication of the overall financial health of individuals and families. As consumers acquire excessive debt or economies are in recession, for example, the threat of personal bankruptcy increases. The laws governing bankruptcy changed in 2005, which had the immediate effect of reducing the number of individuals filing for bankruptcy. The personal bankruptcy rate in Kentucky has essentially been the same as the competitor states, which in 2017 is around 3.3 bankruptcies per 1,000 population. The U.S. average has been somewhat lower over the 2000-2018 period, and stood at 2.3 in 2018. Overall, the bankruptcy rate has been on a downward trend since 2010, and is approaching levels not seen since before the Great Recession.

Personal Bankruptcies,
Kentucky, Competitor States, and the U.S., 2000-2018
(bankruptcies per 1,000 population)

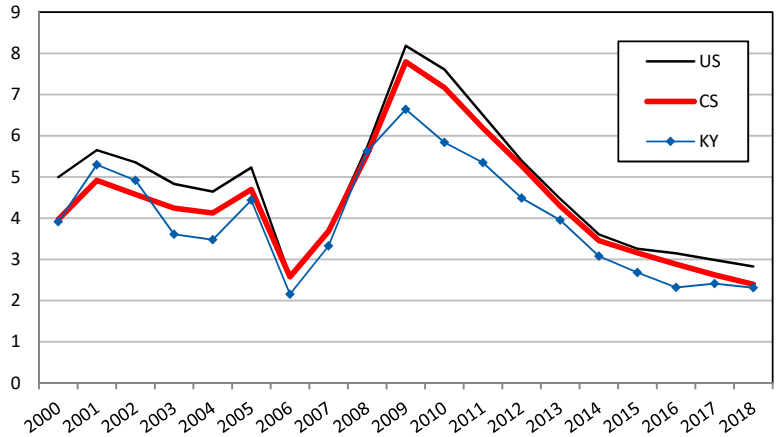


Source: Estimated using data from Administrative Office of the U.S. Courts & Census data, various years.

BUSINESS BANKRUPTCIES

According to the National Bureau of Economic Research (NBER), the trough of the most recent recession was in the second quarter of 2009. It is perhaps no surprise, then, that 2009 is the peak year, as shown in the graph below, for the number of businesses that filed for bankruptcy. Across the various Circuit and District Courts in 2009, there were 60,837 bankruptcy business filings (Chapters 7, 11, 12, 13)—but this has steadily declined since then with 22,232 in 2018. Business filings across the U.S. in the first three quarters of 2019 (January through September) are 4.3 percent higher than the number filed in the first three quarters of 2018. When expressed as a percentage of business establishments, Kentucky has been lower than the competitor states and the U.S. during the last few years, but has converged toward the competitor states average since 2016.

Business Bankruptcies,
Kentucky, Competitor States, and the U.S., 2000-2018
(bankruptcies per 1,000 business establishments)

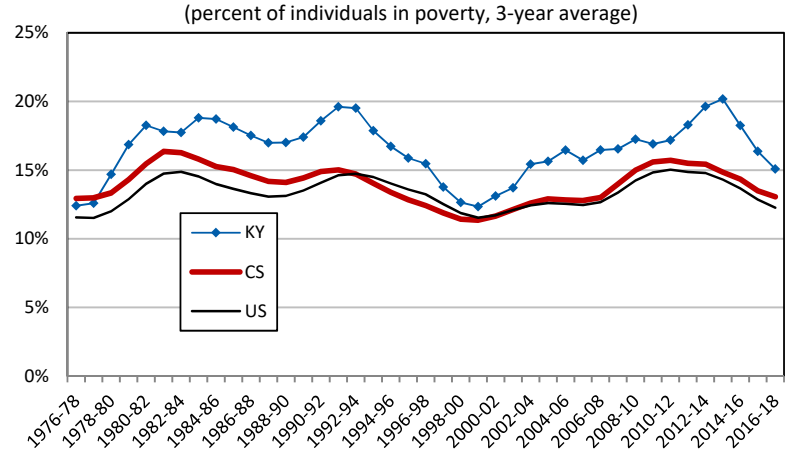


Source: Estimated from Administrative Office of the U.S. Courts data along with establishment data from the U.S. Census, County Business Patterns, various years. Note: 2018 data are estimated by using 2017 establishments and 2018 bankruptcies.

Poverty Rate

Living in poverty can have far-reaching economic, social, and cultural consequences for families and entire populations. Studies reveal that those who grow up in poverty not only experience a lack of basic needs, but that this scarcity can shape their lives and families for generations. In addition, the concentrations of poverty have a significant negative effect on the fiscal health of cities and regions that, as a result, must shoulder higher spending. The U.S. poverty rate increased during the Great Recession and currently stands at around 12 to 13 percent, depending on the data source. From about 1980 to the present, Kentucky's poverty rate has been consistently higher than both the U.S. and competitor states. The data in the chart show the 3-year moving average poverty rate estimated from the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS). According to the Census Bureau's 2018 American Community Survey 1-year estimate, another estimate of the poverty rate, Kentucky's poverty rate is 16.9 percent, which is higher than the competitor state (13.9%) and U.S. (13.1%) poverty estimates. More information about the definition of poverty, the poverty rate, and the poverty threshold is in the Glossary of this report.

Poverty Rate 1976 to 2018,
Kentucky, Competitor States, and the U.S.
(percent of individuals in poverty, 3-year average)

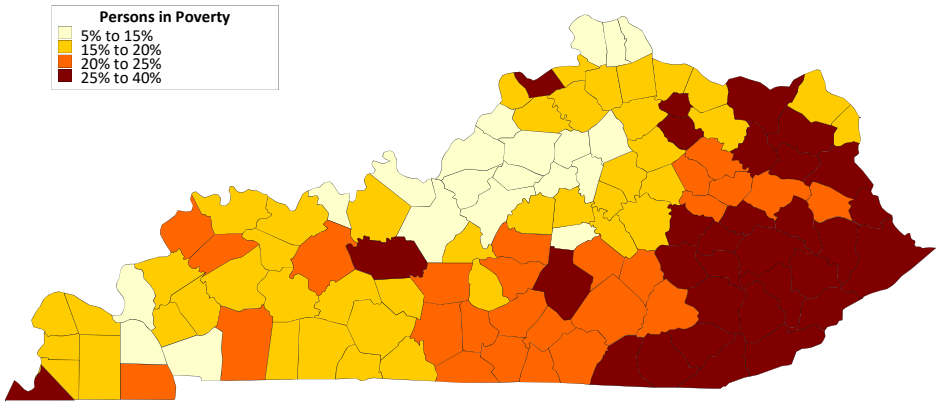


Source: Author's analysis of IPUMS-CPS data, Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [ASEC various years]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V65.0

POVERTY RATE BY COUNTY

Kentucky's persistently poor counties are concentrated in Eastern Kentucky, but high poverty is found across the state. Poverty rates in 7 counties are at least 35 percent—Clay, McCreary, Bell, Harlan, Leslie, Breathitt, and Owsley Counties. Meanwhile, Boone, Oldham, and Spencer Counties have rates in the single digits. There can be, of course, concentrated pockets of poverty within counties with relatively low rates. At 25.1 percent, the "mostly rural" counties generally have higher poverty rates than "slightly rural" (19.4%) and metro counties (14.7%).

Kentucky County-Level Poverty Rates, 2014-2018

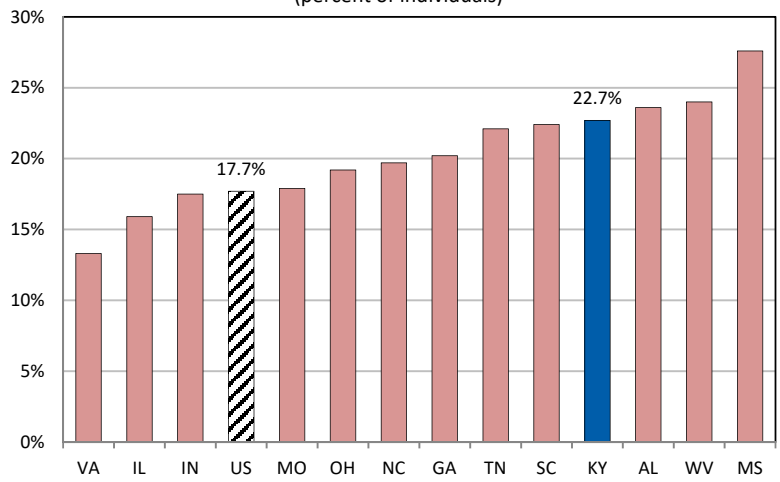


Source: American Community Survey, 2018 5-Year Estimate, Table S1701

Child Poverty

Child poverty, and all that it bodes for the future, continues to be disturbing and vexing problem for Kentucky. Here, we illustrate child poverty rates for Kentucky, the competitor states, and the U.S. The rates shown are for children who live in households with incomes below 100 percent of the federal poverty level. Kentucky's poverty rate for children under 18 in 2018 was 22.7 percent, somewhat higher than the U.S. rate of 17.7 percent. Nationally, only three states have child poverty rates statistically significantly higher than Kentucky (e.g., Louisiana, Mississippi, and New Mexico). At 27.6 percent, Mississippi has the highest child poverty rate in the nation; Utah is the lowest with a child poverty rate of 9.3 percent.

Poverty Rate, 2018, Children Under 18, Kentucky, Competitor States and the U.S.
(percent of individuals)

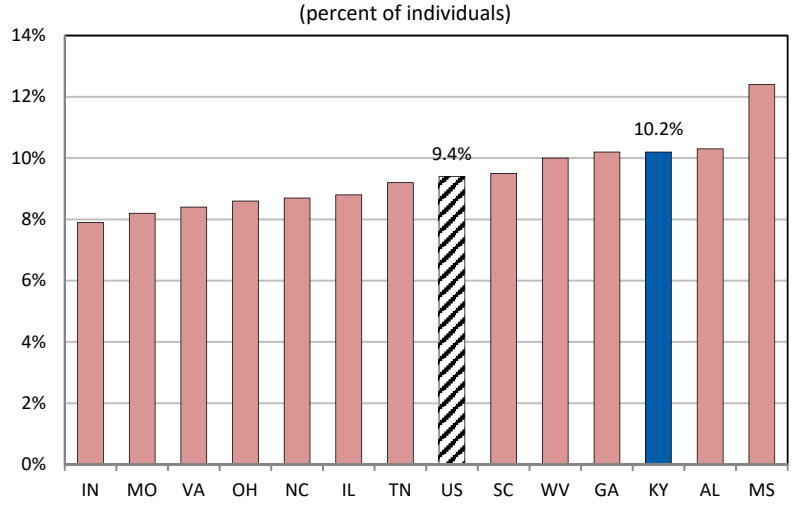


Source: 2018 American Community Survey 1-Year Estimates

Elder Poverty

The first wave of Baby Boomers started hitting the traditional retirement age of 65 in 2011. At 10.2 percent, Kentucky's population of persons aged 65 and older who live below the poverty level is higher than most of the competitor states as well as the U.S. average of 9.4 percent. In Kentucky, the state's underfunded pension systems could certainly make some retirees feel less financially secure. According to the Employee Benefit Research Institute's *2019 Retirement Confidence Survey*, which is a national survey, *retirees* are more confident than they were last year that they will have enough for basic expenses, medical expenses or long-term care. An estimated 82 percent of retirees report feeling either "very or somewhat confident" about having enough money to live comfortably throughout their retirement years (compared with 75% in 2018). According to the researchers, "retirees are also much more likely than last year to be confident in their ability to afford the lifestyle they are accustomed to (77% vs. 70%) and having enough to last their entire life (76% vs. 67%)."

Poverty Rate, 2018, Adults 65 and Over
Kentucky, Competitor States and the U.S.
(percent of individuals)

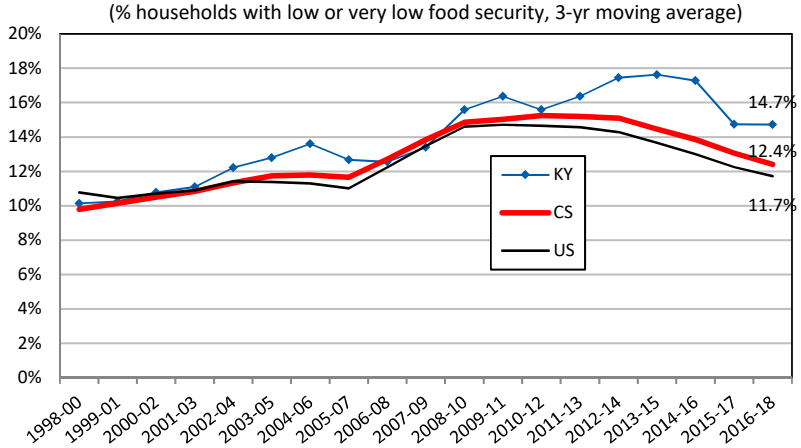


Source: 2018 American Community Survey 1-Year Estimates

Food Insecurity

Food security is defined as having "access at all times to enough food for an active, healthy life for all household members," while food insecurity means "that the food intake of one or more household members was reduced and their eating patterns were disrupted at times during the year because the household lacked money and other resources for food." An estimated 10.1 percent of Kentucky households experienced food insecurity during the 1999-2001 period, and this increased to 14.7 percent in the most recent period. The competitor states and the U.S. averages were lower than Kentucky's food insecurity level, at 12.4 and 11.7 percent, respectively. During the 2016 to 2018 period, there are no states with food insecurity rates that are statistically higher than Kentucky's. There are, however, 21 states that are statistically the same as Kentucky and 29 states (and DC) that are statistically lower. Generally, national data show that rates of food insecurity tend to be higher for certain groups, such as households with children—especially young children (under age 6), households with children headed by a single parent—especially a woman, households headed by a minority—especially Black and Hispanic, and the elderly. Research by University of Kentucky economist James Ziliak reveals that rates of food insecurity have remained persistently high following the Great Recession for Americans over 60.

Prevalence of Food Insecurity,
Kentucky, Competitor States, and the U.S., 1998-2018
(% households with low or very low food security, 3-yr moving average)



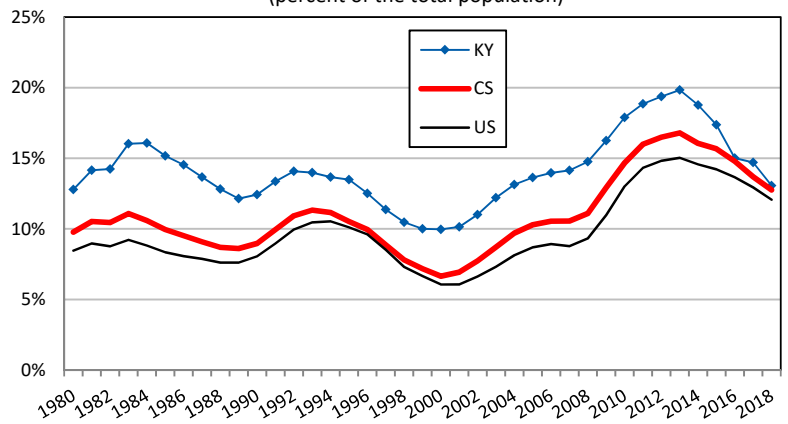
Source: Author's analysis of data from Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [dataset]. Minneapolis, MN: IPUMS, 2019. https://doi.org/10.18128/D030.V65.0

FOOD STAMP PARTICIPATION

The Food Stamp Act of 1977 defines this federally-funded program as one intended to "permit low-income households to obtain a more nutritious diet." Nationally, almost 75 percent of Food Stamp Program (FSP) participants are in families with children and more than one-quarter of participants are in households with seniors or people with disabilities. As noted on the facing page, University of Kentucky economist James Ziliak has found that rates of food insecurity have remained persistently high following the Great Recession for Americans over 60. This is noteworthy since the Robert Wood Johnson Foundation has reported on research showing that seniors who participate in the Supplemental Nutrition Assistance Program (SNAP) are much less likely to be admitted to nursing homes and hospitals. The implication of this finding, of course, is that ensuring food security for elders can potentially reduce health care costs and improve health outcomes. In 2018, an estimated 13.1 percent of Kentucky's population participated in the FSP, a percentage higher than both the competitor states (12.8%) and the U.S. (12.1%). SNAP benefits are dependent on, among other factors, family size and income levels—with the average SNAP recipient in the U.S. receiving about $126 a month. The average per person benefit in Kentucky is around $116.

Food Stamp Program, Average Monthly Participation, Kentucky, Competitor States, and the U.S., 1980-2018*

(percent of the total population)

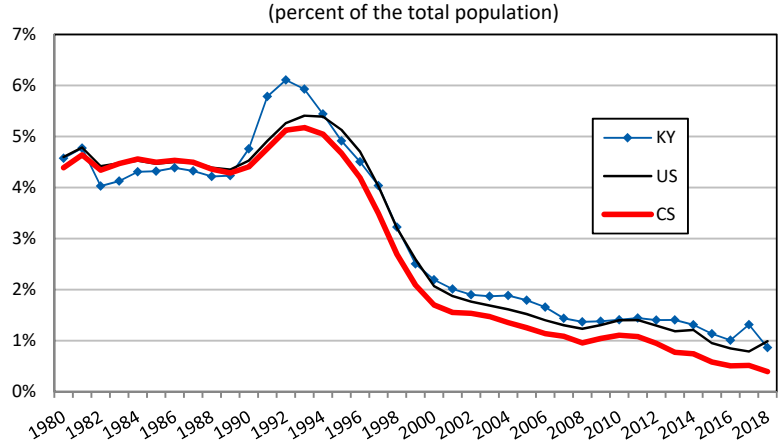


Source: U.S. Department of Agriculture Food and Nutrition Service, U.S. Census, and University of Kentucky Center for Poverty Research. 2017. "UKCPR National Welfare Data, 1980-2016." Gatton College of Business and Economics, University of Kentucky, Lexington, KY. http://www.ukcpr.org/data (accessed October 2018)
**The 2018 number is August estimate.*

Temporary Assistance for Needy Families

The number of Kentuckians receiving Aid to Families with Dependent Children (AFDC)—known as Temporary Assistance to Needy Families (TANF) since the 1996 welfare reform law—has decreased significantly from its high point of 229,400 in 1992 to 38,600 in 2018; roughly 80 percent of the recipients in 2018 were children. This decline is not unique to Kentucky. For example, marking the 20th anniversary of the 1996 legislation that fundamentally changed the program, the Center on Budget and Policy Priorities (CBPP) issued a report in August, 2016, noting that nationally the number of families receiving TANF (AFDC) benefits for every 100 families with children in poverty has declined sharply over time. In 1979, for instance, 82 families per 100 with children in poverty received benefits, compared to 68 in 1996—when TANF was enacted—to 23 in 2014. As a percentage of the total population, more Kentuckians received TANF benefits in 2018, about 0.9 percent, than the competitor state average of 0.4 percent. The benefit amount for a Kentucky family of three is $262 per month, which has not changed since 1996. If the benefit had been indexed to the inflation rate it would equal over $400 now.

AFDC/TANF Recipients,
Kentucky, Competitor States, and the U.S., 1980-2018
(percent of the total population)



Source: The Administration for Children and Families, U.S. Department of Health and Human Services, U.S. Census, and the University of Kentucky Center for Poverty Research. 2018. "UKCPR National Welfare Data, 1980-2017." Lexington, KY. http://ukcpr.org/resources/national-welfare-data (accessed December 5, 2018). The 2018 estimate is derived from USDA data.

MEDICAID BENEFICIARIES

Medicaid is a state-federal partnership to provide health care coverage for people with lower incomes, older people, individuals with disabilities, and some families and children. The Medicaid program is jointly funded by states and the federal government. In Kentucky, the Department for Medicaid Services administers the $23.4 billion program—the budgeted level for the 2018-2020 Biennium. There are many types of services provided for Kentucky's 1.2 million Medicaid beneficiaries—from inpatient hospitalization to long-term care to prescription drugs for acute care. Medicaid constitutes a significant portion of Kentucky's total state government spending. According to the National Association of State Budget Officers, *State Expenditure Report: Fiscal Years 2017-2019*, 29.2 percent of Kentucky state government expenditures were for Medicaid in FY2019. Kentucky's federal match in FY2020 is 71.82 percent; for every $1 expended on Medicaid in Kentucky, 72 cents is from the federal government and 28 cents is from Kentucky. The percentage of the population on Medicaid in Kentucky, the competitor states, and the U.S. is 27, 19 and 22 percent, respectively. And, as a result of the Affordable Care Act, Kentucky has experienced one of the largest increases in Medicaid enrollment in the country. The U.S. average is a 27 percent increase in enrollment, compared to Kentucky's 99 percent.

Total Monthly Medicaid and CHIP Enrollment, Pre-ACA Compared to August 2019, U.S., Competitor States, and Kentucky

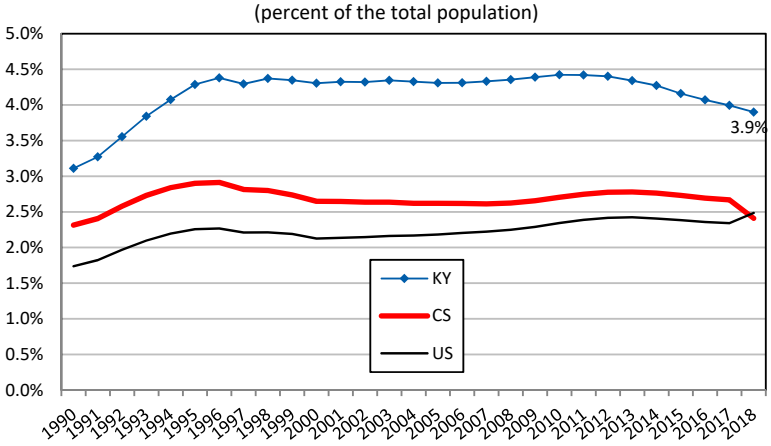
Area	Pre-ACA Average Monthly Enrollment	Total Monthly Medicaid/CHIP Enrollment	% Change	% Total Population Enrolled
US	**56,511,799**	**71,969,720**	**27%**	**22%**
AL	799,176	916,881	15%	19%
GA	1,535,090	1,812,703	18%	17%
IL	2,626,943	2,823,612	7%	22%
IN	1,120,674	1,451,253	30%	22%
KY	**606,805**	**1,209,350**	**99%**	**27%**
MS	615,556	609,659	-1%	20%
MO	846,084	831,826	-2%	14%
NC	1,595,952	1,737,811	9%	17%
OH	2,130,322	2,635,478	24%	23%
SC	889,744	1,036,851	17%	20%
TN	1,244,516	1,440,235	16%	21%
VA	935,434	1,328,805	42%	16%
WV	354,544	529,664	49%	29%
CS	**14,694,035**	**17,154,778**	**17%**	**19%**

Source: Kaiser Family Foundation, derived from CMS, Medicaid & CHIP Monthly Applications, Eligibility Determinations, and Enrollment Reports: January 2014 - August 2019 (preliminary), as of November 8, 2019.
Note: CS is a weighted average of the competitor states.

SUPPLEMENTAL SECURITY INCOME (SSI)

The Supplemental Security Income (SSI) is a Federal income supplement program that is administered by the Social Security Administration (SSA) and funded by general tax revenues (not Social Security taxes). According to the SSA, "It is designed to help aged, blind, and disabled people, who have little or no income, and it provides cash to meet basic needs for food, clothing, and shelter." Of Kentucky's 174,200 recipients in 2018, 5 percent were aged and 95 percent were blind and/or disabled. Nearly one-third of the recipients were either under 18 (14%) or over 64 years old (19%). As is evident by the figure, the percentage of Kentuckians receiving SSI benefits, 3.9 percent, is much higher than the U.S. (2.5%) or competitive state averages (2.4%).

Supplemental Security Income (SSI) Recipients, Kentucky, Competitor States, and the U.S., 1990-2018
(percent of the total population)

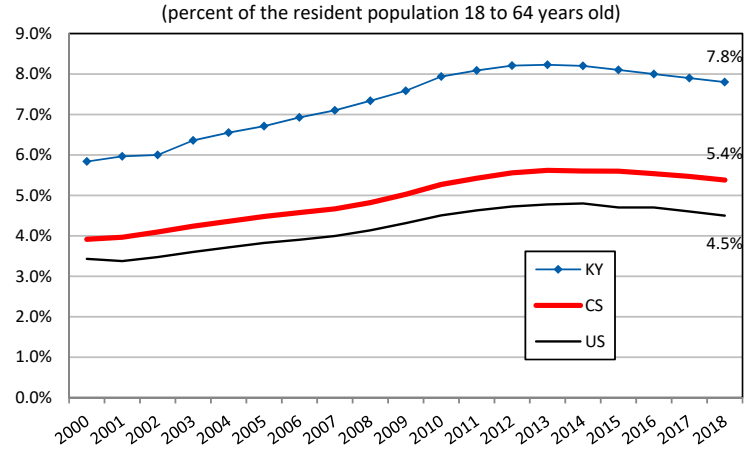


Source: The Administration for Children and Families, U.S. Department of Health and Human Services, U.S. Census, and the University of Kentucky Center for Poverty Research. 2018. "UKCPR National Welfare Data, 1980-2017." Lexington, KY. http://ukcpr.org/resources/national-welfare-data (accessed December 5, 2018). The 2018 number is taken from the U.S. Social Security Administration state-level data files.

DISABILITY INCOME (DI)

According to the Social Security Administration, "Studies show that just over 1 in 4 of today's 20 year-olds will become disabled before reaching age 67." The Social Security Disability Insurance (SSDI) program pays benefits to disabled individuals and some family members if the individual worked long enough and paid Social Security taxes. Kentucky has a higher than average disability rate so it is not surprising that a higher percentage of the state's population receive DI benefits. The percentage of Kentuckians between 18 and 64 years old who receive DI benefits is 7.8 percent, markedly higher than both the competitor state (5.4%) and U.S. (4.5%) averages. The average monthly benefit nationally for disabled workers is about $1,200.

Disability Income (DI) Recipients (18-64 Years Old), Kentucky, Competitor States, and the U.S., 2000-2018
(percent of the resident population 18 to 64 years old)

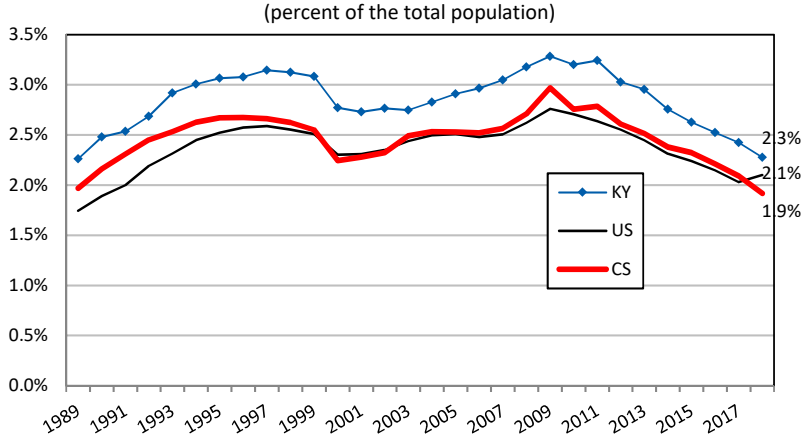


Source: Social Security Administration, Annual Statistical Report on the Social Security Disability Insurance Program, various years.

WOMEN, INFANTS, AND CHILDREN (WIC)

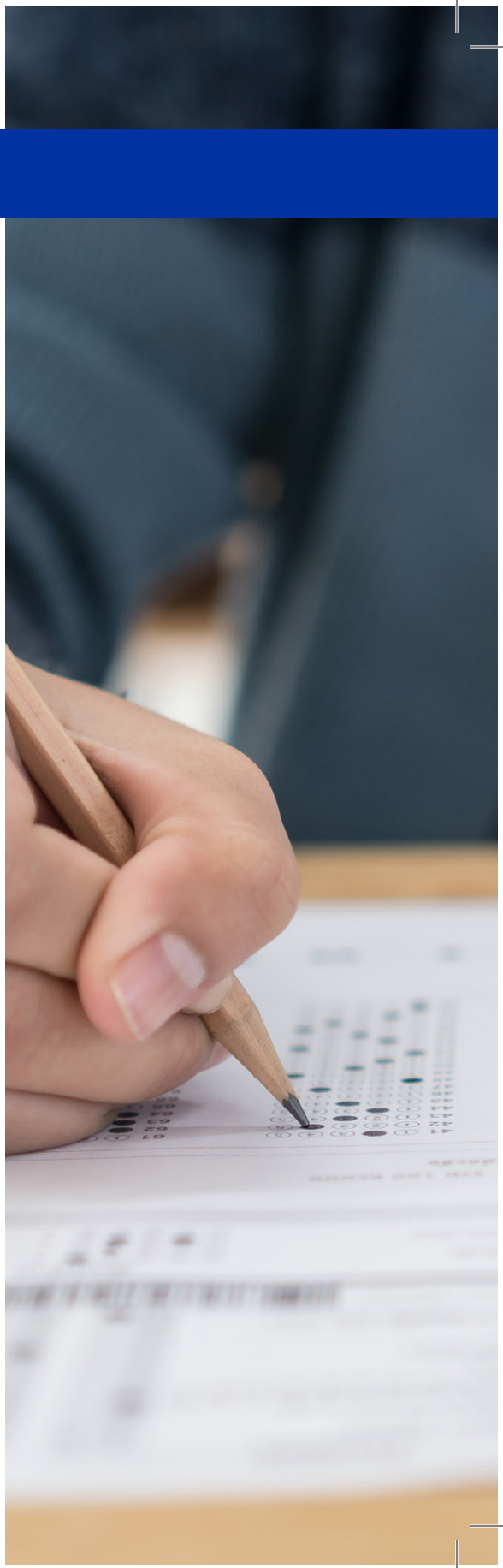
Women, Infants, and Children (WIC) is a federal nutrition program for "supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk." In Kentucky, around 2.3 percent of the population receives WIC benefits, representing a steady decline since its recent peak in 2010; in fact, Kentucky's percentage is at its lowest point since the late 1980s. Kentucky's percentage is only slightly higher than the U.S. (2.1%) and competitor states (1.9%).

Women, Infants, and Children (WIC) Recipients, Kentucky, Competitor States, and the U.S., 1989-2018
(percent of the total population)



Source: The Administration for Children and Families, U.S. Department of Health and Human Services, U.S. Census, and the University of Kentucky Center for Poverty Research. 2018. "UKCPR National Welfare Data, 1980-2017." Lexington, KY. http://ukcpr.org/resources/national-welfare-data (accessed December 5, 2018). The 2018 number is from USDA data files.

Education



ACCORDING TO A 2019 ANALYSIS of federal employment data by *The Wall Street Journal*, "College-educated workers are taking over the American factory floor." This is a long-term trend—more than 40 percent of manufacturing workers have two- or four-year college degrees, up from 22 percent in 1991. They project that "within the next three years, American manufacturers are, for the first time, on track to employ more college graduates than workers with a high-school education or less…" As manufacturing employment grows, jobs are being filled by individuals with higher levels of education, training, and problem-solving skills. The reason is simple: factories are increasingly computerized, automated, and highly advanced workplaces that require workers with commensurate levels of sophistication.

Education is expensive for both the individual and the taxpayer. In fiscal year 2019, 40.8 percent of Kentucky's total state expenditures went to either elementary and secondary education (17.2%) or higher education (23.6%), 11.2 percentage points higher than the national average of 29.6 percent (NASBO, *State Expenditure Report, 2019*). Since the 2008-09 academic year, the annual tuition and mandatory fees in-state students pay to study at the state's eight public universities and 16 community and technical colleges have collectively increased at an average rate of 4.5 percent per year, according to data from the Kentucky Council on Postsecondary Education (*Louisville*

continued on the next page

continued from the previous page
Courier Journal, February 11, 2019). During the same time period, the average annual growth rate in per capita personal income in Kentucky was 2.7 percent.

Education might be expensive, but the lack of education is even more costly. Investments in education yield multiple dividends. According to a 2016 RAND study, government spending on early childhood education returns $2 to $4 for every $1 invested. And, as one climbs the educational ladder, the resulting economic benefits, such as higher income and lower unemployment, get larger, especially for those with a four-year degree or higher. Likewise, there is a clear and consistent pattern with higher levels of education associated with better health, less dependence on public assistance, and increased technology use—just to name a few other benefits. And what is generally good for the individual also benefits the wider community—such as lower crime rates and more volunteerism.

Increasing educational attainment, as well as educational achievement, has measurable positive benefits. Stanford economist Eric Hanushek and his colleagues published a study in 2016 estimating a strong connection between academic achievement and state-level economic growth. They found, for example, that if Kentucky students performed at the same level as those in Minnesota—the state with the highest performing students in the country—then gains to Kentucky's GDP over the next 80 years could top $1 trillion or 5 times the current level.

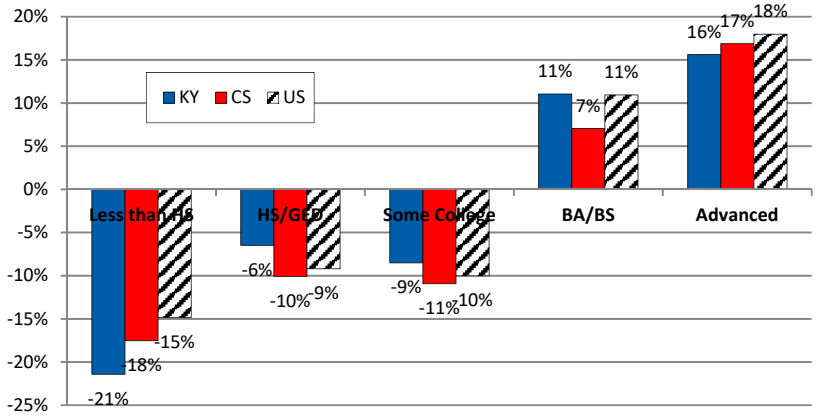
Kentucky's educational status has improved since the early 1990s, when its educational reputation was at a low point. Our analysis shows that Kentucky is statistically higher than 9 states, lower than 16, and statistically no different from 23, based on 12 educational attainment and achievement factors combined into a single index. To improve educational outcomes in Kentucky, we cannot limit our focus solely to the classroom. Kentucky faces many obstacles to cost-effective educational performance, ranging from high poverty to poor health. Moderating the harmful effects of poverty on learning will help to reduce these obstacles and facilitate even higher returns.

Our analysis shows that every year a select group of Kentucky school districts perform better than expected on measures of educational achievement. These measures include things like the percentage of elementary students who achieve proficiency or distinguished in reading, or the proportion of less-advantaged middle school students who show a similar level of competency on the math assessment. These districts are located in all areas of the state: urban, rural, wealthy, and resource deprived. The key to moving the needle on educational performance in the state is to strategically invest resources in the programs and places offering the highest returns on those investments.

WAGES AND EDUCATION

Those with higher levels of education have realized wage gains since the 1970s, while those with only a high school credential, or less, have experienced large declines in hourly wages. These data include hourly earnings for workers paid by the hour (*excluding* overtime, tips, commissions, and bonuses), as well as the usual hourly earnings for nonhourly workers (*including* overtime, tips, commissions, and bonuses). The labor market in the U.S. has changed significantly over the last three and a half decades. Real hourly wages (inflation removed) for Kentuckians with only a high school credential declined by about 6 percent from the late 1970s to the present. At the same time, the wages of those individuals with a Bachelor's degree increased by 11 percent. As is evident by the chart, the same pattern has played out in the competitor states and across the U.S. The lesson here is clear: to get ahead financially in today's labor market, it is essential to have higher levels of education.

Cumulative Change in Median Real Hourly Wages, 1979-1981 to 2016-2018, by Educational Attainment, Kentucky, Competitor States and the U.S.

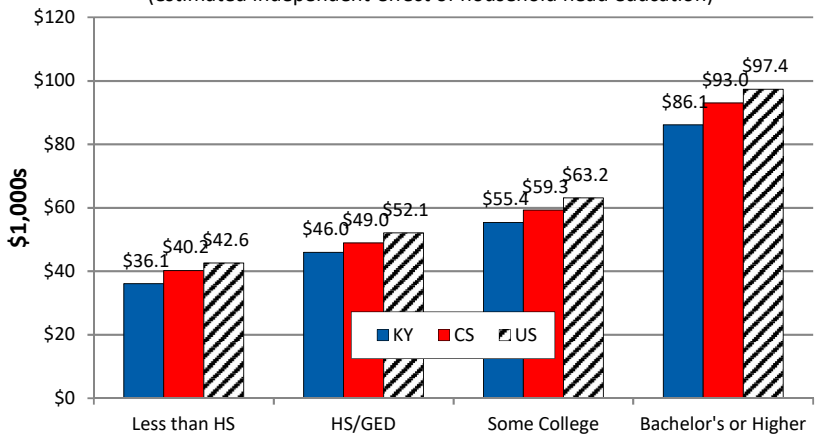


Source: Author's analysis of CPS Outgoing Rotation Group (ORG) data using files created by the Center for Economic Policy Research (CEPR), available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/.

FAMILY INCOME BY EDUCATION

Economists and other researchers have long demonstrated the relationship between education and earnings. Using data from the U.S. Census Bureau American Community Survey (ACS) for the years 2014-2018, statistical methods were implemented to isolate the impact of education on earnings from the many other known factors such as age and gender which affect earnings as well. In Kentucky, there is roughly a $10,000 difference for a family where the head of the household has less than a high school credential, a high school diploma or equivalent, or some college—which includes an associate's degree; even more striking, earning a bachelor's degree or higher leads to an 87% higher family income than a family headed by a high school graduate.

Estimated Family Income by Education,
Kentucky, Competitor States, and the U.S., 2014-2018
(estimated independent effect of household head education)

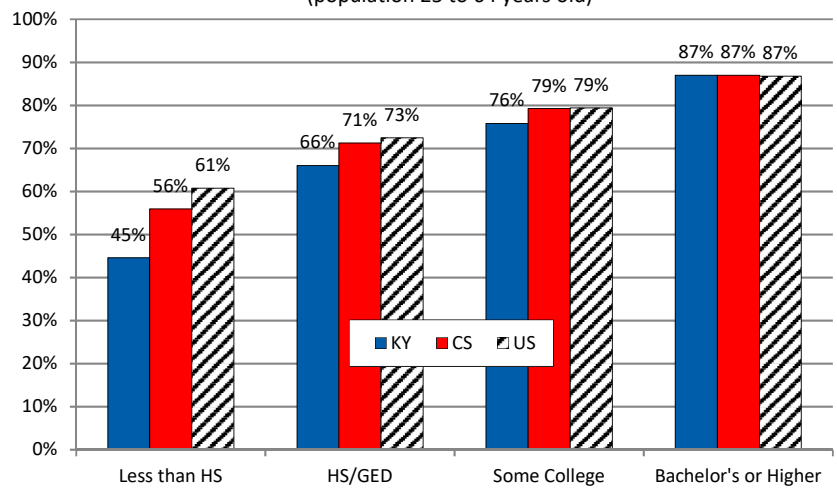


Source: Estimated by the author using data courtesy Steven Ruggles, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas and Matthew Sobek. IPUMS USA: Version 9.0 [ACS 2014 to 2018]. Minneapolis, MN: IPUMS, 2019. https://doi.org/10.18128/D010.V9.0

LABOR FORCE PARTICIPATION BY EDUCATION

While it is well known that a positive relationship exists between educational attainment and earnings for those who are in the labor market, an important part of how education impacts the economy is the labor force participation rate. Looking at labor force participation rates in 2018 for Kentucky, the competitor states, and the U.S. overall, the graph below shows the clear relationship between educational attainment and labor force participation. These data illustrate a consistent rise in the labor force participation rates as education levels increase from a high school diploma to a post-secondary degree.

Labor Force Participation by Education, 2018
Kentucky, Competitor States, and the U.S.
(population 25 to 64 years old)

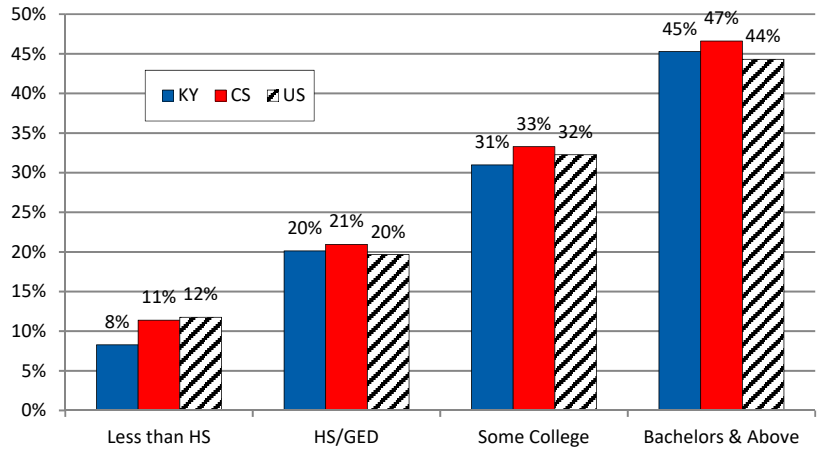


Source: American Community Survey, 2018 1-Year Estimate, Table S2301

Volunteer Rate by Education

In the Community section of this report, we present data on volunteer rates for Kentucky, its competitor states, and the U.S., and discuss some of the social and economic benefits that result from high levels of community service and volunteerism. In the figure below we present volunteer rates for Kentucky, its competitor states, and the U.S. for four broad education groups: individuals with less than a high school degree, individuals with a high school degree only, individuals with some college (including associates degrees), and individuals with at least a bachelor's degree. The percentages below reflect the net effect of education on volunteering while holding other factors constant, such as income, gender, race, urbanity, and age. Kentucky's volunteer rates shown in the figure are consistent with the U.S. and competitor states for all of the education categories. There is, in addition, a clear and consistent relationship between increasing education levels and higher rates of volunteerism. Individuals with a bachelor's degree volunteer at a significantly higher rate than those with less education. This is important given the social and economic benefits realized from volunteer activities.

Volunteer Rate by Education, 2017
Kentucky, Competitor States and the U.S.
(net effect of educational attainment, ages 25 and older, percentage)

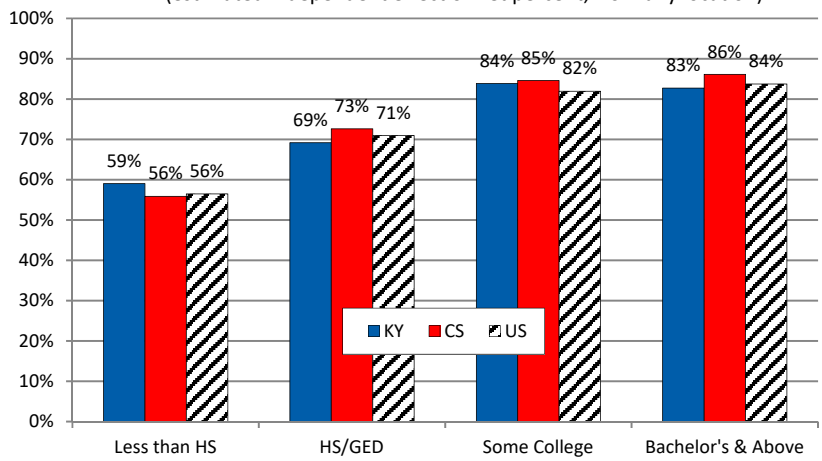


Source: Author's analysis of September 2017 Current Population Survey (CPS) Volunteer Supplement data

TECHNOLOGY USE BY EDUCATION

Research shows that because the Internet permeates so many aspects of our lives, access to and use of it appear to be increasingly important for anyone becoming politically informed, socially integrated, and economically successful in the Information Age. Studies suggest that "Internet use increases employment and income, enhances consumer welfare, and promotes civic engagement," (NTIA, 2013), and that enhancing the nation's broadband infrastructure can improve innovation, entrepreneurship, and productivity. The importance of high-speed Internet access promises to become even more important in the future as online education becomes more firmly rooted. Analysis conducted by CBER shows that the independent effect of education (holding income, gender, age, race, and urbanity constant) is strong. For example, individuals in Kentucky with a Bachelor's degree or higher have a much higher probability of accessing the Internet (83%), ranging from locations such as home, work, school, library, cafe, a friend's house or some other place, than someone with a high school diploma (69%). This relationship is consistent across all levels of education and all geographic regions shown.

Individuals who Access the Internet by Education Level, Kentucky, Competitor States, and the U.S., 2017
(estimated independent effect or net percent, from any location)



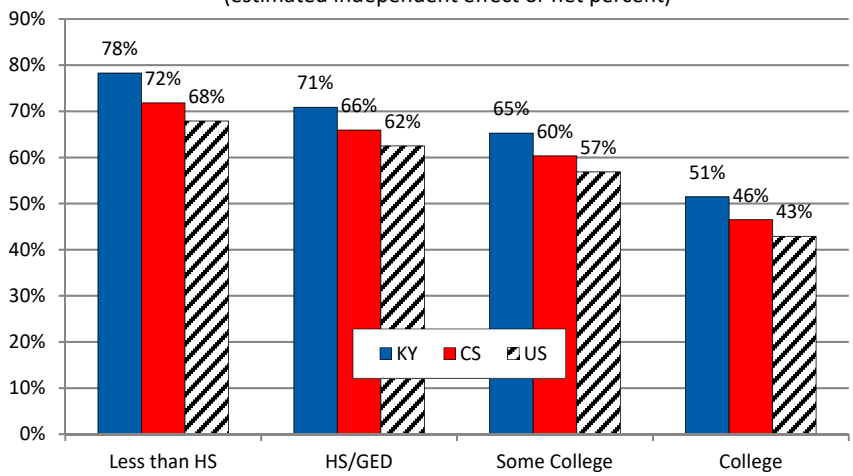
Source: Estimated by the author using CPS November 2017 Computer and Internet Supplement data

Health by Education

It is estimated that more than 75 percent of health care costs are due to chronic conditions such as heart disease, cancer, stroke, diabetes, and arthritis. Much of the chronic disease is caused by four *preventable* health risk behaviors—lack of exercise, poor nutrition, smoking, and heavy alcohol consumption. When compared to the U.S. as well as states that are widely considered to be Kentucky's competitors for economic development prospects, Kentuckians are more likely to smoke, be obese, and not engage in regular physical activity. However, higher levels of education are generally associated with healthier behaviors and lower rates of chronic diseases. We analyzed data from the Behavioral Risk Factor Surveillance System (BRFSS) to explore these relationships. These data represent a comprehensive sample of Kentuckians and provide information on whether a person is at risk for chronic disease, evidenced by the four health risk behaviors. Our models control for other factors, such as race, gender, age, and income, and estimate differences in chronic disease risk behaviors by education levels. For Kentucky, the competitor states, and the U.S. overall, the chronic disease risk behaviors decrease as education levels go up. In Kentucky, for example, the estimated chronic disease risk behaviors go from 71 percent to 51 percent as educational attainment increases from a high school diploma to a college degree.

Estimated Chronic Disease Risk Behaviors by Education, Kentucky, Competitor States, and the U.S., 2014-2018

(estimated independent effect or net percent)



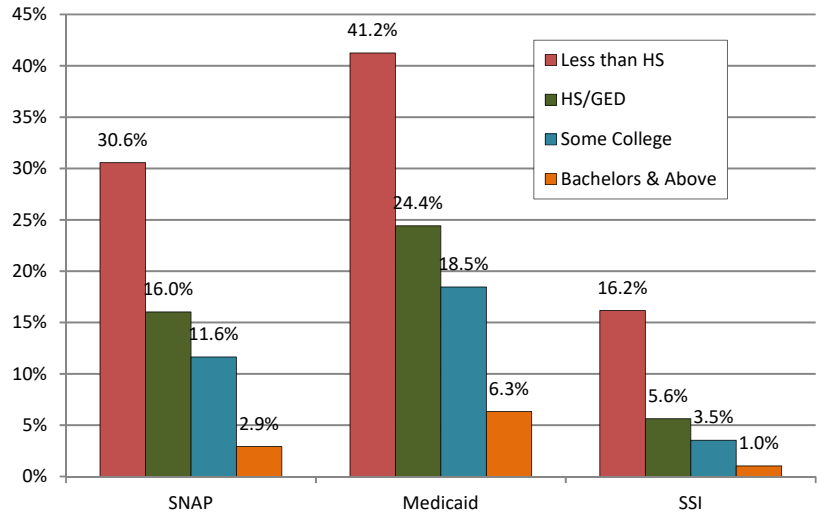
Source: Estimated by the author using CDC Behavioral Risk Factor Surveillance System data, data pooled for 5 years, 2014 to 2018

PUBLIC ASSISTANCE BY EDUCATION

In Kentucky, the percentage of *high school graduates* who are the head of a household and at least 25 years old receiving SNAP benefits (the Supplemental Nutrition Assistance Program previously known as Food Stamps), Medicaid health benefits, Supplemental Security Income (SSI), or public assistance income is 3.7 times higher than those with a *bachelor's degree or higher*. For example, as illustrated below, the percentage of Kentucky high school graduates (household head and 25 or older) participating in SNAP is 16 percent compared to 2.9 percent for those with a 4-year college degree. Importantly, this relationship—higher levels of educational attainment associated with lower levels of public assistance program participation—holds across a range of public assistance programs including, of course, those shown in the chart but not limited to these three programs. Research done, for example, by the College Board and RAND shows a robust relationship across several public assistance programs, such as the National School Lunch Program, Unemployment Insurance, and various housing programs. Our research estimates show that the SNAP, SSI, and Medicaid participation rates all decline as education levels increase. In short, investing in education reduces the need and usage of public assistance programs.

Public Assistance by Education Level, Kentucky, 2018

(head of households, 25 or older, percent receiving assistance)

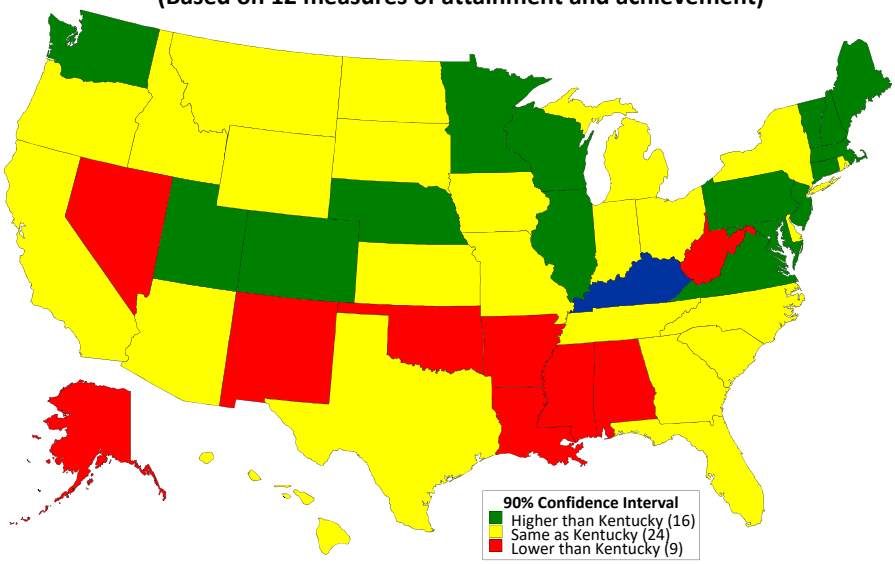


Source: Author's analysis of PUMS, 2018 sample

Education Index

The map below shows how educational outcomes in Kentucky compare to those in other states. Based on 12 educational attainment and achievement factors combined into a single index (see the table on the following page), Kentucky is statistically higher than 9 states, lower than 16 states, and no different statistically from 24 states (using a 90% confidence interval). Looking at Kentucky's competitor states, this Index shows that Kentucky ranks higher than Alabama, Mississippi, and West Virginia, but lower than Illinois and Virginia. There is not a statistically significant difference between Kentucky and the other competitor states (i.e., Georgia, Indiana, Missouri, North Carolina, Ohio, South Carolina, and Tennessee).

Kentucky's Educational Quality Relative to Other States, 2015-2019
(Based on 12 measures of attainment and achievement)



Source: University of Kentucky, CBER, Created November, 2019

SELECTED EDUCATIONAL INDICATORS

Some key indicators used to compare states on educational outcomes are listed below. They include measures of educational attainment, such as the percentage of the population 25 to 54 (prime working age) with a high school diploma or bachelor's degree, as well as educational achievement, including the percentage of students scoring proficient or higher on the various National Assessment of Educational Progress (NAEP) reading, math, and science exams. Kentucky students were statistically no different from the national public students in 4th grade math, 4th grade reading, and 8th grade reading, but significantly lower in 8th grade math. On the other hand, Kentucky high school students continue to make significant gains in the percentage of recent graduates who are college and career ready as well as demonstrating Advanced Placement exam mastery. Finally, as evidenced by many of the indicators listed below, there is a considerable gap between Kentucky and the top tier of states. The top 16 states are those shown in the U.S. map on the facing page as statistically significantly higher than Kentucky on the education index.

Comparing Education Indicators for Kentucky, United States, and the Top 16 States, 2015-2019 (numbers are percentages)

Education Indicators	Kentucky	U.S.	Average for Top 16 States†
HS Diploma or Higher (2018)	90.1	89.6	92.2
Two-Year Degree (2018)	10.0	9.2	9.3
Bachelor's Degree or Higher (2018)	28.5	35.5	41.2
Adj. Cohort HS Grad Rate (2016-17)	89.7	84.6	86.5*
ACT % College/Career Ready (2019)	20.0	26.0	35.7
8th Grade Math NAEP (2019)	29.0	32.9	38.8*
8th Grade Reading NAEP (2019)	33.4	32.4	37.6*
8th Grade Science NAEP (2015)	34.5	33.1	40.0*
4th Grade Math NAEP (2019)	39.9	40.4	44.7*
4th Grade Reading NAEP (2019)	35.1	34.3	38.2*
4th Grade Science NAEP (2015)	44.4	36.5	42.9*
AP Exam Mastery (2018)	18.5	23.5	25.4*

†The top 16 states are statistically significantly higher than Kentucky (using a 90% confidence interval): CO, CT, IL, MA, MD, ME, MN, NE, NH, NJ, PA, UT, VA, VT, WA & WI.
*This is the average of the state averages—*not a weighted average* of these 16 states.
Note: HS Diploma, Two-Year Degree, and Bachelor's Degree are for those between 25 and 54, the prime working age. The NAEP data reflect the percentage of public students scoring proficient or higher, and the U.S. data represents the National Public.

Selected Obstacles to Education

While Kentucky has made educational progress, there is much to be done to improve educational outcomes—and not all of it strictly in the classroom. As is evident by the numbers in the table, obstacles to cost-effective educational performance are more prevalent in Kentucky than in most other places. Each of the factors listed below represents a potential obstacle to optimal educational performance and/or cost-effective educational spending. Considering factors like poverty, parental education, obesity, students' health status, disability rates, and missed school days, these obstacles, if addressed, would enable better educational outcomes in Kentucky.

Selected Obstacles to Cost-Effective Educational Performance, Kentucky, the U.S. & the Top 16 Performing States, 2016-2018 (percentages)

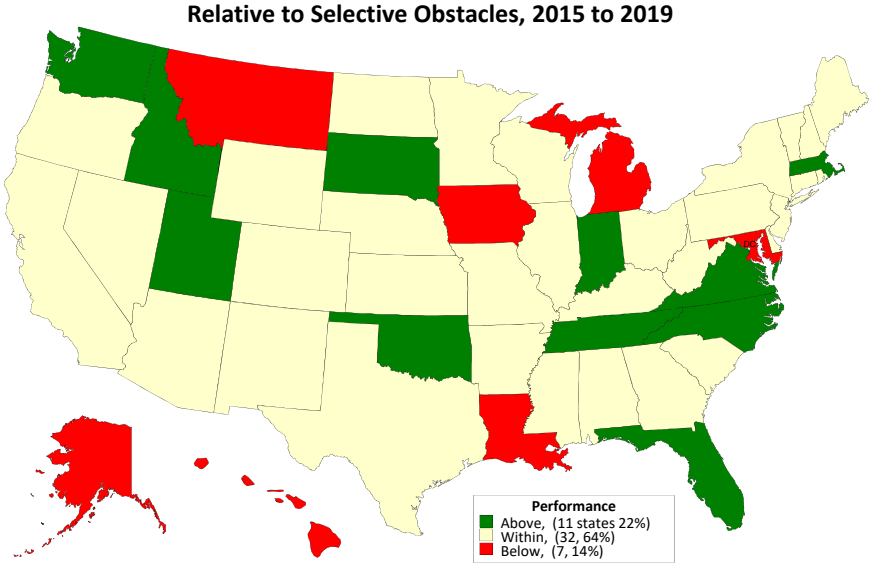
Obstacles	Kentucky	U.S.	Average Top 16 States†*
Children who have at least one parent with a postsecondary degree (2017)	46.5	50.8	59.1
Children eligible for free and reduced priced lunch (2017-18)	59.7	51.5	40.1
Students who live in rural areas (2016-17)	32.2	15.4	18.5
Children and teens (10 to 17) who are overweight or obese (2017-18)	38.0	30.8	28.0
Students with disabilities as a percent of public school enrollment (2017-18)	15.3	13.7	15.1
Limited English proficiency students as a of total enrollment (2016)	3.2	9.6	6.6
Children (6 to 17) who missed 11 or more school days due to illness/injury (2017-18)	4.8	4.0	4.2
Children (0 to 17) whose overall health is fair or poor (2017-18)	1.8	1.4	1.1

†The top 16 states based on the education index are: CO, CT, IL, MA, MD, ME, MN, NE, NH, NJ, PA, UT, VA, VT, WA & WI.
*These percentages are the averages of the state averages—not a weighted average of the top 16 states.

EDUCATIONAL SPENDING ROI

Kentucky's NAEP results show that, on average, an estimated 36.1 percent of 4th and 8th graders scored proficient or higher on the math, reading, and science exams (2015 Science results, 2019 Reading and Math results). With per pupil expenditures of $11,210 (adjusted for cost-of-living differences across the states), Kentucky gets an estimated 3.2 NAEP proficiency percentage points for every $1,000 in per pupil spending. Once we account for the relative differences in obstacles to optimal educational performance and/or cost-effective educational spending faced by the states (e.g., the obstacles are listed in the table on the facing page), we find that Kentucky and 31 other states perform as expected given the obstacles they face. There are 11 states that perform better than expected, and 8 states perform lower than expected.

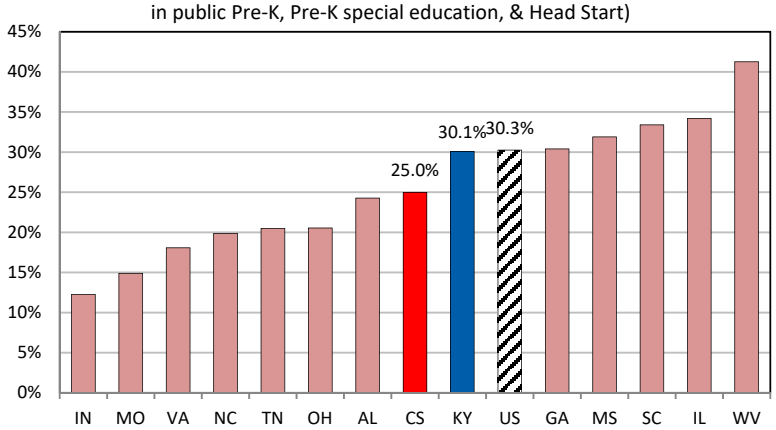
NAEP Proficiency/Distinquished Points per $1,000 per Pupil Spending Relative to Selective Obstacles, 2015 to 2019



PUBLIC PRE-K ENROLLMENT

The Kentucky Department of Education Kindergarten Readiness Screener data show that only half (51.1%) of the students who entered kindergarten in 2018 were ready when assessed on three scales: academic/cognitive; language development; and physical development. Moreover, children with Limited English Proficiency (31.2%), those receiving Free or Reduced Price Meals (41.1%), and those with a disability (34.2%) have even lower levels of readiness. Early childhood development programs can help. A 2016 RAND study—*Informing Investments in Preschool Quality and Access in Cincinnati: Evidence of Impacts and Economic Returns from National, State, and Local Preschool Programs*—touts their benefits. "High-quality preschool programs represent a significant investment of resources, but that investment may be paid back through improved outcomes during the school-age years and beyond," said the authors. They found that "credible estimates of the economic return for full-scale high-quality preschool programs range from about $2 to $4 for every $1 invested." Similarly, a 2009 CBER study estimated that in Kentucky "the total estimated benefit is more than $5 for every $1 the state would invest in an expanded pre-k program." According to estimates from the National Institute for Early Education Research, 30.1 percent of Kentucky's 3- and 4-year-olds are enrolled in *public* pre-kindergarden programs.

Estimated Enrollment in Pre-K Programs,
Kentucky, Competitor States and the U.S., 2018
(percent of all children 3- and 4-years-old
in public Pre-K, Pre-K special education, & Head Start)



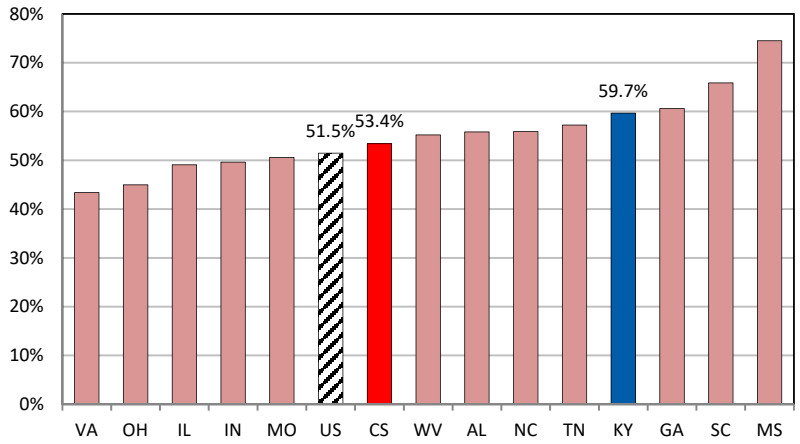
Source: Estimated from The State of Preschool 2018, State Preschool Yearbook, National Institute for Early Education Research. Note: These estimates likely include some double-counted children since some Head Start children are likely in State Pre-K programs too.

FREE- AND REDUCED-LUNCH ELIGIBILITY

Less-advantaged students face many obstacles to educational success. On average, students eligible for free- or reduced-priced lunch in Kentucky follow national trends and do not score as high on standardized tests such as NAEP when compared to students who are not eligible; the same is true for Kentucky's various state-specific assessment tools, such as the Kentucky Performance Rating for Educational Progress (K-PREP). Regardless of the assessment system, less-advantaged students do not perform as well, on average, as more-advantaged students. Researchers at organizations like the Education Trust, for example, have examined the underlying reasons for the achievement gap and identified several systemic causes. A student's eligibility for the free-lunch program is determined by household income and size. During the 2017-2018 school year, Kentucky ranked above the national average with 59.7 percent of public school students eligible for a free- or reduced-priced lunch. The national average is 51.5 percent. Among the 50 states, Mississippi has the highest percentage at 74.5 percent while New Hampshire has the lowest at 26.3 percent.

Students Eligible for Free or Reduced-Price Lunch, 2017-18, Kentucky, Competitor States, and the U.S.

(percent of public school students, school year 2017-18)



Source: National Center for Education Statistics - http://nces.ed.gov/ccd/elsi/, Downloaded 10/23/2019

Performance on Standardized Tests

The National Assessment of Educational Progress (NAEP), commonly known as the "Nation's Report Card," gauges student progress in a variety of subject areas, including reading, mathematics, and science. Here we present the test results for 4th and 8th graders from 2005 to 2019. Over this time period, Kentucky 4th graders experienced large gains in math and more modest gains in reading. At the 8th grade level, Kentucky students have demonstrated modest gains in math, but have consistently trailed the national performance. Reading proficiency for Kentucky 8th graders rose to levels that were significantly higher than the national percentages in 2011 and 2013, but have since fallen to a level reached a decade ago in 2009. Performance in science has been unchanged, but generally better than the national public. In 2019, Kentucky students were statistically no different from the national public students in 4th grade math, 4th grade reading, and 8th grade reading, but significantly lower in 8th grade math. While 33 percent of the nation's 8th graders scored proficient or higher on the math assessment in 2019, around 29 percent reached this level in Kentucky—a statistically significant difference.

Kentucky's Math, Reading, and Science NAEP Results, Percentage Scoring Proficient or Higher, By Subject, Grade, and Year

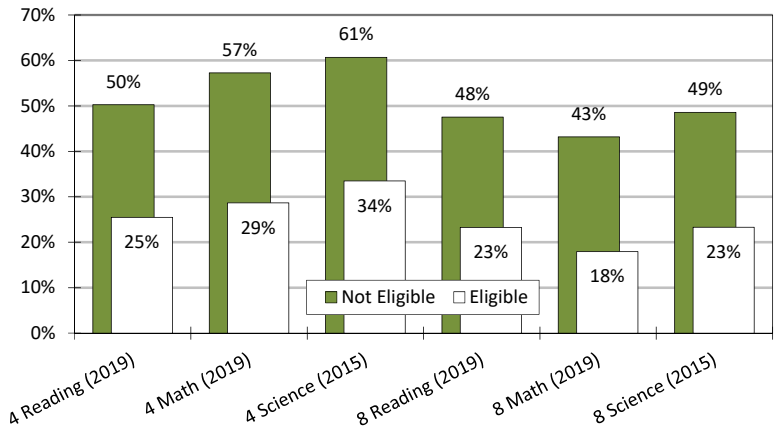
	2005	2007	2009	2011	2013	2015	2017	2019
Math 4	26↓	31↓	37	39	42	41	40	40
Math 8	23↓	27↓	27↓	31↓	30↓	28↓	29↓	29↓
Reading 4	31	33	36↑	35	36	40↑	38	35
Reading 8	31	28	33	36↑	38↑	36	34	33
Science 4	-	-	45↑	-	-	44↑	-	-
Science 8	-	-	34↑	34↑	-	35	-	-

Source: National Center for Education Statistics (NCES), Institute of Educational Sciences (IES), National Assessment of Educational Progress (NAEP), Kentucky State Profile.
Note: A dash (-) in the cell indicates that this test was not taken by Kentucky students. An arrow pointed down (↓) next to a number indicates that the percentage is statistically significantly lower than the National public percentage. Conversely, an arrow pointed up (↑) next to a number indicates that the percentage is significantly higher. No arrow indicates that the Kentucky percentage is not significantly different from the National public.

EDUCATIONAL ACHIEVEMENT GAP

A 2015 study authored by RAND Corporation economist Lynn Karoly on the economic consequences of the achievement gap in Pennsylvania illustrates the magnitude of these costs for the wider society. In Kentucky, the academic success of disadvantaged children will affect whether the state's future remains one of disproportionate poverty or gives way to rising prosperity. Economic disadvantage has a significant negative drag on academic performance, and the sheer number of economically disadvantaged students in Kentucky adversely affects overall performance on both state and national tests. Kentucky has one of the nation's largest populations of students eligible for free or reduced-price lunches (59%), a reliable proxy for poverty and need. The different outcomes on the National Assessment of Educational Progress (NAEP) exams are stark. The percentage of students scoring at or above proficiency is consistently and markedly lower for less-advantaged students in every subject area. As evident below in the figure, proficiency levels for less-advantaged students are generally less than half the level of more-advantaged students. Were we to close the substantial academic gaps associated with inequities, Kentucky students would be performing at dramatically higher levels relative to their national peers and our goals for education would be nearly realized.

Kentucky 2015 & 2019 NAEP Results by Free- and Reduced-Lunch Eligibility
(percent of students scoring at or above proficient)

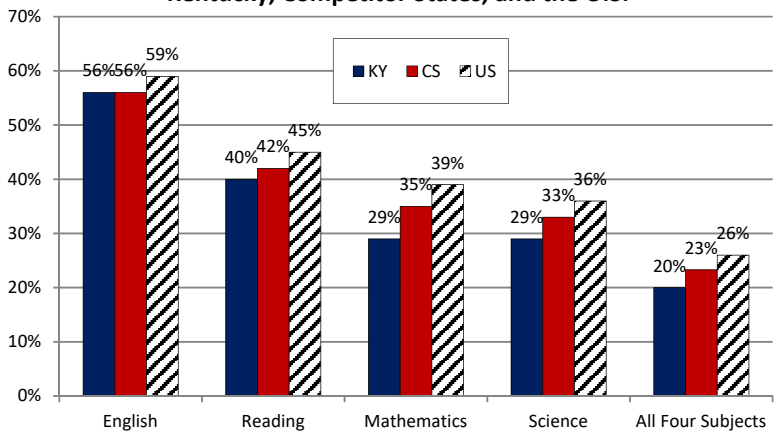


Source: https://www.nationsreportcard.gov/ndecore/xplore/NDE

COLLEGE READINESS

An estimated 20 percent of Kentucky's recent high school graduates are considered "college ready" in all four of the tested subjects—English, reading, mathematics, and science—a decrease from 22 percent in 2018. The percentage of students nationally and in the competitor states who are "college ready" in all four subjects is higher than it is in Kentucky, 26 and 23 percent respectively. It should be noted that one reason for Kentucky's lower percentage is that since 2009 state law mandates that every 11th grader take the ACT—even those who have no interest or intention of going to college. In contrast, 68 percent of the graduating class in the competitor states and 52 percent nationally took the ACT in 2019. At 56 percent, Massachusetts has the highest percentages of students "college ready" in all four subjects, but only 21 percent of Massachusetts students took the ACT in 2019—and these are likely self-selected, college-bound students.

Percent of 2019 ACT-Tested High School Graduates Meeting College Readiness Benchmarks by Subject, Kentucky, Competitor States, and the U.S.

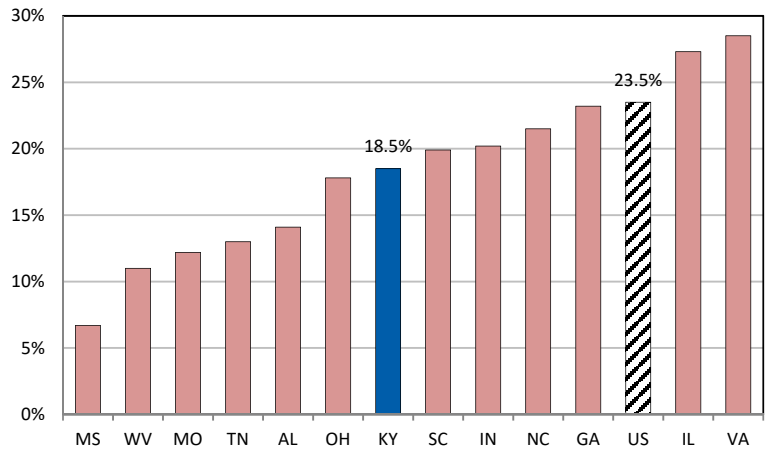


Source: The Condition of College & Career Readiness, 2019, various state reports, ACT, Inc.

ADVANCED PLACEMENT EXAM MASTERY

In order to pass an Advanced Placement (AP) examination, a high school student must demonstrate mastery of college-level material. Indeed, many colleges and universities award college credit for students showing AP mastery (scoring 3+ on an exam). The National Conference of State Legislatures reports that 28 to 40 percent of first-time undergraduates take at least one remedial course. These high percentages highlight the importance of high school students being challenged academically so they are better prepared in college. The College Board, which administers the advanced placement program, offers 35 different AP exams each spring on subjects ranging from Art History to Calculus to Macroeconomics. In 2018, there were 1.24 million U.S. public high school graduates who had taken an AP exam at some point, with 23.5 percent scoring a 3 or higher. This is a substantial increase from the 15.3 percent in 2008. Kentucky's students have also increased their performance on AP exams over the years, from 10 percent in 2008 to 18.5 percent in 2018—the fifteenth highest increase of all the states and DC during this ten year period. Massachusetts had the highest percentage of students in the class of 2018 scoring a 3 or higher on an AP exam during high school—32.9 percent. Mississippi, at 6.7 percent, was the lowest.

High School Students Scoring 3+ on AP Exams, Kentucky, Competitor States, and the U.S., 2018
(percent of graduating students)

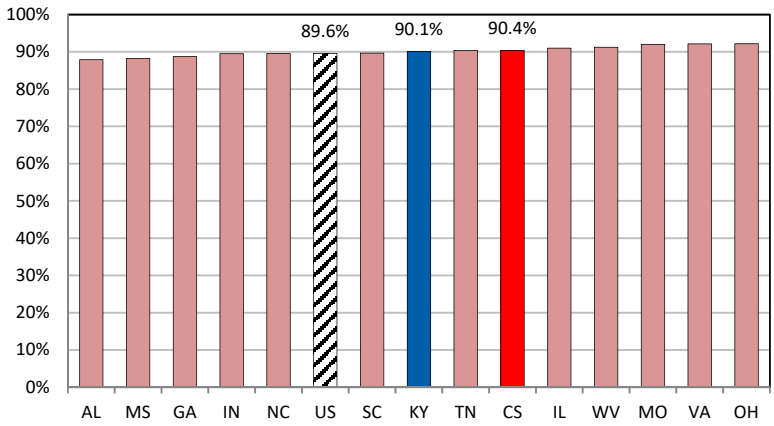


Source: College Board, AP Report to the Nation, various years, and the AP Cohort Data, Graduating Class, 2018

HIGH SCHOOL ATTAINMENT

Kentucky's labor force increasingly competes in a global environment that demands rising levels of educational attainment. At a minimum, today's workers need a high school diploma. Following the education reforms of the early 1990s, Kentucky's adult population (25 and older) made significant gains, as the portion with a high school diploma or higher rose from 65 percent in 1990 to 87.1 percent in 2018. At the same time, the nation improved to 88.3 percent, which is a statistically significant difference from Kentucky's 87.1 percent. Looking just at those individuals 25 to 54—the prime working age group—Kentucky's 90.1 percent is statistically the same as the U.S. average of 89.6 percent as well as the competitor state average of 90.4 percent. Among the competitor states, Mississippi, Alabama, and Georgia have statistically significant lower rates, while four states are statistically significantly higher (i.e., OH, VA, MO, & IL); Indiana, North Carolina, South Carolina, Tennessee and West Virginia are statistically the same as Kentucky. Among all states, 26 are higher, 9 are lower, and 14 are statically the same as Kentucky. Texas has the lowest high school attainment rate (85.4%) and Maine has the highest (94.7%).

High School Graduate or Higher,
Kentucky, Competitor States and the U.S., 2018
(percent of individuals 25 to 54 years old)

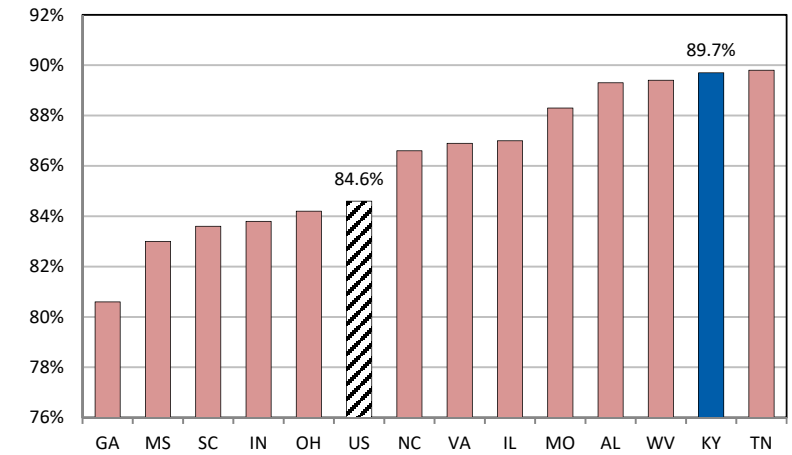


Source: Estimated from 2018 American Community Survey 1-Year PUMS
Note: CS is the weighted average of the competitor states.

HIGH SCHOOL GRADUATION RATE

High-school graduation rates hit a new high of 84.6 percent in the U.S. in the 2016-17 academic year, according to the Department of Education, continuing a seven-year trend of gains in a basic and fundamental credential for gaining employment and access to higher education and training. There are important economic consequences of dropping out of high school—for the individual, of course, but also for the wider community. The U.S. Department of Education data shown in the figure below are the latest data for the competitor states and Kentucky, which are for the 2016-2017 school year. As one can see by the figure, Kentucky is well positioned among the competitor states with a 89.7 percent adjusted cohort graduation rate (ACGR). At 91 percent, Iowa has the highest ACGR in the country while New Mexico has the lowest at 71 percent.

Graduation Rate, 2016-2017 School Year, Kentucky, Competitor States, and the U.S.
(four-year regulatory adjusted cohort graduation rate)

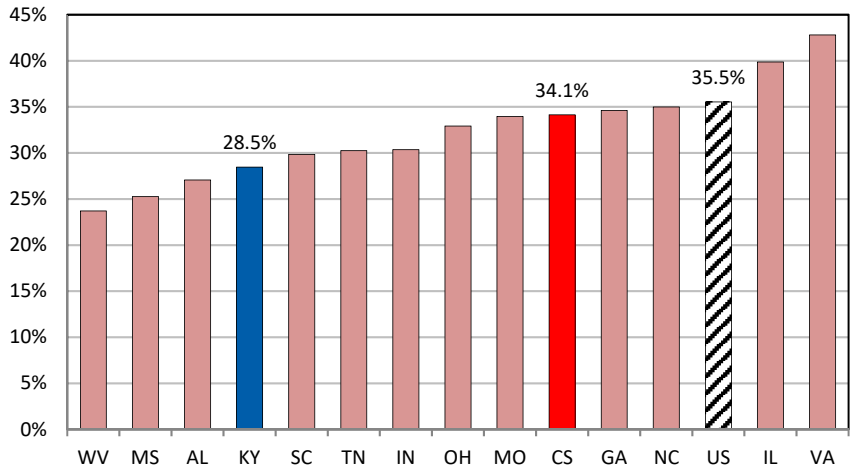


Source: U.S. Department of Education

COLLEGE ATTAINMENT

Kentucky workers face growing competition for low-wage, low-skill jobs, and increasingly for high-skill jobs. Today, any "routine" job and a growing number of high-skill jobs can be automated and outsourced. Competition in such an environment requires providing something that others cannot. That "something" will come from workers who have high levels of education and skill. Essentially, the rigors of the global economy require creative, highly-skilled, college-educated workers. Since 1990, Kentucky has made important progress, as the proportion of adults 25 and older with a four-year degree or higher climbed from 13.6 percent to 25.2 percent in 2018; by comparison, the U.S. percentage in 2018 was 32.6. Among prime working age adults 25 to 54, however, the state continues to significantly lag the competitor states and the nation in educational attainment at the college level—28.5 percent for Kentucky compared to 34.1 and 35.5 percent for the competitor states and U.S. respectively. Virtually all of the competitor states are statistically significantly higher than Kentucky. South Carolina is statistically no different from Kentucky, but Alabama, Mississippi and West Virginia are significantly lower. Massachusetts has the highest rate in the nation (49.8%) and West Virginia the lowest (23.7%). Nationally, 37 states have higher rates than Kentucky while 7 are lower (5 are statistically the same as Kentucky).

Bachelor's Degree or Higher,
Kentucky, Competitor States and the U.S., 2018
(percent of individuals 25 to 54 years old)



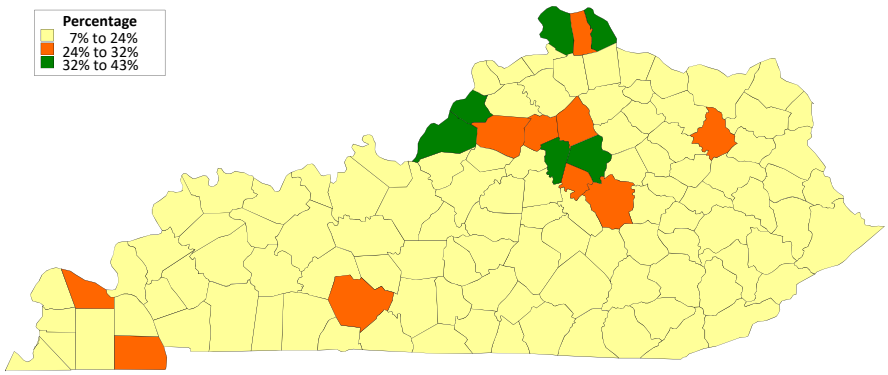
Source: Estimated from 2018 American Community Survey 1-Year PUMS
Note: CS is the weighted average of the competitor states.

COLLEGE ATTAINMENT BY COUNTY

There are six Kentucky counties where the percentage of the population with a bachelor's degree or higher (using the 2014-2018 five-year estimate) exceeds the U.S. average of 31.5 percent. These six counties anchor the so-called urban triangle—Fayette (42.9%), Oldham (42.2%), Campbell (33.5%), Woodford (32.9%), Jefferson (32.7%), and Boone (31.6%). There are ten counties that are above the Kentucky average of 23.6 percent but below the U.S. average—ranging from Shelby County's 24.2 percent to Warren County's at 30.6 percent. Kentucky's remaining 104 counties are below the Kentucky average, with several in the single digits. It is extremely difficult for any geographic region—whether a city, a county, a state, or a country—to be globally competitive without a skilled and educated population.

Kentucky County-Level Bachelor's Degree or Higher, 2014-2018

(percent of individuals 25 years old or older)

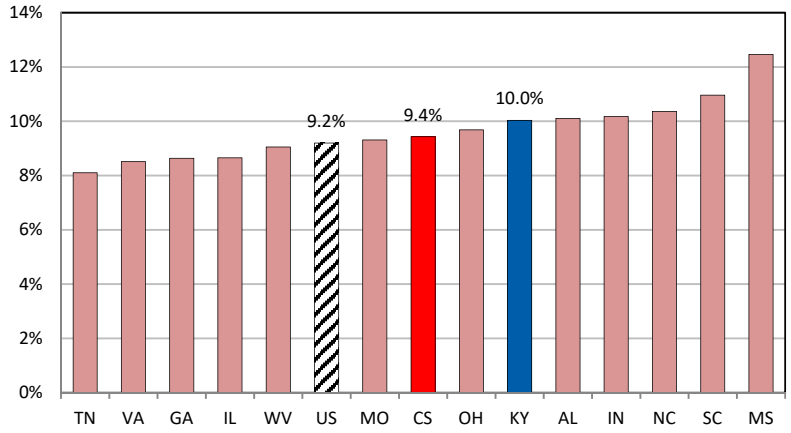


Source: American Community Survey, 2018 5-Year Estimate, Table S1501

Associate's Degrees

The associate's degree is a terminal degree for many people, while others use it as a springboard toward a bachelor's degree. Our analyses on the economic and societal benefits of postsecondary education shows that an individual with an associate's degree or a bachelor's degree will, on average, have higher income, less unemployment, and better health outcomes—to name a few of the benefits afforded by higher education—than someone with lower levels of education. The percentage of prime working age adults between 25 and 54 years old in Kentucky with an associate's degree is 10 percent. Among the competitor states, several have statistically significant lower percentages (i.e., GA, IL, TN & VA), and this also includes the weighted average of the competitor states (9.4%) and the U.S. (9.2%). Two competitor states, Mississippi and South Carolina, have statistically significant higher rates than Kentucky. Nationally, 12 states are higher, 22 are lower, and 15 are statistically the same as Kentucky. Maryland is the lowest at 7.1 percent and North Dakota is the highest at 16.9 percent.

Associate's Degree Attainment,
Kentucky, Competitor States and the U.S., 2018
(percent of individuals 25 to 54 years old)

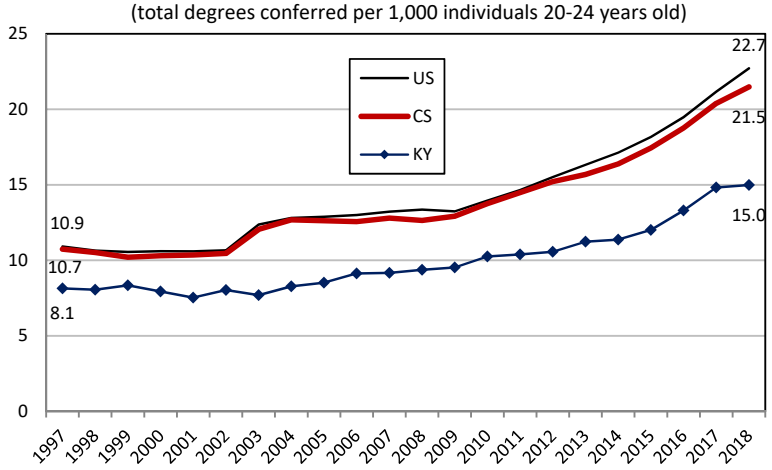


Source: Estimated from 2018 American Community Survey 1-Year PUMS
Note: CS is the weighted average of the competitor states.

SCIENCE AND ENGINEERING GRADUATES

Being competitive in the global economy depends upon many things—including continuous innovation in products and services and having a highly skilled workforce. It is especially important to have a workforce with a high level of science, technology, engineering, and mathematics (STEM) training and expertise. The national average wage for all STEM occupations in 2018 was $93,130, nearly double the national average wage for non-STEM occupations ($51,440). And not only are wages nearly double for STEM occupations compared to non-STEM occupations, so too is the job growth rate. Employment in STEM occupations grew by 19.2 percent nationally, or nearly 1.5 million jobs, between May 2007 and May 2018, compared with 6.6 percent growth in the number of jobs overall. While remaining substantially below the competitor states and the U.S., the total number of science and engineering degrees conferred per 1,000 individuals from 20 to 24 years old in Kentucky has increased since 1997—from 8.1 to 15. By comparison, the competitor states (21.5) and the U.S. (22.7) awarded significantly more STEM-designated bachelor's degrees in 2018. Over the last two decades, the percentage increase in these numbers is greater in the U.S. (108%) and the competitor states (100%) than in Kentucky (84%).

STEM-Designated Bachelor's Degrees Awarded, Kentucky, Competitor States, and the U.S., 1997-2018
(total degrees conferred per 1,000 individuals 20-24 years old)



Source: Author's analysis of Integrated Postsecondary Education Data System (IPEDS) data using 2013 designated CIP Codes to identify STEM degrees & U.S. Census data for population estimates

Exemplar School Districts

Every year a select group of Kentucky school districts perform better than expected on measures of educational achievement. These measures include things like the percentage of elementary students who achieve proficiency or distinguished in reading, or the proportion of less-advantaged middle school students who show a similar level of competency on the math assessment. Using a district-level database that includes educational and demographic data covering six years, 2012 to 2017, we estimate an expected level of performance and then compare it to the actual performance for each district. The difference between actual performance and model-based expected performance is the "residual." If the size of the residual is sufficiently large, we consider it a "bright spot." We evaluate seven different outcome measures to identify any districts that met two conditions: first, when considering all of the students, the district performed better than expected at least once during the time period analyzed; and second, when considering only less-advantaged students, the district performed better than expected in 2017. By using these two conditions, we identify twelve districts where all students (on average) perform better than expected at least once during this period, and less-advantaged students show steady progress over the time period culminating with a better-than-expected outcome in 2017.

TWELVE EXEMPLAR SCHOOL DISTRICTS
(Educational Bright Spots)

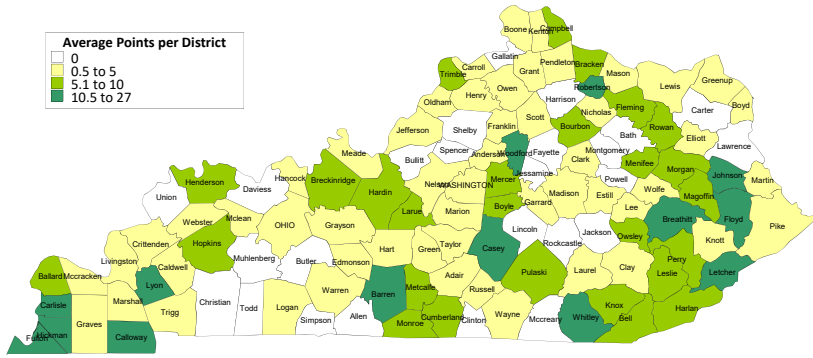
School District	Educational Outcome Measures
Barbourville Independent	ACT Mathematics College & Career Ready
Fleming County	K-PREP Middle School Mathematics
Grayson County	ACT Mathematics College & Career Ready
Hazard Independent	K-PREP Elementary Reading
Hickman County	K-PREP Middle School Reading
Jenkins Independent	K-PREP Elementary Reading
Monroe County	K-PREP Elementary Mathematics
Paintsville Independent	ACT Reading College & Career Ready
Pineville Independent	ACT Reading College & Career Ready
Robertson County	K-PREP Elementary Reading & Elementary Mathematics
Somerset Independent	K-PREP Middle School Mathematics
Woodford County	ACT Composite and ACT Mathematics College & Career Ready

Note: The seven measures analyzed include four K-PREP assessments, elementary and middle school reading and mathematics, and three ACT measures, the overall composite and percentage achieving college and career readiness for reading and mathematics. More details are available on the CBER website: http://cber.uky.edu/brightspots.

Bright Spot Performance Points

Kentucky school districts that perform better than expected are located in all regions of the state, as illustrated in the county-level map below. The points portrayed on the map represent the total number of "performance points" garnered at the county level adjusted by the number of districts in the county. For example, Campbell County has a total of 36.5 performance points, but we have adjusted the total by considering that there are 7 school districts in Campbell County—resulting in an adjusted bright spot performance point county value of 5.2. The main point is to illustrate the wide geographical distribution of bright spots across the Commonwealth. The complete report, *Kentucky School Districts as Educational Bright Spots*, is available online < http://cber.uky.edu/brightspots >.

Bright Spot Performance Points



Note: County-level performance points reflect an adjusted value for the number of districts in a county. For example, Campbell County's performance point total is 36.5, but this is adjusted to 5.2 since there are 7 different school districts in the county.

Energy

COMPELLED BY FINANCIAL concerns as well as environmental regulations, electric utility companies are gradually transitioning away from coal and toward natural gas as a fuel source. Natural gas accounts for 35.2 percent; coal, by comparison, accounts for 27.5 percent. The use of natural gas to produce electricity—and the concomitant decline in the use of coal—has been going on for about 20 years. In 1988, coal accounted for about 57 percent of the total megawatt hours generated and natural gas accounted for just over 9 percent.

Meanwhile, renewable energy continues to grow as an energy source. The U.S. Energy Information Administration (EIA) notes in its *Annual Energy Outlook 2019* that the United States will become less reliant on coal and nuclear power over the next three decades while increasing its usage of natural gas and renewable energy. The outlook report states that "(electricity) generation from both coal and nuclear is expected to decline in all cases (i.e., all alternative scenarios modelled). In the Reference case (which is the baseline forecasting model), from a 28% share in 2018, coal generation drops to 17% of total generation by 2050. Nuclear generation declines from a 19% share of total generation in 2018 to 12% by 2050. The share of natural gas generation rises from 34% in 2018 to 39% in 2050, and the share of renewable generation increases from 18% to 31%."

According to a June 2018 report in *The Wall Street Journal*, "global spending on renewable energy is outpacing investment

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in electricity from coal, natural gas and nuclear power plants, driven by falling costs of producing wind and solar power." The power of the global financial markets to impact the global energy portfolio suggests that no single entity can determine the future of energy generation—and the markets appear to be betting on renewables. Of Kentucky's total energy production, only 6.8 percent is from renewable sources, but it is growing rapidly. The U.S. and competitor states are, by comparison, much higher at 12.6 and 13.7 percent, respectively, and also growing rapidly.

Business is embracing "green," and the implications of a shifting energy landscape will be felt now and in the future as the Kentucky economy and labor markets are compelled to adapt and react. For example, Toyota, which employs approximately 8,000 individuals in Scott County, is encouraging its manufacturing plants to use increasing amounts of renewable and hydrogen energy as it pursues *Environmental Challenge 2050*, its corporate-level plan of zero CO_2 emissions. Toyota is not alone. Some of the largest corporate employers in Kentucky—GE, UPS, Ford, and Walmart—have environmental and energy plans to reduce greenhouse gases and use more renewable energy.

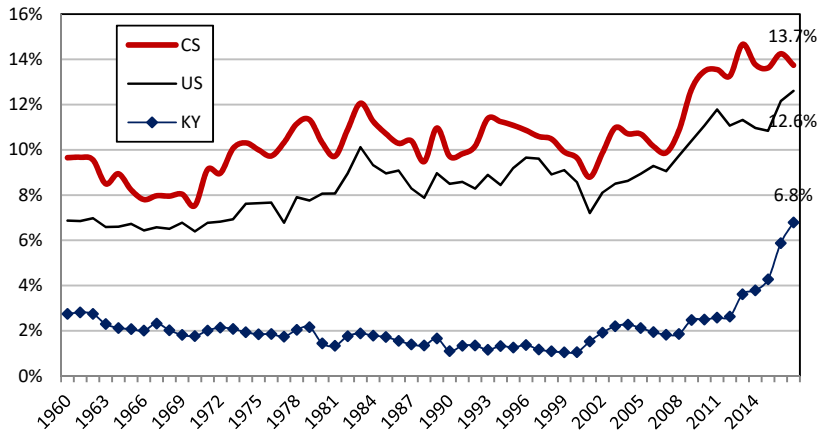
There are important future economic implications for Kentucky as a result of this anticipated shift in energy production. As noted in the U.S. Department of Energy, *United States Energy and Employment Report (USEER)*, "rising employment in solar, wind, and natural gas coincides with the shift in energy generation by source, especially given recent large-scale distributed and utility-scale solar capacity additions." The changing economics of the coal industry have been widely publicized. Cheaper sources of energy, like natural gas, more stringent air-quality regulations, and weaker-than-expected demand for coal in Asia are leading to decreases in the amount of coal produced in Kentucky.

The changing economics of the coal industry have been widely publicized. Cheaper sources of energy, like natural gas and renewables, more stringent air-quality regulations, and weaker-than-expected demand for coal in Asia are leading to decreases in the amount of coal produced in Kentucky. Statewide coal production continued to decline in 2018 to 39.6 million tons, a 5.2 percent decrease from 2017; this marks the lowest level of recorded annual production since 1954. Moreover, as of September 2019, an estimated 5,792 persons were employed at Kentucky coal mines. It has been 120 years since coal mining employment was this low.

RENEWABLE ENERGY PRODUCTION

Renewable energy sources include biomass, geothermal, wind, solar, and hydropower. The U.S. Energy Information Administration (EIA) considers multiple future energy production scenarios. According to the EIA *Annual Energy Outlook 2019*, the United States will become less reliant on coal and nuclear power over the next three decades; in short, the U.S. is expected to move away from coal and nuclear while increasing its usage of natural gas and renewable energy. In the EIA's base or reference case (one of several possible future outcomes), electricity generated from renewable sources increases from 18 percent in 2018 to 31 percent in 2050. Meanwhile, coal generated electricity production is expected to decrease from 28 percent to 17 percent. There could be important future economic implications for Kentucky as a result of this anticipated shift in energy production. Rising employment in solar, wind, and natural gas has coincided with the shift in energy generation by source. Because Kentucky lags behind in renewable energy production, as evidenced in the chart below, it is likely that it also lags behind in employment levels for this growing industry. Of Kentucky's total energy production, only 6.8 percent is from renewable sources, but it is growing rapidly. The U.S. and competitor states are, by comparison, much higher at 12.6 and 13.7 percent, respectively.

Renewable Energy Production,
Kentucky, Competitor States, and the U.S., 1960 to 2017
(expressed as a percentage of total energy production)

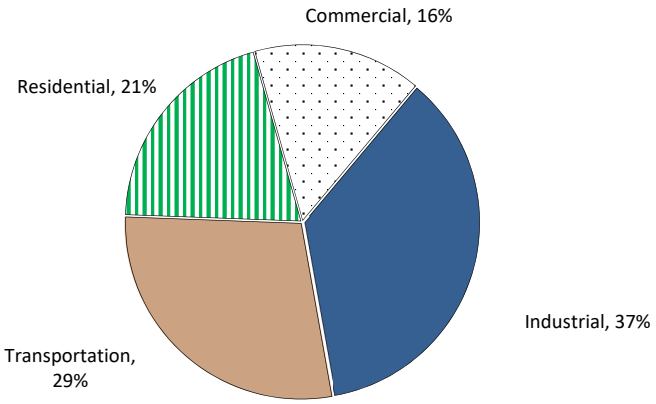


Source: U.S. Energy Information Administration, State Energy Data Production, State Energy Data System (SEDS), 1960-2016 estimates, https://www.eia.gov/state/seds/

Energy Consumption by End-Use Sector

Energy consumption is categorized into four broad sectors: industrial, commercial, residential, and transportation. Industry consumes the bulk of energy in Kentucky, accounting for 37 percent of the total consumption (2017). As noted in the Kentucky Department for Energy Development and Independence, *2017 Energy Profile*, our state has large manufacturing operations like General Electric, Ford, and Toyota, as well as other "energy-intensive manufacturing processes including; aluminum smelting, iron and steel mills, paper mills, chemical production, and glass manufacturing." By comparison, industrial consumption by the competitor states and the U.S. as a percentage of total energy consumption is 31 and 33 percent, respectively. The transportation sector in Kentucky is the second largest consumer of energy, accounting for 29 percent, compared to 28 and 29 percent in the competitor states and the U.S. The residential sector in Kentucky, the competitor states, and the U.S., consumes 21, 22, and 20 percent. And while the commercial sector in Kentucky accounts for only 16 percent, it represents 18 to 19 percent of total energy consumption for the competitor states and the U.S. Broadly speaking, these distributions suggest that public policies affecting energy usage will be disproportionately felt in Kentucky by *industrial* users.

Kentucky Energy Consumption by End-Use Sector, 2017

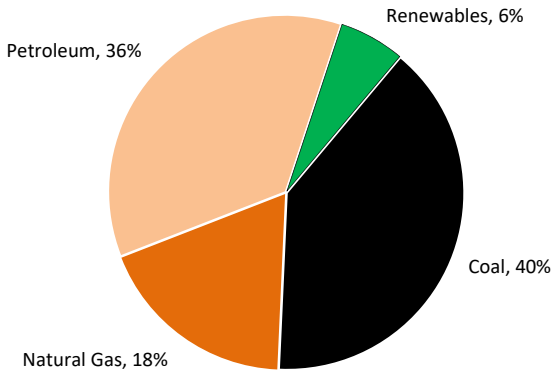


Source: U.S. Energy Information Administration, State Energy Data System

ENERGY CONSUMPTION BY SOURCE

Of the four broad energy sources used in Kentucky—coal, natural gas, petroleum, and renewables—coal accounts for the majority of the total consumption, 40 percent (2017). In 2011, this percentage was over half at 52 percent. While the chart below represents energy consumption for all uses, Kentucky relies heavily on coal for electricity generation. According to the Kentucky Department for Energy Development and Independence, *2017 Energy Profile*, "Coal accounts for 83 percent of Kentucky's own electricity portfolio." This is expected to change, however, given the many factors affecting coal usage, such as federal environmental regulations, aging coal generators, and low natural gas prices. The upshot is that Kentucky will become increasingly dependent upon natural gas for future electricity generation. By comparison, coal consumption by the competitor states and the U.S. as a percentage of total energy consumption is 21 and 14 percent, respectively, and is declining. Natural gas is about 18 percent in Kentucky (and rising), but much higher as well as rising in the U.S. (29%) and the competitor states (26%). The competitor states and the U.S.—as well as Kentucky—are moving away from coal and toward natural gas.

Kentucky Energy Consumption by Source, 2017
(consumption by fuel type)

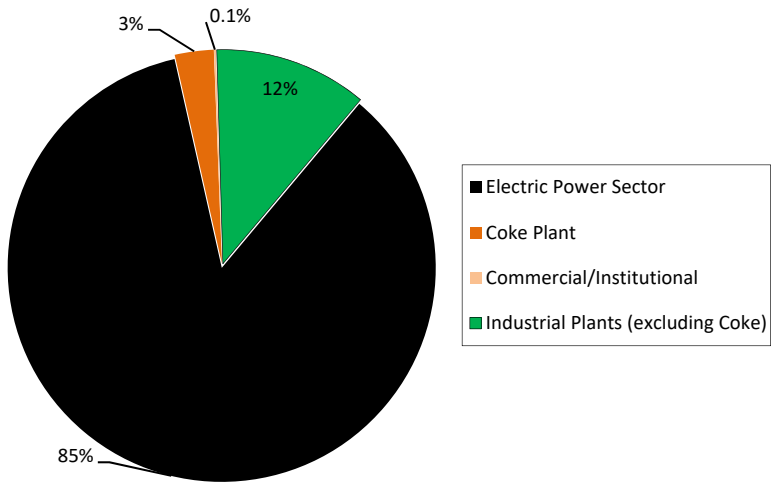


Source: U.S. Energy Information Administration, State Energy Data 2017, Consumption

KENTUCKY COAL DISTRIBUTION

The vast majority of Kentucky coal is used to generate electricity. Of the 37.5 million tons of Kentucky coal distributed in 2018, roughly 31.7 million tons was distributed domestically among the four categories shown below: electric power sector; coke plant; commercial & institutional; and industrial plants (excluding coke). An additional amount of Kentucky coal is exported out of the country—roughly 5.9 million tons in 2018—and the rest is thought to be stockpiled. Of the Kentucky produced coal that was consumed domestically in 2018, it is estimated that 85 percent went toward electric power generation. However, for a variety of reasons, electrical power plants are moving away from coal and toward natural gas as a fuel source (see the next page), and this has been a major factor in the decline of Kentucky's coal industry.

Kentucky Coal Distribution, 2018
(domestic consumption by end-user type)

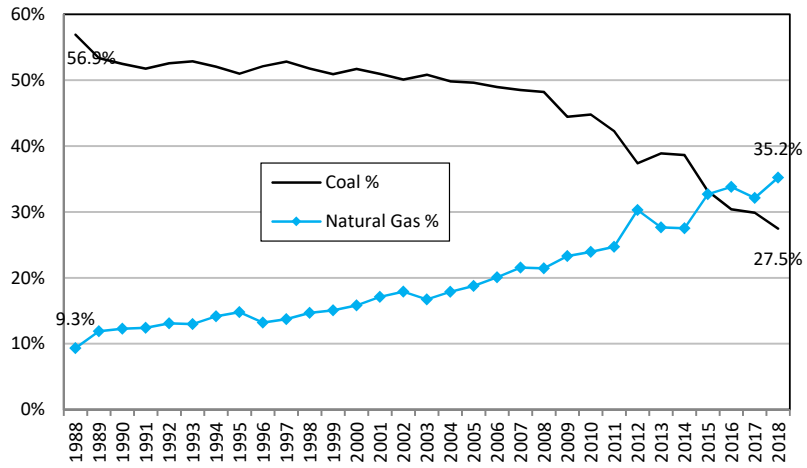


Source: U.S. Energy Information Administration, Annual Coal Distribution Report 2018

NATURAL GAS SUPPLANTING COAL

The use of natural gas to produce electricity—and the concomitant decline in the use of coal—has been going on for about 20 years. In 1988, coal accounted for about 57 percent of the total megawatt hours generated and natural gas accounted for just over 9 percent. This was the high point for coal and the low point for natural gas when viewed over the 69 year period from 1949 to 2018. Since 1988, coal has been declining and natural gas has been increasing, as is readily evident by the line chart below. This is a watershed moment for coal. Natural gas has supplanted coal as the principal source of fuel for generating electricity in the United States—accounting for 35.2 percent; coal, by comparison, accounts for 27.5 percent. Nuclear is another major energy source of electricity in the U.S. at 19 percent. The fracking boom has made natural gas a more financially attractive source of fuel for generating electricity. Relatively cheap natural gas, the rising importance of renewable sources, which currently accounts for about 17 percent of total net electricity generation in the U.S., and the mounting environmental concerns surrounding coal-fired power plants, are making fundamental changes to the global energy market—which, of course, are being felt in Kentucky's coal regions.

U.S. Electricity Generation, by Source, Coal and Natural Gas, 1988-2018
(percentage of total megawatt hours generated)

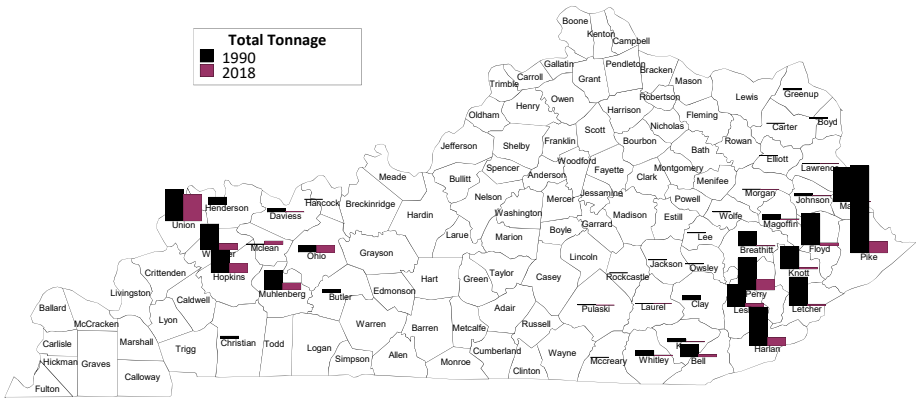


Source: Energy Information Adminstration, State Energy Data System

Coal Production

The changing economics of the coal industry have been widely publicized. Cheaper sources of energy, like natural gas and renewables, more stringent air-quality regulations, and weaker-than-expected demand for coal in Asia are leading to decreases in the amount of coal produced in Kentucky. Statewide coal production continued to decline in 2018 to 39.6 million tons, a 5.2 percent decrease from 2017; this marks the lowest level of recorded annual production since 1954. The high point of coal production in the state was in 1990 when 179 million tons was mined in 40 Eastern and Western Kentucky counties. Coal production has been declining since that time, evidenced by the 2018 production total as well as the lower number of counties (25) reporting some level of production. The map below shows the 1990 and 2018 production levels, with every county except three—McLean, Morgan, and Ohio—experiencing a decline over the 28-year period. As is evident by the map, the declines in the Eastern Kentucky counties have been much steeper than those experienced in Western Kentucky. Coal production in the first three quarters of 2019 is down 5.8 percent compared to the first three quarters of 2018—continuing the downward decline in coal production evident for the last several years.

Kentucky Coal Production, by County, 1990 and 2018



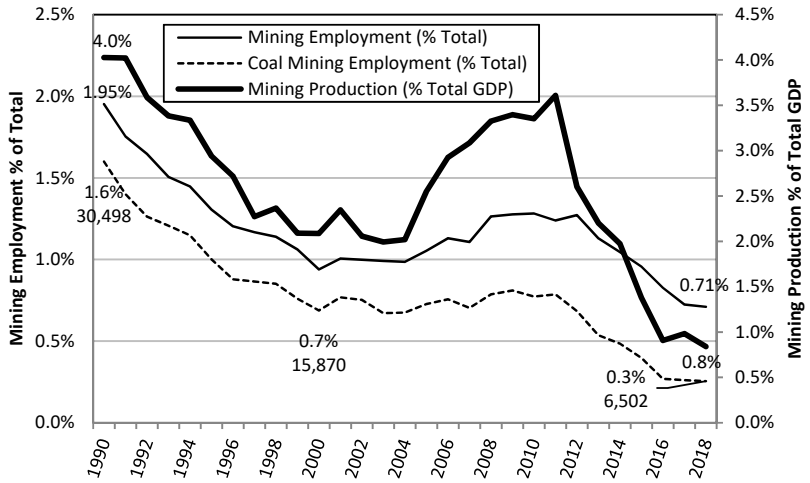
Source: Kentucky Coal Facts, 2nd Edition & Kentucky Quarterly Coal Report, (Q4 2018), available at energy.ky.gov

MINING & COAL

As of September 2019, an estimated 5,792 persons were employed at Kentucky coal mines. One has to go back 120 years to find an employment level this low; there were an average of 6,399 coal miners in the state in 1898. While Kentucky mines a significant amount of coal in both Western and Eastern Kentucky, the bulk of the job losses have been in Eastern Kentucky. When viewed within the context of the state's wider economy, mining employment and coal mining employment are 0.71% and 0.3% of total employment, respectively. Similarly, mining production accounts for 0.8% of Kentucky's gross domestic product. While the effects of declining production and loss of jobs are small relative to the size of the state's overall economy, the communities where these jobs are concentrated have been hit extremely hard. According to the latest employment numbers from the Kentucky Energy and Environment Cabinet, in the third quarter of 2019 (July to September), coal mining employment was 3,223 in Eastern Kentucky and 2,569 in Western Kentucky. These employment numbers include all employees engaged in production, preparation, processing, development, maintenance, repair, shop or yard work at mining operations, mining operations management and all technical and engineering personnel (these numbers also include office workers).

Kentucky Mining Employment & Production, 1990-2018

(% of total employment, % of total gross domestic product)



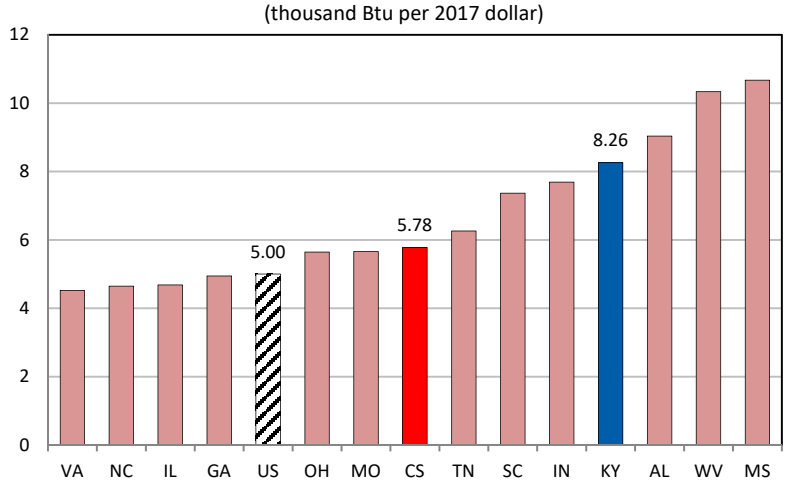
Source: Bureau of Economic Analysis & Energy Information Administration, Annual Coal Report, various years, and Kentucky Coal Facts, various years

ENERGY CONSUMPTION PER GDP

Kentucky has an energy intensive economy. To generate $1 in state gross domestic product, Kentucky consumes about 8,261 Btu (2017). By comparison, the U.S. average is around 5,000 Btu and the competitor state average is 5,780 Btu. This difference is driven, in part, by Kentucky's larger than average manufacturing sector, which, of course, depends greatly upon energy as a production input. One implication of this higher dependence on energy as an economic input is that, compared to most of the competitor states, Kentucky's economy is more sensitive to energy prices.

Energy Consumption per Real Dollar of GDP, 2017, Kentucky, Competitor States, and the U.S.

(thousand Btu per 2017 dollar)

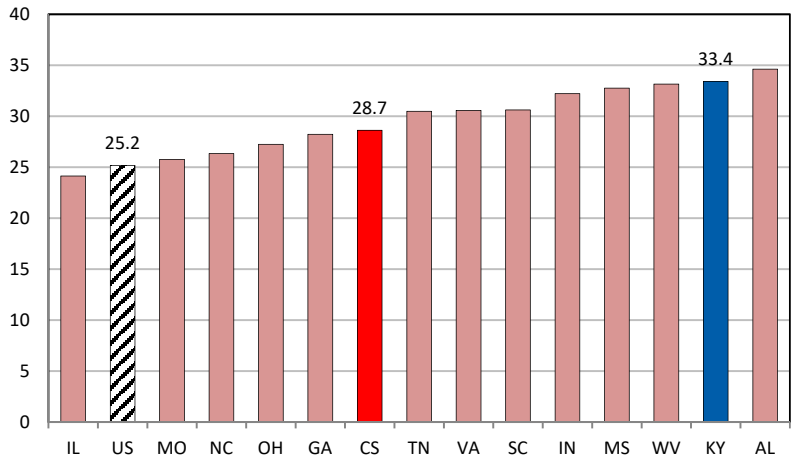


Source: Calculated using data from the U.S. Energy Information Administration and Bureau of Economic Analysis

ENERGY EFFICIENCY

This variable is an indicator of energy efficiency and conservation. It is the number of megawatt hours of electricity sold to all customers; it is inclusive of residential, commercial, industrial, and transportation sales and customers. It is not a perfect measure of energy efficiency, since it is affected by the industrial mix in a state. If we limited this to only residential sales and customers, then Kentucky's energy usage/efficiency improves somewhat when compared to the competitor states and the U.S. For example, while Kentucky has the second highest usage when including *all sales and customers* (see below, comparing competitor states only), it is the four highest when only examining *residential* usage/efficiency. Kentucky's megawatt usage per residential customer is 14 (in thousands of megawatt hours), which is below Tennessee (15.4), the highest competitor state; Illinois is the lowest competitor state using the residential measure (8.9). The residential only competitor state average is 12.8 while the U.S. average is 11—both lower than Kentucky's residential per customer usage (14). Part of the reason for Kentucky's higher-than-average per customer usage at the residential level is surely due to the state's relatively low electricity costs.

Megawatt Hours per Energy Customer, 2018, Kentucky, Competitor States, and the U.S.
(thousands of megawatt hours)



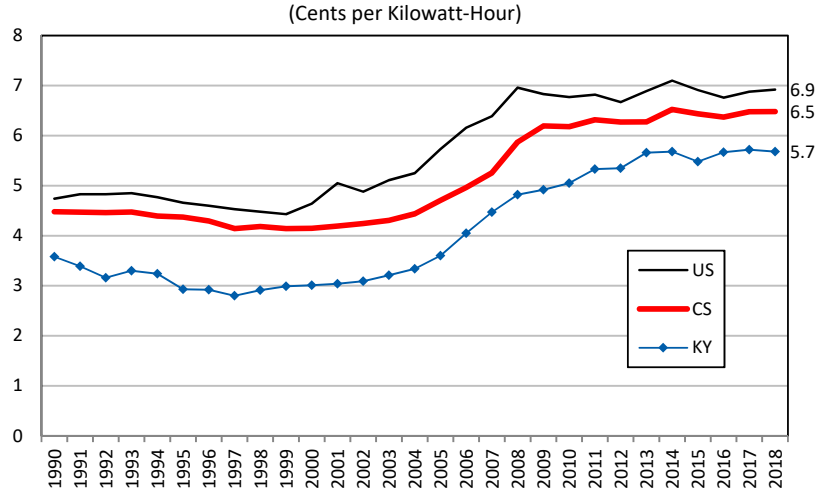
Source: Calculated using data from the U.S. Energy Information Administration

INDUSTRIAL ELECTRICITY COSTS

Frequently cited as an important factor to recruit new industries to Kentucky as well as keep existing industries competitive, electricity prices here are consistently below the U.S. and competitor state averages. Kentucky's industrial rates are lower because of an abundance of coal and coal-fired power plants in the state and region. However, the average retail price of electricity to industrial customers increased in Kentucky by 103 percent from its nadir of 2.8 cents in 1997 to 5.7 cents in 2018. As prices have increased so too have the worries that Kentucky is losing its comparative advantage in low-cost utility rates; price increases for the U.S. and competitor states during the same time period have been about 53-56 percent compared to Kentucky's 103 percent. Nonetheless, in 1990 Kentucky had the seventh lowest industrial rate in the country and in 2018 the seventh lowest—tied with Tennessee and trailing Arkansas, Louisiana, Montana, Oklahoma, Texas, and Washington. And among the competitor states Kentucky's industrial rates are the lowest. Kentucky's annual rate in 2018—at 5.7 cents per kilowatt-hour—was well below the U.S. (6.9) and competitor states (6.5).

Average Retail Price of Electricity, Industrial Customers, Kentucky, Competitor States, and the U.S., 1990-2018

(Cents per Kilowatt-Hour)



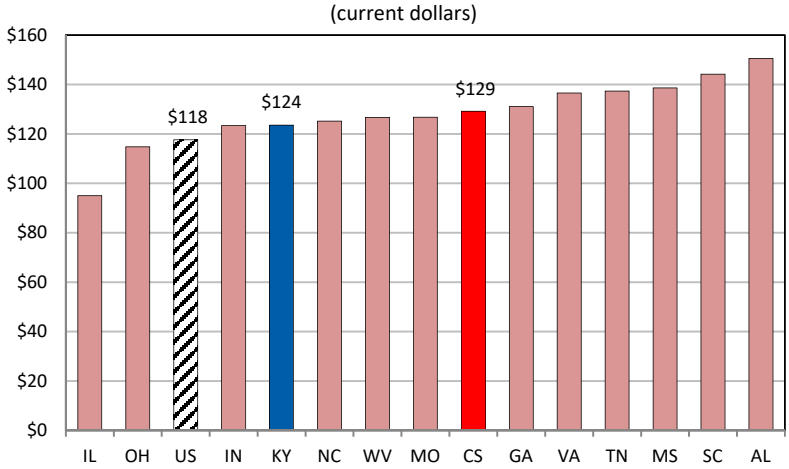
Source: U.S. Energy Information Administration

RESIDENTIAL ELECTRICITY COSTS

According to the U.S. Census Bureau, Consumer Expenditure Survey, the typical "consumer unit" had $61,224 in average annual expenditures in 2018—with annual electricity expenses of $1,496. In the South Region of the U.S.—where Kentucky and eight of the competitor states are located—average annual expenditures were $56,667 and annual electricity expenses were $1,722. Electricity costs range in these two examples from 2.4 to 3.0 percent of total expenditures. Using data from the U.S. Energy Information Administration, residential average monthly electricity bills, among the competitor states, ranged from a low of $95 in Illinois to a high of $150 in Alabama. At $124, Kentucky's average monthly bill is between the U.S. and competitor states averages. Like industrial customers of electricity, Kentucky's residential customers enjoy somewhat lower rates than most competitor states.

Residential Average Monthly Electricity Bill, 2018, Kentucky, Competitor States, and the U.S.

(current dollars)



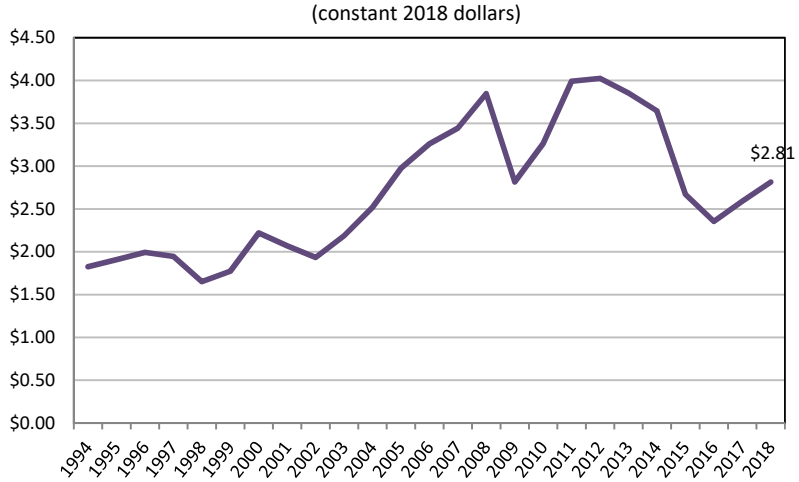
Source: U.S. Energy Information Administration
Note: The competitor states average (CS) is not a weighted average.

MOTOR GASOLINE EXPENDITURES

The typical American "consumer unit," what most would consider the average household, spent $61,224 on various products and services in 2018 according to the Consumer Expenditure Survey; "gasoline and motor oil" accounted for $2,109 of the total—about 3.4 percent of the total; this represents a decline from recent years when it was 5.1 percent in 2013, 4.6 percent in 2014, and 3.7 percent in 2015. In 2018, the average price for a gallon of gas in the U.S. was about $2.81 (in constant 2018 dollars).

U.S. All Grades, All Formulations, Retail Gasoline Prices, Dollars per Gallon, 1994-2018

(constant 2018 dollars)



Source: Energy Information Adminstration, State Energy Data System

Environment

THE U.S. GLOBAL CHANGE RESEARCH PROGRAM, upon the release of its *Fourth National Climate Assessment* in late 2018, threw the interrelationship between the environment and the economy into stark relief. Mandated by The Global Change Research Act of 1990, the report on climate change is delivered to Congress and the President no less than every four years. They wrote that "climate change creates new risks and exacerbates existing vulnerabilities in communities across the United States, presenting growing challenges to human health and safety, quality of life, and the rate of economic growth." They go on to say, "without substantial and sustained global mitigation and regional adaptation efforts, climate change is expected to cause growing losses to American infrastructure and property and impede the rate of economic growth over this century."

Public policy debates about the current and future status of Kentucky's coal industry illustrate the connections between the economy, the environment, and global energy markets—including the tensions between them. The Shaping Our Appalachian Region (SOAR) initiative to rejuvenate the Eastern Kentucky economy, in the wake of the precipitous decline of the coal industry, illustrates in its *Regional Blueprint for Economic Growth* how the state will be forced to reckon with, and ultimately reconcile, potentially competing policy objectives. The *Blueprint* calls for an increase in natural resource extraction while

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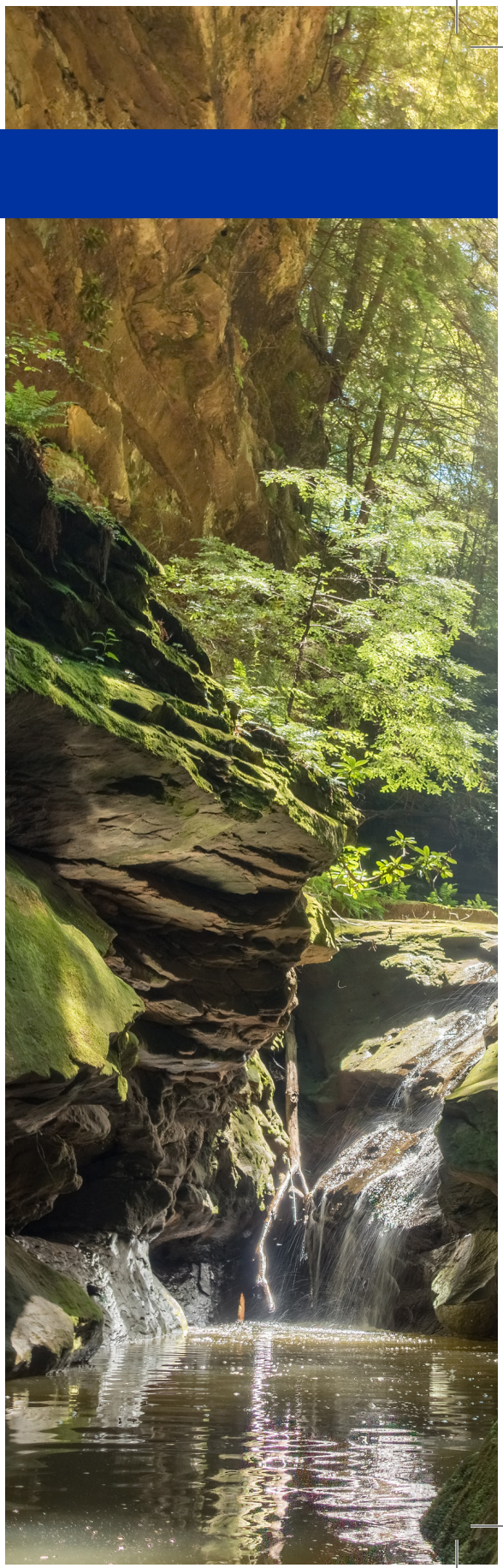

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simultaneously establishing the region as a tourism destination.

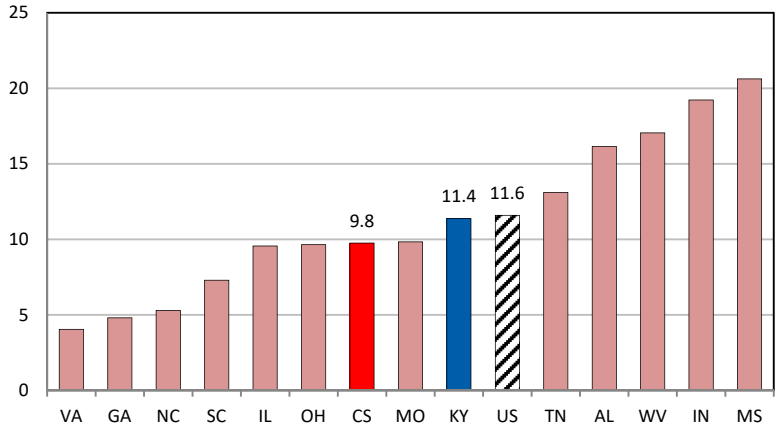
Our economic development policies and practices can, and do, affect the quality of the air, water, land, and other environmental assets of the state. At the same time, a body of literature has emerged demonstrating how community amenities, such as a clean and beautiful environment, are used as a tool for attracting and retaining entrepreneurs and innovators—who can also be job creators. Environmental regulations are important considerations for CEOs exploring sites for industrial expansion or relocation—but so are "quality of life" considerations, which might include a clean environment. For example, choosing from a list of 28 different factors, ranging from labor costs to environmental regulations, the single most important factor for respondents to the *2018 Area Development Site Selection Survey* was the availability of skilled labor, evidenced by 90.5 percent ranking it as either "important" or "very important." By comparison, "environmental regulations" ranked 16th on the list at 69.9 percent while "quality of life" factors ranked 6th at 82.8 percent.

At a time when the broad-based threats to the environment resulting from climate change appear to be gaining traction as an important public-policy issue around the globe, the typical Kentuckian is breathing cleaner air, drinking cleaner water, and being more responsible with solid waste than ever before.

TOXIC RELEASES

Toxic pollutants can cause cancer or other serious health effects, such as reproductive or birth defects, as well as adverse ecological and environmental consequences. The Environmental Protection Agency (EPA) provides data to help communities identify chemical disposal facilities and other toxic release patterns that warrant public vigilance. Combined with hazard and exposure information, these data can be valuable in risk identification. Given that toxic releases are often by-products of manufacturing processes, it is not surprising that Kentucky, which is home to an above-average manufacturing base, typically exceeds the U.S. average in toxic releases. In 2018, however, Kentucky reported 11.4 pounds of toxic releases per capita; this is an increase from 11 pounds in 2017, but a reduction from 12.0 in 2016. The most recent data show that Kentucky trails the national average (11.6 pounds), and lags behind the competitor states of Mississippi (20.6), Indiana (19.2), West Virginia (17.1), Alabama (16.2), and Tennessee (13.1).

Toxic Chemicals Disposed of or Otherwise Released, 2018
Kentucky, Competitor States, and the U.S.
(pounds per capita)

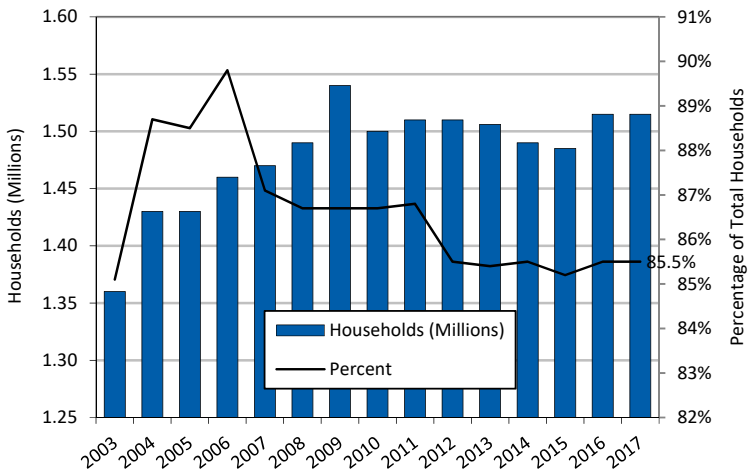


Source: United States Environmental Protection Agency. (2019). TRI Explorer (2018 Dataset, released November 2019) [Internet database]. Retrieved from https://www.epa.gov/triexplorer, (December 5, 2019).
Note: CS is the weighted average of the competitor states.

SOLID WASTE

Beginning in 2002, state law required waste haulers and recycling haulers to register and report to each county in which they provide service, thereby providing data on the number of households that participate in municipal solid waste collection (MSW). The 2016 and 2017 statewide household participation rates for MSW collection were around 85.5 percent. The Kentucky Division of Waste Management (DWM) estimates that another 5-10 percent of households either legally self-haul their waste to transfer stations or are otherwise not counted in these numbers because they use dumpsters in multi-unit housing complexes. Consequently, the real percentage of households participating in municipal solid waste collections is likely 90 to 95 percent according to the DWM. The remaining 5 to 10 percent of households are thought to illegally dump their waste. The DWM notes in its 2018 Annual Report that household municipal solid waste participation remains steady in 2017.

Kentucky Households Participating in Municipal Solid Waste (MSW) Collection, 2003-2017



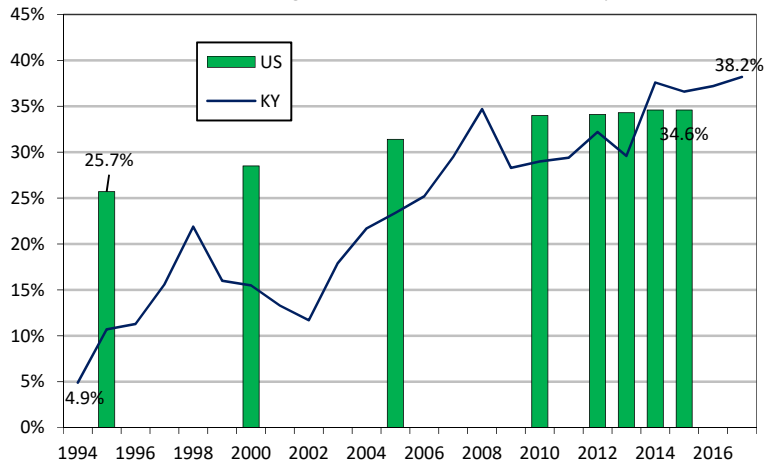
Source: Kentucky Division of Waste Management Annual Reports, various years

RECYCLING

According to the Kentucky Division of Waste Management, Kentuckians recycled 38.2 percent of common household recyclables in 2017 (e.g., aluminum, cardboard, steel, plastic, newspaper, glass, and paper). As one can see in the figure, the percentage of generated waste that is recycled has climbed steadily over the last two decades. And, according to the U.S. Environmental Protection Agency (EPA), Americans generated about 258 million tons of trash in 2014 and recycled (or composted) approximately 89 million tons of this material—resulting in a 34.6 percent recycling rate. Americans generate around of 4.40 pounds of individual waste per person each day and recycled or composted 1.5 pounds of it. Kentucky was slow to the recycling movement, but has gathered momentum supporting this initiative, now matching the U.S. average. Interestingly, the EPA states that "recycling and composting of MSW results in greenhouse gas (GHG) emissions reduction," with the 89 million tons of recycled and composted MSW providing "an annual reduction of over 181 million metric tons of carbon dioxide equivalent emissions, comparable to the annual emissions from over 38 million passenger cars."

Recycling Rates, Kentucky and the U.S., 1994-2017

(As a Percentage of Waste Generated in Kentucky)



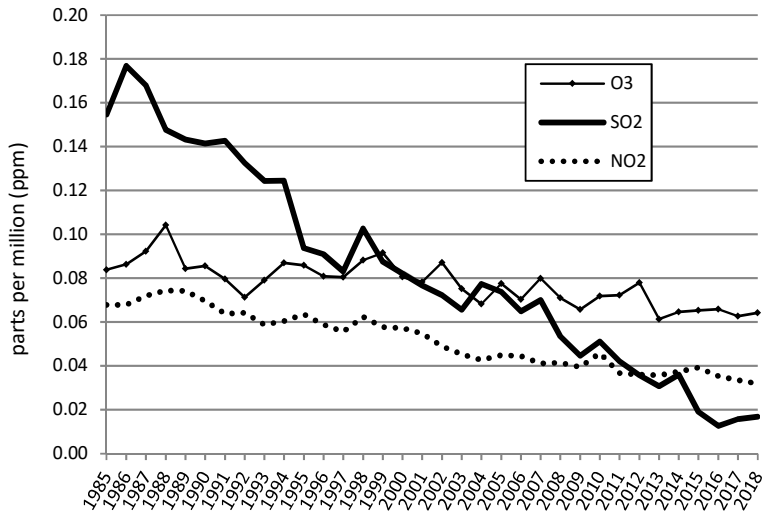
Source: Kentucky Division of Waste Management, Annual Report, Fiscal Year 2018

Air Quality

The Kentucky Division for Air Quality reports that Kentuckians are breathing cleaner, healthier air. The Division points out that "this improvement is a direct result of reduced air pollution. For example, emissions of sulfur dioxide (SO_2) from Kentucky coal-fired power plants totaled 1.5 million tons in 1976. In 2015, those emissions had dropped to 131,696 tons – a remarkable 91 percent reduction." The Division notes that the "decrease is all the more dramatic considering Kentucky's population and economy have grown significantly during that same time period. New air pollution control technologies, improved vehicle fuel economy, and a growing emphasis on energy efficiency have all contributed to cleaner air." The pollutants shown in the figure below are Ozone (O_3), Sulfur Dioxide (SO_2), and Nitrogen Dioxide (NO_2). While individual pollutants oscillate from year to year, overall the trend shows a decline in pollution levels from 1985 to 2018. The pollutants are shown in terms of parts per million (ppm). Other important air pollutants, expressed in both parts per million and micrograms per cubic meter (µ/m3) are shown on the facing page. This graph shows generalized pollution trends through time. It does not show trends for specific sites nor does it demonstrate attainment for any particular area. While individual pollutants may spike in certain years, overall trends show declines in pollution levels.

Kentucky Air Quality Trends, 1985 to 2018

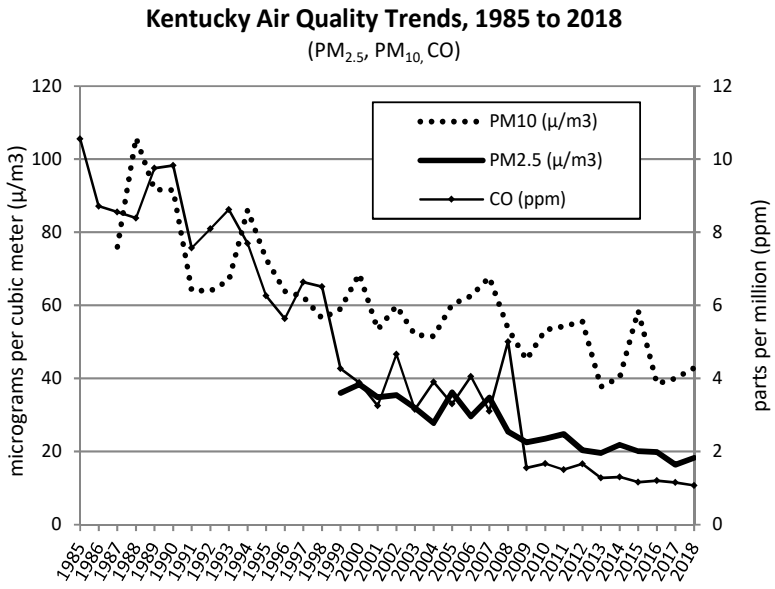
(O_3, SO_2, NO_2)



Source: Kentucky Energy and Environment Cabinet, Division for Air Quality

AIR QUALITY

As noted on the facing page, the Kentucky Division for Air Quality reports that Kentucky's air is getting cleaner. The pollutants shown in the figure below are Carbon Monoxide (CO), Particulate Matter (PM_{10}), Fine Particulate Matter ($PM_{2.5}$). And, just like with Ozone (O_3), Sulfur Dioxide (SO_2), and Nitrogen Dioxide (NO_2) shown on the previous page, the pollutants in the graph below have been declining gradually over the time period shown. This graph shows generalized pollution trends through time. It does not show trends for specific sites nor does it demonstrate attainment for any particular area. While individual pollutants may spike in certain years, overall trends show declines in pollution levels.

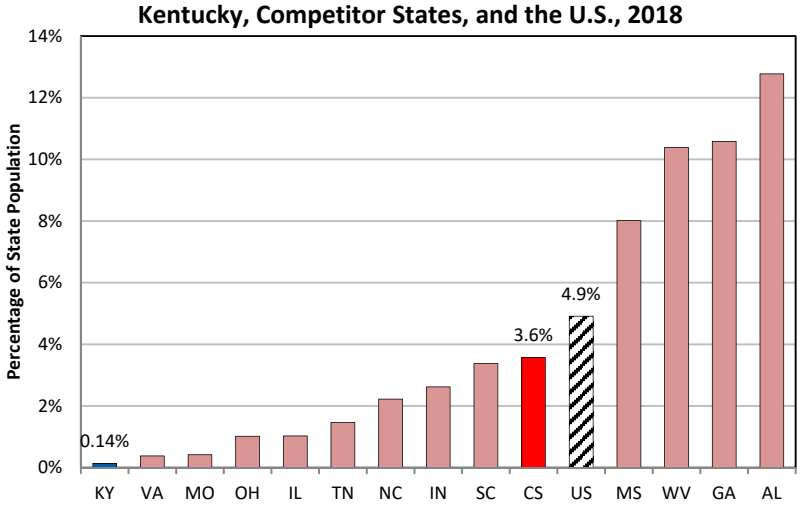


Source: Kentucky Energy and Environment Cabinet, Division for Air Quality

Lead & Copper Rule Violations

The United States enjoys one of the safest and most reliable supplies of drinking water in the world. Clearly, the Safe Drinking Water Act of 1974 plays an important role in maintaining high standards for quality. While the water supply is generally violation-free, in 2018 there were about 69,000 violations of the Safe Drinking Water Act among community water systems that served around 81 million people, which represents around 25 percent of the U.S. population. Of these 69,000 violations, an estimated 7,900 were violations of the Lead and Copper Rule, affecting approximately 16.1 million people. Lead water pipes have been used for many years, but exposure to lead is extremely serious and can cause life-altering consequences, especially for children. A 2017 NBER Working Paper by Anna Aizer and Janet Currie, *Lead and Juvenile Delinquency: New Evidence from Linked Birth, School, and Juvenile Detention Records*, finds strong connections between childhood lead exposure and antisocial behavior, leading to increased school suspension rates as well as increased incarceration rates later in life. With three violations of the Lead and Copper Rule in 2018, Kentucky experienced a relatively small number, affecting an estimated 0.14 percent of the state population. The competitor state and U.S. averages were higher, at 3.6 and 4 .9 percent, respectively.

Population Served by a Community Water System with a Safe Drinking Water Violation of the Lead & Copper Rule, Kentucky, Competitor States, and the U.S., 2018

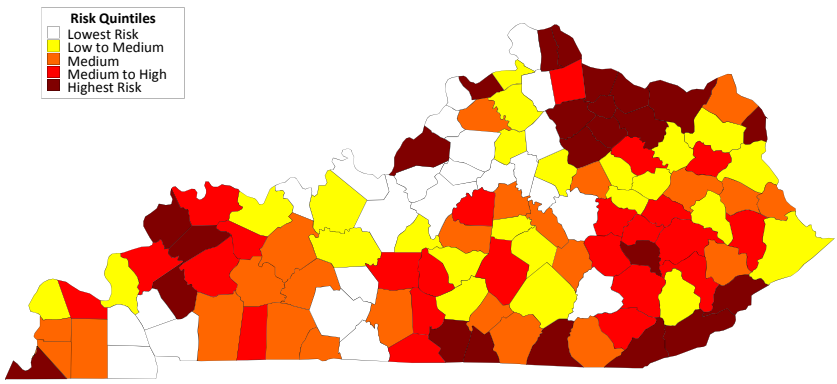


Source: Author's analysis of EPA SDWIS data.

Lead Risk

Lead poisoning has serious health consequences. According to the Mayo Clinic, "Exposure to even low levels of lead can cause damage over time, especially in children. The greatest risk is to brain development, where irreversible damage may occur. Higher levels can damage the kidneys and nervous system in both children and adults. Very high lead levels may cause seizures, unconsciousness and possibly death." Using a method developed by epidemiologists from the Washington State Department of Public Health, we produced a county-level map of Kentucky showing the *estimated* relative risk for lead exposure. This method, which has been widely embraced by environmental health experts associated with the Center for Disease Control and the American Public Health Association, uses two variables to assign relative risk: the age of the houses (which predicts the likelihood of lead paint) and poverty; the environmental health literature finds that kids are more likely to come into contact with lead in older houses and that living in conditions of poverty elevates the risk. Risk levels are not uniform within a county; that is, not everyone in Jefferson County will be at the highest level of risk. Likewise, not everyone in Warren County will be at the lowest level. Instead, the map illustrates the *estimated* average lead risk level at the county level.

Lead Risk by Kentucky County



Source: Estimated by Rex Bray and Timothy Bianco using a method developed by Vox and Rad Cunninghnam, Washington State Dept. of Health <http://www.vox.com/a/lead-exposure-risk-map>.

Health

KENTUCKY'S HEALTH SHORTcomings are well-known—*America's Health Rankings 2019*, delineates our high rates of drug overdose deaths, chronic disease, and disability, by ranking the state 43rd overall. It lists areas considered to be strengths (i.e., high percentage of high school graduation, low prevalence of excessive drinking, low violent crime rate), as well as its challenges (i.e., high prevalence of physical inactivity, high prevalence of frequent mental distress, high cancer death rate).

Some of the findings in the *America's Health Rankings 2019* report concerning Kentucky include: since 2012, obesity has increased 20%, from 30.4% to 36.6% of adults; in the past 10 years, drug deaths have increased 96%, from 16.4 to 32.2 deaths per 100,000 population; since 2010, the percentage of the population without health insurance decreased 66%, from 16.1% to 5.5%; in the past three years, frequent mental distress increased 21%, from 13.8% to 16.7% of adults; in the past two years, mental health providers increased 17%, from 194.6 to 227.5 per 100,000 population; and in the past four years, diabetes increased 10%, from 12.5% to 13.7% of adults.

There were 1,336 drug overdose deaths in Kentucky during 2018, down from 1,628 in 2017—much of it fueled by opioids. While the growing opioid crisis garners increased attention, chronic diseases are responsible for 7 of 10 deaths each year and drive most of the nation's health care costs. Among Kentucky's prime working-age adults, smoking (28%),

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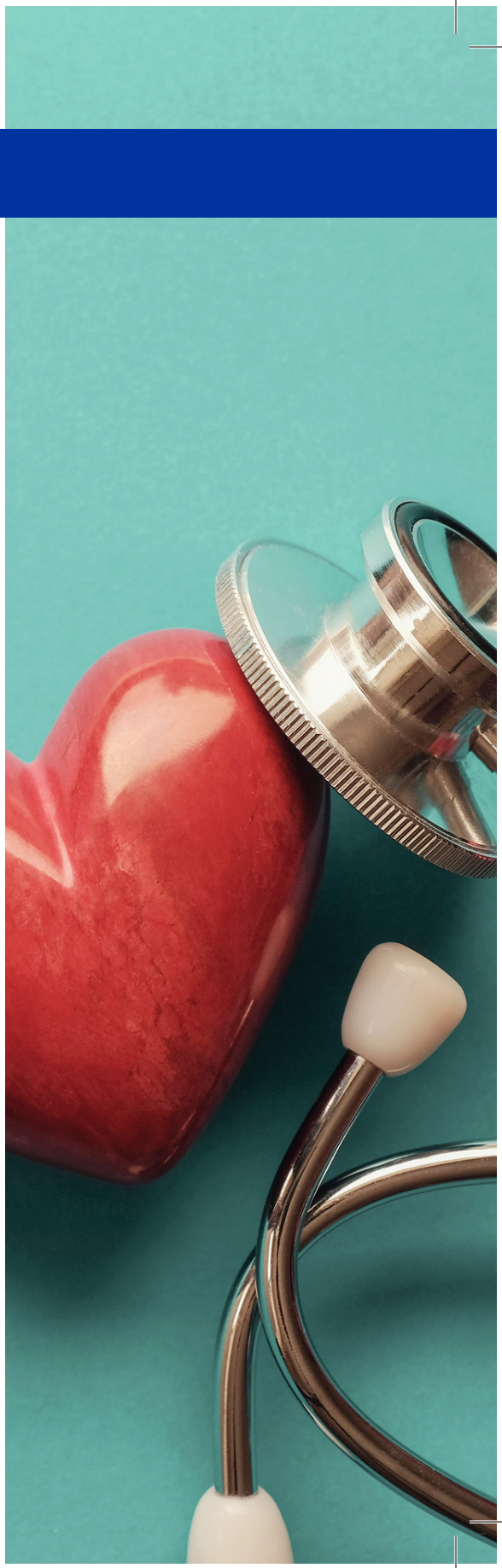

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obesity (42%), and physical inactivity (28%) put many at risk for chronic disease. Overall, around 29 percent of Kentucky's prime working-age adults exhibit multiple chronic disease-causing behaviors, and these risk factors lead to higher absenteeism at work and increase employer costs. The Milken Institute has estimated that the economic toll of chronic disease on the Kentucky economy measured in the billions of dollars, reflecting the cost of treating avoidable medical expenses as well as the resulting lower labor force productivity and subsequent lower economic growth rates.

Kentucky's poor health outcomes have large economic effects and societal consequences. At the most basic level, good health enables workers to be more productive. Indirectly, higher levels of health facilitate, for example, more education and schooling, which directly affects economic outcomes. Conversely, poor health can lead to premature death, lower workforce participation, higher public assistance costs, and less-than-optimal worker productivity. Studies have found, for instance, that labor time lost due to health reasons totals in the billions of dollars per year in lost economic output. Moreover, given the importance of workforce quality on firm location decisions, communities with high disability rates and poor health status are at a competitive disadvantage. For these reasons, investments in improving the health outcomes of individuals and communities can and do have vital and long-lasting economic benefits.

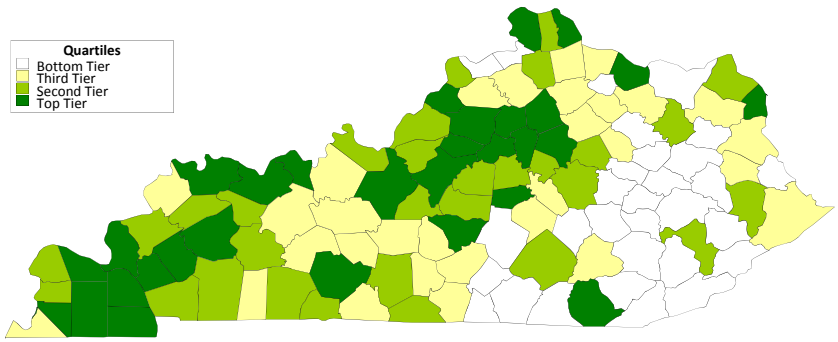
Investments to improve health outcomes in Kentucky can exert important economic benefits. Our analyses suggest that opioid abuse has reduced Kentucky's labor force participation rate by 1.3 to 3.1 percentage points. This translates to a loss of 23,100 to 55,200 workers, $1.0 to $2.8 billion in earnings, and $63 to $169 million in state tax revenues—a considerable economic toll. When we analyze the economic consequences of smoking on Kentucky, we identify effects in three areas—reduced wages for smokers who work, reduced employment among smokers (a loss of 28,500 workers) and increased premature deaths for smokers. Combined, the impact of smoking in Kentucky's reduces total earnings by $1.8 billion to $2.9 billion annually and its state tax revenues by $111 million to $176 million annually. Likewise, there are significant costs associated with other chronic diseases, like diabetes.

Factors like job stability, educational attainment, and neighborhood safety exert a strong influence over health outcomes. By addressing the place-based, social determinants of health in Kentucky communities, policy makers have the opportunity to improve the health of, and by extension economic outcomes for, citizens of the Commonwealth. The findings are clear—poor health can have deleterious economic effects, while good health can improve earnings, employment, and one's quality of life.

Social Determinants of Health

The health of individuals is affected by many factors, including, of course, individual behaviors regarding diet and exercise, but also including community characteristics. The U.S. Department of Health and Human Services advances a "place-based" framework under the auspices of the *Healthy People 2020* initiative to explain and understand the factors affecting health outcomes. This framework includes five principal areas that constitute the *social determinants of health*: economic stability; education; social and community context; health and health care; and neighborhood and built environment. Using 24 separate factors organized into these five categories, we estimate the strength of the social determinants of health at the county level. Using a technique known as principal component analysis, we rank Kentucky's 120 counties into quartiles, or four equal groups, by analyzing variables that include, but are not limited to, the poverty rate, the rate of successful transition to adult life after high school graduation, the number of community associations, the number of various types of health care providers, and environmental conditions such as air and water quality. Together, these factors reflect critical elements in our social and physical environments that affect individual health. Counties in Central and Western Kentucky show the best outcomes, with less favorable outcomes in Eastern Kentucky.

Social Determinants of Health by Kentucky County



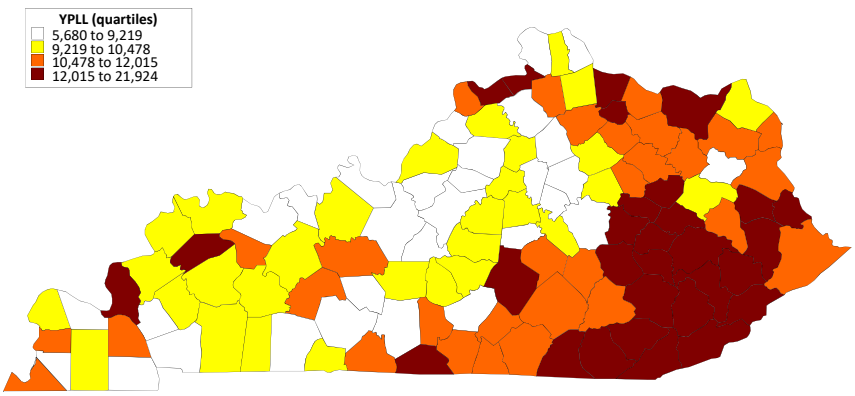
Source: Data collection and analysis performed by Timothy Bianco, Rex Bray III, and Michael Childress.

Premature Death

These county-level estimates of premature death are indicative of the state's health status. Comparing the map below to the one on the previous page reinforces the importance of the social determinants of health. There is a clear and discernible pattern that is especially evident in the Urban Triangle and in Eastern Kentucky. Where the social determinants of health are weak, there is more premature death, and vice versa. Premature deaths occur before a person reaches an expected age, which in this case is 75 years old. The belief is that many of these deaths are preventable. The numbers represent the potential years of life lost due to premature death—adjusted to facilitate comparisons across all U.S. counties. The data categories in the map below reflect quartiles, or four groups of 30 counties each. According to the *County Health Rankings* report, the years of potential life lost measure (YPLL) is age-adjusted to allow comparison between counties and is reported as a rate per 100,000 people. The results of these calculations are shown in the map below, with the highest YPLL values in counties of Eastern Kentucky. For comparison, the median for all U.S. counties is around 8,165 and the median for all Kentucky counties is about 10,470. The range of values for Kentucky counties is 5,682 (Oldham County) to 21,923 (Owsley County).

Estimated Premature Death, 2015-2017

Age-Adjusted Years of Potential Life Lost (YPLL) Rate per 100,000

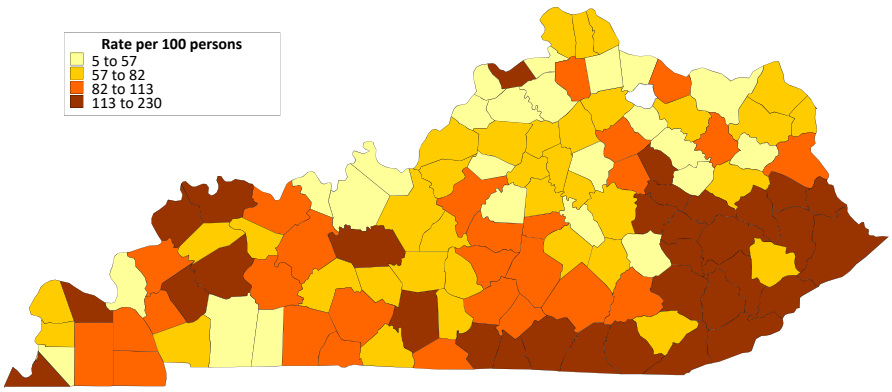


Source: Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute, County Health Rankings 2019, www.countyhealthrankings.org

OPIOID PRESCRIPTION RATE

Implementing programs that increase the labor force participation rate will be critical for the state's future economic prosperity. These strategies include, but are not limited to, programs to lower opioid abuse. Some research suggests that from 1999 to 2015 up to 20 percent of the national drop in the labor force participation rate among prime working-age men and 25 percent of the drop among women *might be* due to the use and abuse of opioids. We should note, however, there is no unanimity among economists about the nature of the relationship between opioids and labor force participation. Nonetheless, these two factors, opioid abuse and the labor force participation rate, are strongly associated. As one can see by the map below, the level of prescribed opioids on a per capita basis is significantly higher in portions of Eastern, Southeast Kentucky, and Western Kentucky. The U.S. prescribing rate per 100 persons was 58.7 in 2017, but in Kentucky it was 86.8. When ranking all 3,100+ counties and county equivalents in the U.S. from highest to lowest on the prescribing rate, we find four Kentucky counties in the top ten: Owsley (229 prescriptions per 100 persons), Bell (228), Whitley (221), and Floyd (216). Owsley, Bell, and Floyd Counties are in the lowest quartile for labor force participation.

Opioid Prescribing Rate by County, 2017

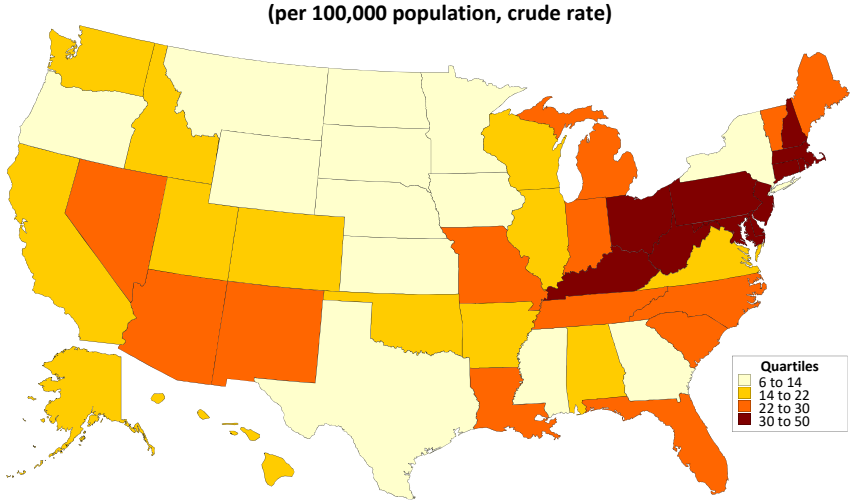


Source: Centers for Disease Control and Prevention (CDC), Opioid Overdose, U.S. County Prescribing Rates, 2017, available at <https://www.cdc.gov/drugoverdose/maps/rxcounty2017.html>.
Note: Data for Robertson County are missing.

DRUG OVERDOSE DEATH RATE

The United States is in the midst of a public health crisis due to drug misuse and abuse, resulting in significant economic consequences. Drug overdoses are now the leading cause of death among Americans under 50. Much of this, but not all, is fueled by opioids. However, while opioids account for a growing number of drug overdose deaths, there are many other contributing substances. In total, approximately 74,985 Americans died from drug overdoses in 2017. Based on data released in November 2019, the 2018 estimate has decreased to 68,640. Kentucky, unfortunately, has one of the highest drug overdose death rates in the country. In 2018, an estimated 29.9 Kentuckians per 100,000 population died from a drug overdose (unadjusted crude rate). As can be seen in the map below, Kentucky is among the states in the highest quartile nationally. Focusing only on the opioid crisis, researchers at Altarum, a nonprofit health research and consulting institute, have estimated that its costs exceeded $1 trillion from 2001 to 2017. In the near future, the crisis is expected to cost an additional $500 billion by 2020 (Altarum, February 2018). These costs include lost wages, lower productivity, lost tax revenue, and higher government expenditures—all of which have consequences for the economy.

Drug Overdose Death Rate, 2018
(per 100,000 population, crude rate)

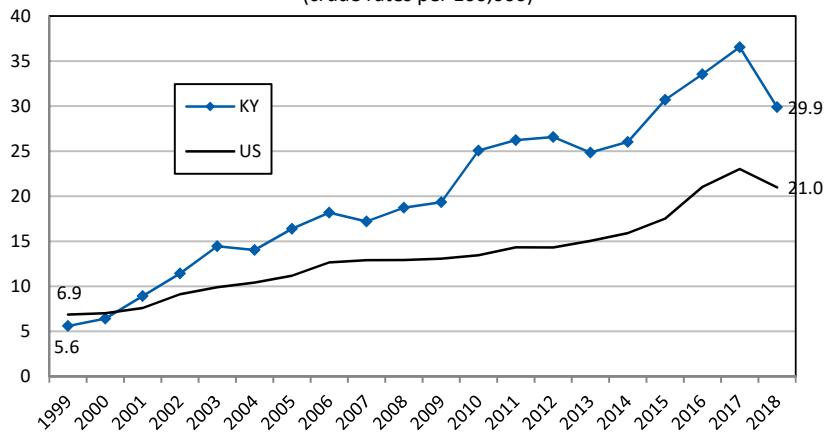


Source: Estimated by the author using CDC National Center for Health Statistics, Vital Statistics Rapid Release, Monthly Provisional Drug Overdose Death Counts, released November 2019.

DRUG OVERDOSE DEATH RATE

The number of Kentuckians dying from a drug overdose is beginning to arc downward. The primary culprit in drug overdose deaths is opioid abuse, especially heroin and fentanyl. According to CDC estimates (November 2019), there were 1,336 overdose deaths in Kentucky during 2018, down from 1,628 in 2017. The U.S. drug overdose death rate increased by a factor of 3.1 from 1999 to 2018, but in Kentucky it increased by a factor of 5.3. Averaged over a five-year period from 2012 to 2016, the highest drug overdose death rates (per 100,000) within Kentucky were in Eastern Kentucky (Leslie, Bell, and Powell Counties with rates of 66.3, 58.5, and 56.5, respectively) and Northern Kentucky (Gallatin and Campbell Counties with rates of 56.2 and 52.1). These upward trending drug overdose death rates put significant financial stress on local governments and exert an economic impact on communities. For example, despite the considerable uncertainty regarding the extent to which opioids reduce labor force participation, our analyses suggest that opioid abuse has reduced Kentucky's labor force participation rate by 1.3 to 3.1 percentage points. This translates to a loss of 23,100 to 55,200 workers, $1.0 to $2.8 billion in earnings, and $63 to $169 million in state tax revenues—a considerable economic toll.

Drug Overdose Death Rates,
Kentucky and the U.S., 1999-2017
(crude rates per 100,000)



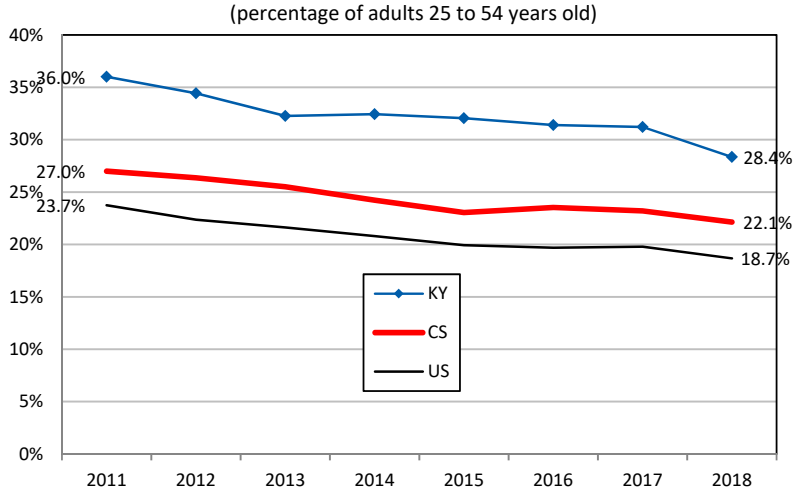
Source: Centers for Disease Control and Prevention (CDC), National Center for Health Statistics, Multiple Cause of Death 1999-2017 on CDC WONDER Online Database. The 2018 estimates are from the CDC National Center for Health Statistics, Vital Statistics Rapid Release, Monthly Provisional Drug Overdose Death Counts.

ADULT SMOKERS

Kentucky has one of the highest adult smoking rates in the nation. Consequently, smoking-related causes of death, including lung cancer and heart disease, exert a disproportionately high cost. With a smoking rate among prime working-age adults (25 to 54 years old) of 28.4 percent, Kentucky is well above the national average of 18.7 percent. Kentucky is statistically tied with Arkansas (29.2%), Indiana (25.8%), Mississippi (25.3%), Ohio (26.1%), and West Virginia (31.5%) for the highest rate. The other 45 states, DC, as well as the competitor states and U.S. average, have statistically significant lower rates. The economic costs associated with smoking are high. A 2019 report from the Center for Business and Economic Research (CBER), *The Effect of Smoking on Kentucky's Workforce*, finds that smoking leads to poorer labor market outcomes. Smokers are more likely to be unemployed, earn lower wages, and die prematurely than non-smokers. These negative labor market effects reduce economic activity and lower tax revenues, adding to the social costs and fiscal impact that smoking imposes. Combined, these three effects—reduced wages for smokers who work, reduced employment among smokers, and increased premature deaths for smokers—reduce Kentucky's total earnings by $1.8 billion to $2.9 billion annually and its state tax revenues by $111 million to $176 million annually.

Prime Working-Age Adults Who are Current Smokers, Kentucky, Competitor States, and the U.S., 2011-2018

(percentage of adults 25 to 54 years old)

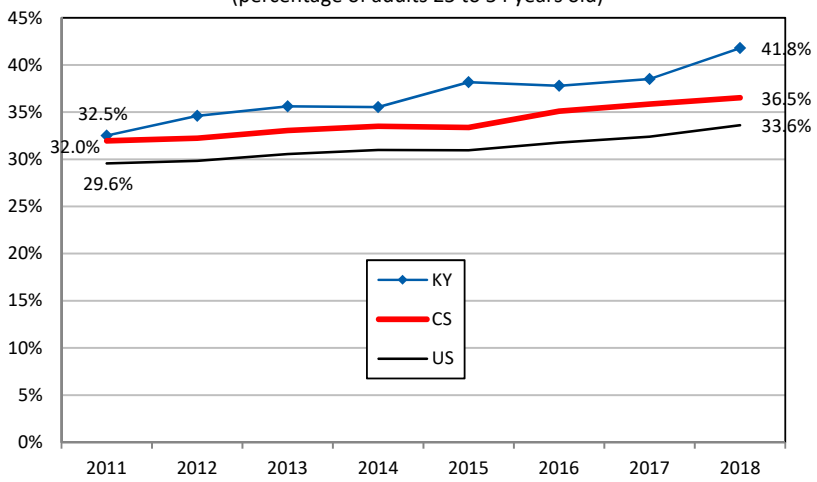


Source: Author's analysis of CDC Behavioral Risk Factor Surveillance System data, various years

ADULT OBESITY

Obesity can lead to heart disease, stroke, type 2 diabetes, and certain types of cancer. The Centers for Disease Control and Prevention (CDC) notes that the medical care costs of obesity in the United States are in the billions of dollars. One consequence of obesity—diabetes—is addressed in a 2019 Center for Business and Economic Research (CBER) report, *The Economic Impact of Diabetes in Kentucky*. It notes that the percentage of Kentucky adults diagnosed with diabetes has increased from 9.9 percent in 2007 to 12.8 percent in 2017. Currently, approximately 441,000 Kentucky adults have diabetes. Research shows that diabetes is associated with lower employment and earnings. In Kentucky, diabetes reduces employment by approximately 15,700 workers, representing a loss of $551.3 million in earnings and $33.1 million in state tax revenue annually. With the number of obese adults in Kentucky at an all-time high, the economic impact of diabetes in Kentucky will likely increase. Currently, about 41.8 percent of prime working-age adults (25 to 54 years old) in Kentucky are obese, about 8 percentage points above the national average of 33.6 percent. No other state has a higher obesity rate than Kentucky, while 10 states are statistically no different from Kentucky. The other 39 states, DC, as well as the competitor states and U.S. average, have statistically significant lower rates.

Obesity Among Prime Working-Age Adults, Kentucky, Competitor States, and the U.S., 2011-2018
(percentage of adults 25 to 54 years old)



Source: Author's analysis of CDC Behavioral Risk Factor Surveillance System data, various years

Risk Behaviors and Chronic Disease

According to the Centers for Disease Control and Prevention (CDC), more than 75 percent of health care costs are due to chronic conditions such as heart disease, cancer, stroke, diabetes, and arthritis. Many patients have multiple chronic conditions and their care costs up to seven times as much as those with one chronic condition. Much of the chronic disease is caused by four *preventable* health risk behaviors—lack of exercise, poor nutrition, smoking, and heavy alcohol consumption. When compared to the U.S. as well as states that are widely considered to be Kentucky's competitors for economic development prospects, *prime working-age* (25 to 54 years old) Kentuckians are more likely to smoke, be obese, and not engage in regular physical activity—but look similar to the U.S. and competitor states with respect to heavy alcohol consumption.

Four Risk Behaviors that Contribute to Chronic Disease, U.S., Competitor States, and Kentucky, 2018
(prime working-age adults)

Adults, 25 to 54 years old	US (%)	CS (%)	KY (%)
Current Smoker	19*	22*	28
Obese	34*	37*	42
Lack of Physical Activity	22*	23*	28
Heavy Alcohol Consumption	7	7	7

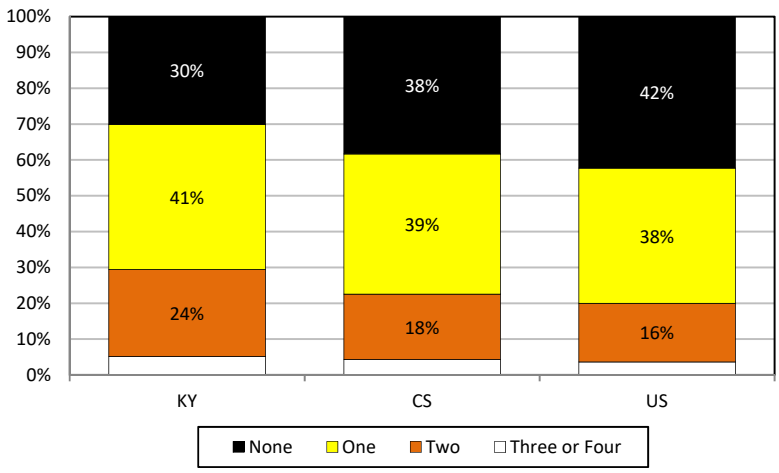
Source: Authors' analysis of data from Centers for Disease Control and Prevention (CDC), Behavioral Risk Factor Surveillance System Survey Data, Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2018
Note: The competitor states are AL, GA, IL, IN, MO, MS, NC, OH, SC, TN, VA, & WV.
**These percentages are statistically different from the Kentucky percentages (alpha=.05).*

NUMBER AT RISK FOR CHRONIC DISEASE

Overall, 29 percent of Kentucky's prime working-age (25 to 54 years old) adults engage in multiple chronic disease causing behaviors. About 30 percent have none of the risk factors of smoking, obesity, inactivity, or heavy drinking, and 41 percent have one. However, 24 percent have two and about 5 percent exhibit three or four. Much of chronic disease is caused by these four risk factors and it is estimated that 75 percent of health care costs are due to chronic conditions such as heart disease, cancer, stroke, diabetes, and arthritis. Compared to the competitor states and the U.S., prime working-age adults in Kentucky are more likely to have one or more chronic disease risk factors. These risk factors, particularly smoking, physical inactivity, and obesity, are linked to higher absenteeism and employer costs. Research published in 2016 found that "Absenteeism costs associated with chronic diseases and health risk factors can be substantial. Employers may incur these costs through lower productivity, and employees could incur costs through lower wages." This association brings the health status of the state's workers to the forefront when considering strategies for improving Kentucky's economic prospects.

Number of Key Chronic Disease Causing Behaviors, 2018, Kentucky, Competitor States, and the U.S.

(percent of prime working-age adults, 25 to 54 years old)



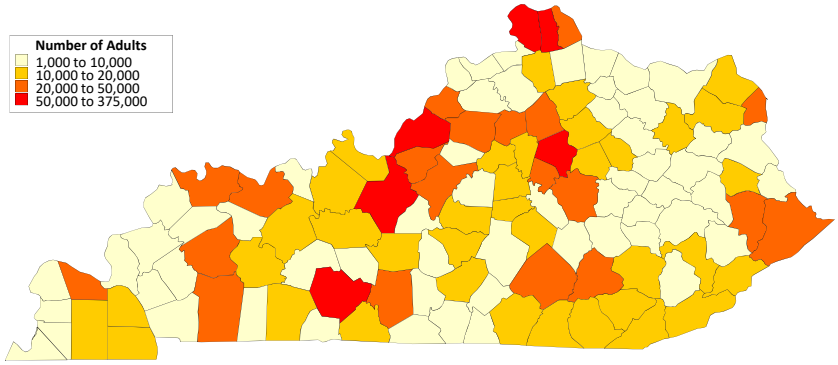
Source: Author's analysis of Behavioral Risk Factor Surveillance System data

CHRONIC DISEASE BY COUNTY: NUMBER

Over one-quarter of Kentucky adults 18 and older (26.3%) exhibit multiple chronic disease causing behaviors. These behaviors or resulting outcomes include smoking, obesity, inactivity, and heavy drinking. We estimate that 39 percent have one of these behaviors, 22 percent have two, and 5 percent exhibit three or four. The map below and the one on the next page illustrate different facets of this problem. Because most of the state's population live in the urban triangle region, the vast majority of the people at risk for chronic disease are concentrated in this region—even though they represent a comparatively lower percentage of the population in these counties. Jefferson County has the highest number of adults at risk for chronic disease at nearly 371,000. When developing approaches and allocating resources to address chronic disease across Kentucky, it is important to consider the sheer number at risk as well as the percentage.

Kentucky Adults Exhibiting Behaviors Putting Them At Risk for Chronic Disease, 2014-2018

(estimated number of adults 18 and older)



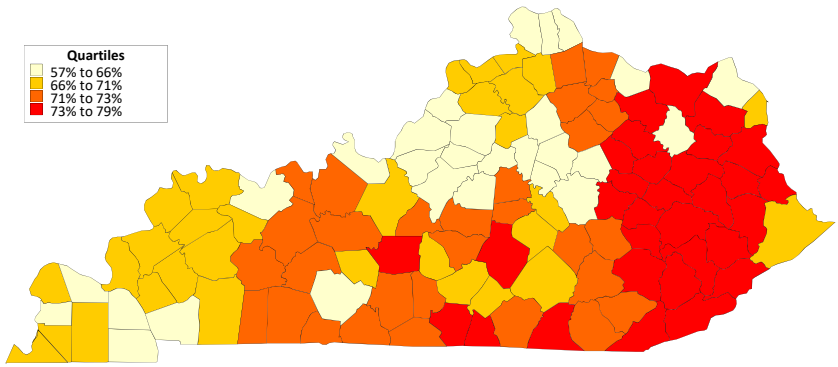
Source: Author's analysis of data from Kentucky Department for Public Health (KDPH) and Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Frankfort, Kentucky: Cabinet for Health and Family Services, Kentucky Department for Public Health, 2014 to 2018

Chronic Disease by County: Percent

A very different picture of chronic disease is shown on this map. While the map on the previous page shows that the estimated absolute number of those at risk for chronic disease is relatively small in Eastern Kentucky, it is relatively large when viewed as a percentage of the county population. Likewise, the number at risk in the urban triangle is quite large, but it is comparatively small as a percentage of the population.

Kentucky Adults Exhibiting Behaviors Putting Them At Risk for Chronic Disease, 2014-2018

(estimated percentage of adults 18 and older)

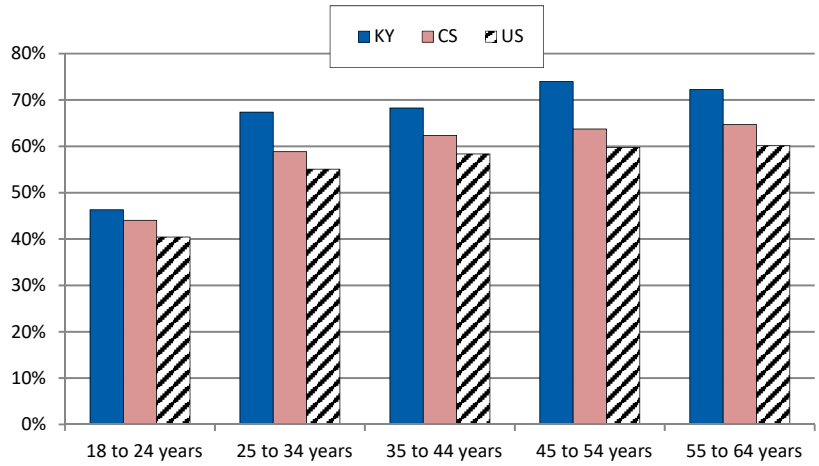


Source: Author's analysis of data from Kentucky Department for Public Health (KDPH) and Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Frankfort, Kentucky: Cabinet for Health and Family Services, Kentucky Department for Public Health, 2014 to 2018

CHRONIC DISEASE RISK BY AGE GROUP

An estimated 66 percent of Kentucky adults demonstrate at least one of the four behaviors that put them at risk of developing a chronic disease—smoking, obesity, physical inactivity, or heavy alcohol consumption—compared to 59 percent in the competitive states and 55 percent in the United States. These rates have been consistent and stable for at least the last decade—an indication of how difficult it is to change chronic disease causing activities, not only in Kentucky but across the United States. And in Kentucky, the uninsured—currently about 5 percent of the population—are more likely to be at risk of developing a chronic disease (74%) than the insured (66%). The chronic disease risk does not change much across the age groups for those *25 and older*. In Kentucky, 70 percent of adults in the prime working age group—25 to 54 years old—exhibit behavior that puts them at risk for developing a chronic disease. By comparison, an estimated 62 percent and 58 percent of prime working age adults exhibit behaviors putting them at risk for chronic disease in the competitor states and U.S., respectively.

Chronic Disease Risk by Various Age Groups, Kentucky, Competitor States, and the U.S.
(percent of individuals at risk for chronic disease, 2018)

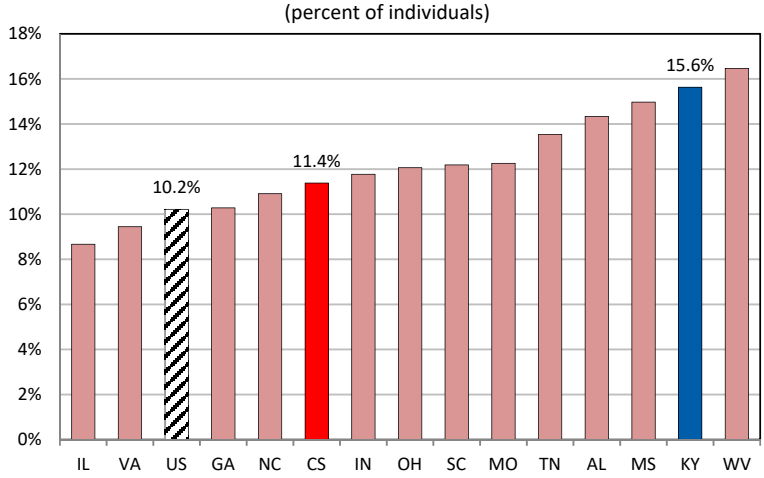


Source: Author's analysis of Behavioral Risk Factor Surveillance System data

DISABILITY

The Census Bureau asks six questions to determine the types and prevalence of disabilities. They include the following: Hearing Disability—Is this person deaf or does he/she have serious difficulty hearing?; Visual Disability—Is this person blind or does he/she have serious difficulty seeing even when wearing glasses?; Cognitive Disability—Because of a physical, mental, or emotional condition, does this person have serious difficulty concentrating, remembering, or making decisions?; Ambulatory Disability—Does this person have serious difficulty walking or climbing stairs?; Self-Care Disability—Does this person have difficulty dressing or bathing?; and, Independent Living Disability—Because of a physical, mental, or emotional condition, does this person have difficulty doing errands alone such as visiting a doctor's office or shopping? Kentucky has the nation's second highest rate of disability (15.6%) among adults 18 to 64 years old. The U.S. average is 10.2 percent and the competitor states average is 11.4 percent. The prevalence of the six disability types among persons between 18 and 64 in Kentucky is: Visual—3.1 percent; Hearing—3.2 percent; Ambulatory—8.1 percent; Cognitive—6.9 percent; Self-Care—2.7 percent; and Independent Living Disability—5.8 percent.

Disabled Individuals 18 to 64 Years, 2018
Kentucky, Competitor States and the U.S.
(percent of individuals)

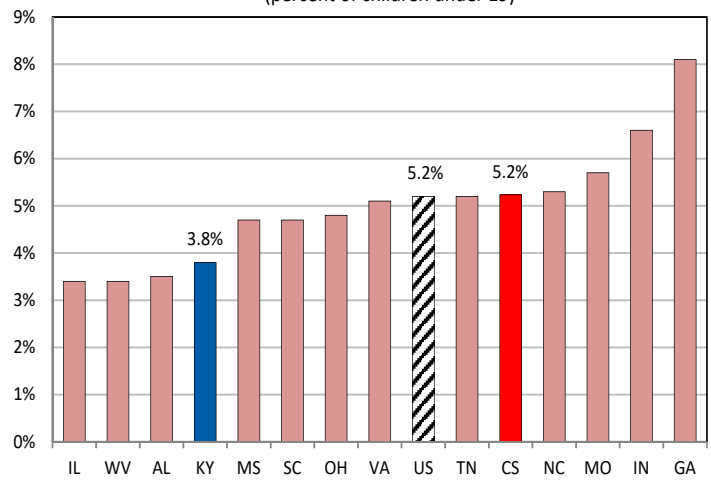


Source: 2018 American Community Survey 1-Year Estimates

Health Insurance Coverage: Children

An estimated 40,000 Kentucky children under 19 years old were not covered by health insurance in 2018, or about 3.8 percent of children. The percentage of uninsured children, which was around 11 percent in 1999, has been generally declining as children were added to the Kentucky Children's Health Insurance Program (KCHIP) or Medicaid. The Kentucky Children's Health Insurance Program is free or low-cost health insurance for children. KCHIP is for children younger than 19 who do not have health insurance and whose family income is at or less than 218 percent of the federal poverty level. For example, a family of four can earn up to $56,139 a year and qualify for KCHIP. The percentages of uninsured children (under 19) in the competitor states and U.S. are 5.2 percent (2018). Investments in children's health insurance can have high long-term payoffs. A 2019 study by Nathaniel Hendren and Ben Sprung-Keyser, *A Unified Welfare Analysis of Government Policies*, found that "direct investments in low-income children's health and education have historically had the highest Marginal Value of Public Funds (MVPF)" when examining 133 policy changes in the United States over a 50 year period. In short, they find the largest "bang for the buck" when investing in children, particularly in programs that improve the health and education of low-income children.

Children without Health Insurance Coverage, Kentucky, Competitor States and the U.S., 2018
(percent of children under 19)

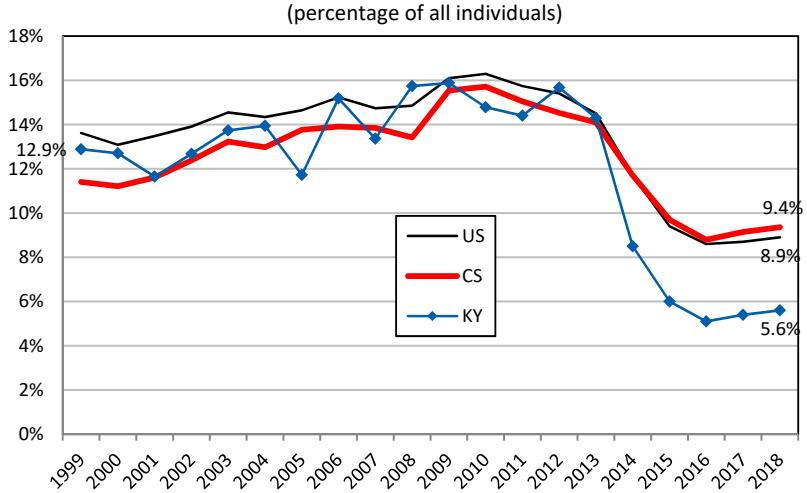


Source: 2018 American Community Survey 1-Year Estimates

HEALTH INSURANCE COVERAGE: EVERYONE

An estimated 28.6 million Americans were without health insurance in 2018, with the number and the percentage of uninsured people increasing slightly from the prior year. In Kentucky, 248,000, or 5.6 percent of the total state population, did not have health insurance in 2018. Medicaid has historically played a key role in providing health coverage for disproportionately poor Kentuckians, insuring an estimated 27 percent of the population here in 2018, compared to about 19 percent in the competitor states and 22 in the U.S. The implementation of the Affordable Care Act has increased the number of individuals on Medicaid over the past few years.

Individuals without Health Insurance Coverage, Kentucky, Competitor States, and the U.S., 1999-2018
(percentage of all individuals)



Source: U.S. Census, Health Insurance Historical Tables - HIB Series (1999 to 2012) and American Community Survey, 1-Year Estimates (2013-2018)

Youth Health-Related Behaviors

Research shows important links between health-related behaviors and educational outcomes. Specifically, lower academic achievement among high school students is associated with a lack of physical activity and inadequate nutrition. Based on data from the CDC's Youth Risk Behavior Survey (YRBS), researchers examined the linkages between several dietary, physical activity, sedentary risk behaviors, and students' grades in school. The findings show that, when compared to students with lower grades (mostly D's/F's), students who reported higher grades (mostly A's) are: more likely to engage in physical activity; play on at least one sports team; eat breakfast; eat fruits and vegetables as well as drink 100% fruit juice; drink milk; and *not* drink soda. Furthermore, the better students were less likely to watch television for extended periods, or play video games, or use a computer 3 or more hours per day. The table below shows how Kentucky high school students compare to the U.S. and selected surrounding states. In general, Kentucky students get less physical activity, evidenced by statistically significant differences. In addition, compared to the U.S., Kentucky students generally have poorer dietary practices. Improving the health of today's high school students can help create a healthier and better prepared workforce in the future.

Health-Related Behaviors of High School Students, U.S., Selected States, and Kentucky, 2017

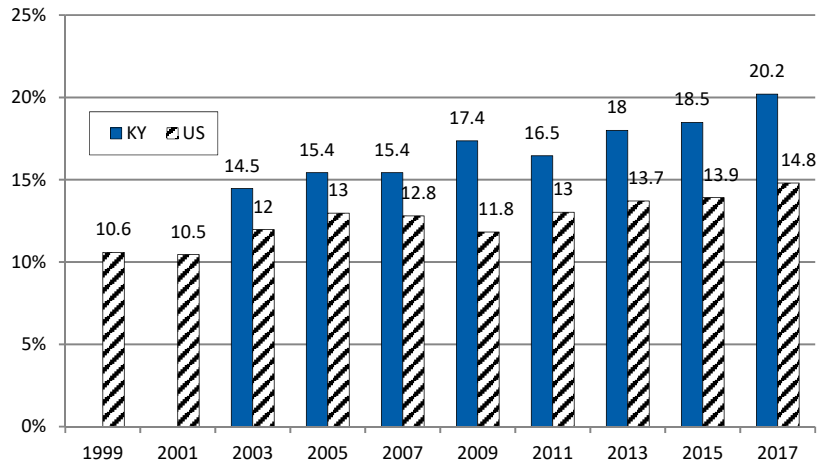
9th through 12th graders	US (%)	SS (%)	KY (%)
Ate breakfast on all 7 days before the survey	35.3*	34.2*	30.2
Ate fruit or drank 100% fruit juices one or more times per day during the 7 days prior to the survey	60.8*	55.4*	48.3
Ate vegetables one or more times per day during the 7 days before the survey	59.4*	56.6*	50.7
Drank one or more glasses per day of milk during the 7 days before the survey	31.3*	28.7	28.0
Did not drink a can, bottle, or glass of soda or pop during the 7 days before the survey	27.8*	27.3*	23.2
Physically active at least 60 minutes per day on 5 or more days during the 7 days before the survey	46.5*	44.3*	40.6
Played on at least one sports team during the 12 months before the survey	54.3*	52.1*	48.3
Watched television 3 or more hours per day on an average school day	20.7	21.0	20.9
Played video or computer games or used a computer 3 or more hours per day on the average school day	43.0	42.1	41.2

Source: Authors' analysis of data from Centers for Disease Control and Prevention (CDC), Youth Risk Behavior Surveillance System Survey Data, Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2015
Note: The selected states (SS) are IL, MO, NC, SC, TN, VA, & WV. These are weighted averages. IL did not ask the "breakfast" question, VA & NC did not ask the "milk" question, MO did not ask the "soda" question, and VA, NC, & MO did not ask the question on "playing on sport teams."
**These percentages are statistically different from the Kentucky percentages (alpha=.05).*

YOUTH OBESITY

Some research findings indicate that being significantly overweight or obese can lower a student's academic achievement. Overweight or obese students, it is argued, are more likely to suffer from adverse health consequences, such as asthma, type 2 diabetes, depression, and sleep apnea, which can then lead to higher absenteeism and negatively affect their academic performance. According to a 2007 study, obesity is a stronger predictor of school absenteeism than race, socioeconomic status, age, or gender. The obesity rate for Kentucky high school students in 2017 was one of the highest in the country. There was not a state with a statistically significant higher rate, while there were 25 states with statistically significant lower rates (out of the 32 states to which we can compare Kentucky). There is a statistically significant difference between Kentucky's youth obesity rate and the U.S. rate in every year shown in the graph below. Finally, Kentucky's 2017 rate of 20.2 percent is statistically higher than its rates in 2003, 2005, 2007, and 2011.

Obese High School Students, Kentucky and the U.S., 1999 to 2017
(percent of individuals in grades 9 through 12)



Source: Author's analysis of CDC Youth Risk Behavior Survey data, various years.

YOUTH SMOKING & VAPING

The percentage of high school students who smoke cigarettes has dropped dramatically over the last two decades, as evidenced by the Centers for Disease Control and Prevention, *High School Youth Risk Behavior Survey* results shown in the table below. In Kentucky, for example, the percentage went from almost half (47%) in 1997 to about 14 percent in 2017. While cigarettes have become somewhat passé, new products have emerged, such as vaping devices, which include e-cigarettes, e-cigars, e-pipes, vape pipes, vaping pens, e-hookahs, and hookah pens. Approximately one-quarter of Kentucky and U.S. high school students were using electronic vapor products in 2015, but these percentages declined to around 14 and 13 percent, respectively, by 2017. However, this decline appears to be short-lived. *The Wall Street Journal* reported in September 2018 that preliminary federal data for 2018 reveals a *75 percent increase* in e-cigarette usage among teens. Moreover, in late 2018, researchers at the University of Michigan reported that "Increases in adolescent vaping from 2017 to 2018 were the largest ever recorded in the past 43 years for any adolescent substance use outcome in the U.S. The percentage of 12th grade students who reported ***vaping nicotine*** in the past 30 days nearly doubled, rising from 11% to 21%." The growing use of vaping devices among teens alarms public health officials.

Percent of Kentucky & U.S. High School Students† Who Smoke Cigarettes or Use Electronic Vapor Products, Selected Years

	Smoke Cigarettes**		Use Electronic Vapor Products***	
Year	KY	US	KY	US
1997	47.0	36.4*	-	-
2003	32.7	21.9*	-	-
2005	26.2	23.0	-	-
2007	26.0	20.0*	-	-
2009	26.1	19.5*	-	-
2011	24.1	18.1*	-	-
2013	17.9	15.7	-	-
2015	16.9	10.8*	23.4	24.1
2017	14.3	8.8*	14.1	13.2

† Grades 9-12
* Statistically different from Kentucky (alpha=.05).
** Currently smoke cigarettes (on at least 1 day during the 30 days before the survey)
*** Currently used electronic vapor products (including e-cigarettes, e-cigars, e-pipes, vape pipes, vaping pens, e-hookahs, and hookah pens on at least 1 day during the 30 days before the survey)
Source: Centers for Disease Control and Prevention, High School Youth Risk Behavior Survey, various years

YOUTH ALCOHOL AND DRUG USE

A range of behavioral risks can compromise the health and well-being of young people. Here, we illustrate trends of two such behaviors. While down sharply in recent years, roughly one-quarter of Kentucky high school students—24.4 percent of males and 28.6 percent of females—are considered current drinkers (at least 1 drink of alcohol on at least one day during the 30 days before the survey). Kentucky's overall percentage in 2017, which is 26.6 percent, is statistically significantly lower than the U.S. percentage of 29.8 percent (using a 95 percent confidence interval). Thirty-three states participated in the survey in 2017, and only two are significantly lower than Kentucky—Maine at 22.0 percent and Utah at 10.6 percent. The percentage of Kentucky youth who reported using marijuana one or more times in the past month has also been on a downward trend over the last two decades, but is still in the double digits—14.6 percent of males and 16.7 percent of females. Kentucky's overall percentage in 2017 is 15.8 percent, which is statistically significantly lower than the U.S. percentage of 19.8 percent. At 8.1 percent, only Utah has a statistically lower percentage than Kentucky.

Percent of Kentucky High School Students* Who Drank Alcohol or Used Marijuana*** in Past 30 Days, Selected Years**

	Alcohol Use**		Marijuana Use***	
Year	Male	Female	Male	Female
1997	53.8	44.5	33.5	23.3
2003	46.3	44.2	22.5	19.5
2005	38.0	36.8	18.1	13.4
2007	41.0	40.1	17.4	15.4
2009	40.4	35.2	19.6	12.5
2011	35.6	33.3	20.6	17.4
2013	32.6	28.0	20.0	15.3
2015	25.6	31.2	17.5	16.9
2017	24.4	28.6	14.6	16.7

* Grades 9-12
** Currently drank alcohol (at least 1 drink of alcohol, on at least 1 day during the 30 days before the survey)
*** Currently used marijuana (one or more times during the 30 days before the survey)
Source: Centers for Disease Control and Prevention, High School Youth Risk Behavior Survey, various years

Oral Health

The oral health of our citizens is important for several reasons. First, it is important as a quality-of-life issue; healthy teeth and gums can translate into a better appearance, higher self-esteem, and more self-confidence, which are key to a better quality of life. Second, missing and decayed teeth or diseased gums can make it difficult to find employment and perform well on the job, adversely affecting the pocketbooks of individuals and families as well as the state's capacity to realize economic development and increase prosperity. Third, and perhaps most important, missing teeth, inflamed gums, and cavities often make it difficult to eat a balanced diet, and increasingly research links poor oral health to illness, chronic disease, and even early mortality. While real public health gains have been made in oral health here, Kentucky's overall status can best be termed as slightly below average. Compared to the competitor states (63.2%) and U.S. overall (65.4%), a statistically significant lower percentage of Kentucky prime working-age adults (59.2%) responded "None," when asked this question: *Not including teeth lost for injury or orthodontics, how many of your permanent teeth have been removed because of tooth decay or gum disease?*

Oral Health Indicators, U.S., Competitor States, and Kentucky, 2018
(prime working-age adults, 25 to 54 years old)

Oral Status	US (%)	CS (%)	KY (%)
Missing 1 to 5 permanent teeth	27.5	27.7	28.7
Missing 6 or more teeth, but not all	5.3*	6.6	7.1
Missing all teeth	1.8*	2.5*	5.0
Visited dentist in last 12 months	64.7	63.3	63.0

Source: Author's analysis of data from Centers for Disease Control and Prevention (CDC), Behavioral Risk Factor Surveillance System Survey Data, Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2018
Note: The competitor states are AL, GA, IL, IN, MO, MS, NC, OH, SC, TN, VA, & WV.
**These percentages are statistically different from the Kentucky percentages (alpha=.05).*

Infrastructure

THE REASONS INFRASTRUCTURE development and maintenance are fundamentally important for Kentucky's future economic advancement are simple; it includes, but is not limited to, aviation, bridges, dams, drinking water, energy, hazardous waste disposal sites, levees, public parks, roads, schools, solid waste processing plants, telecommunications, and wastewater facilities. Infrastructure is all encompassing and provides a foundation for future economic progress.

The state received a "C-" on the *2019 Report Card on Kentucky's Infrastructure*, which was produced by the Kentucky Section of the American Society of Civil Engineers (ASCE); America's infrastructure got a grade of "D+" on the most recent ASCE infrastructure assessment in 2017. Generally, the engineers evaluate 16 separate categories from aviation to wastewater according to capacity, condition, funding, future need, operation and maintenance, public safety and resilience. The Kentucky assessment in 2019 examined 10 categories.

The Kentucky Report Card presents three broad areas for improving the state's infrastructure: an integrative and comprehensive big picture approach to planning that anticipates the future challenges while addressing current needs; a concentrated investment in the multimodal freight network to support the distribution and logistics needs of growing industries; and a recognition that rural communities often lack the financial wherewithal to address vital infrastructure needs—particularly with

continued on the next page

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respect to the drinking water infrastructure.

While the ASCE infrastructure report card does not include high-speed internet as one of its elements, broadband accessibility and speed are increasingly viewed as fundamentally important components of a state's infrastructure. Unfortunately, the data show that Kentucky is lagging in its internet infrastructure, especially in rural areas. The Pew Research Center reported in May 2019 that "roughly two-thirds of rural Americans (63%) say they have a broadband internet connection at home, up from about a third (35%) in 2007… Rural Americans are now 12 percentage points less likely than Americans overall to have home broadband; in 2007, there was a 16-point gap between rural Americans (35%) and all U.S. adults (51%) on this question."

Surveys of CEOs and consultants who are involved in industrial site selection decisions show that infrastructure considerations play an important role in their decision-making. For example, choosing from a list of 28 different factors, ranging from labor costs to environmental regulations, the single most important factor for respondents to the *2018 Area Development Site Selection Survey* was the availability of skilled labor, evidenced by 90.5 percent ranking it as either "important" or "very important." By comparison, "highway accessibility" ranked third on the list at 87.2 percent.

Maintaining—let alone expanding—Kentucky's existing infrastructure, whether school buildings or roads, requires a tremendous amount of money. In today's budgetary environment, finding the necessary funds is challenging. Generating the resources to maintain and expand the state's basic infrastructure will not only continue to be a challenge, it will also be an important factor in keeping the state economically competitive for all forms of industry.

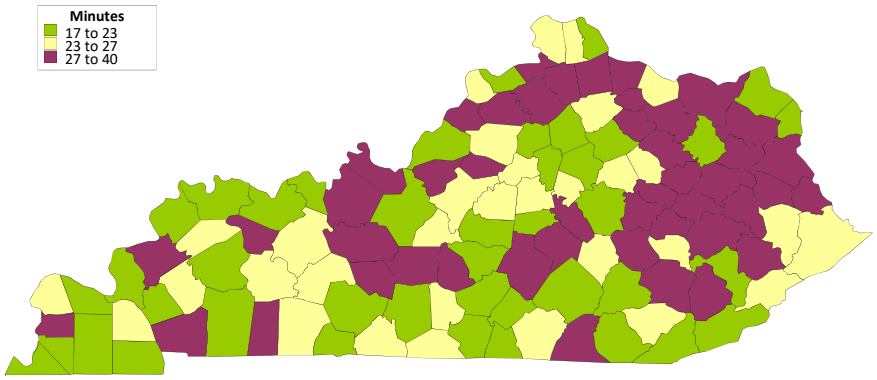
We combine several expenditure categories into a single catchall to estimate infrastructure expenditures (see page 230); this includes highways, air transportation, sea and inland ports, parking facilities, sewerage, solid waste management, and utilities like water supply, electric power, gas supply and transit. State and local expenditures for infrastructure have steadily increased on a per capita basis (in constant 2018 dollars). When viewed over the 23-year period from 1995 to 2017, Kentucky has a higher percentage increase (26%) than the competitor states (14%) or the U.S. (21%). Kentucky has expended slightly more of its cumulative gross domestic product on infrastructure (3.0%) than the competitor states (2.7%) or the U.S. (2.9%). Despite the state's past investments, it is clear more are needed to ensure the state has an adequate infrastructure to ensure future economic prosperity.

COMMUTING

An estimated 76.4 percent of Americans 16 years and older drive to work alone, which is near an all-time high. By comparison, carpooling is around 9.1 percent and public transportation accounts for about 5.0 percent. The rest use some other form of transportation, like biking, or work from home. Reflecting both economic centers of gravity as well as the state of the infrastructure network, the map below illustrates Kentucky's county-level average travel times to work. An estimated 82.1 percent of Kentuckians drive to work alone. Kentucky's statewide average of 23.3 minutes is less than the U.S. average of 26.6 minutes (based on 5-year pooled 2014-2018 data). The counties in the map are divided into one of three categories: below the Kentucky average; above the Kentucky average but below the U.S. average; and above the U.S. average. Calloway County in Western Kentucky has the lowest average travel time at 16.9 minutes, while Elliott County, located in Eastern Kentucky, is the highest at 39.4 minutes. *The Wall Street Journal* reported in November 2017 that traffic congestion incurred a $1,400 cost on each driver in the U.S. in 2016 due to wasted fuel, lost time, and decreased productivity (Inrix Annual Scorecard). New York City has an average travel time to work of 36.7 minutes, which is less than Elliott County.

Average Travel Time to Work, 2014-2018

(workers 16 years old or older)

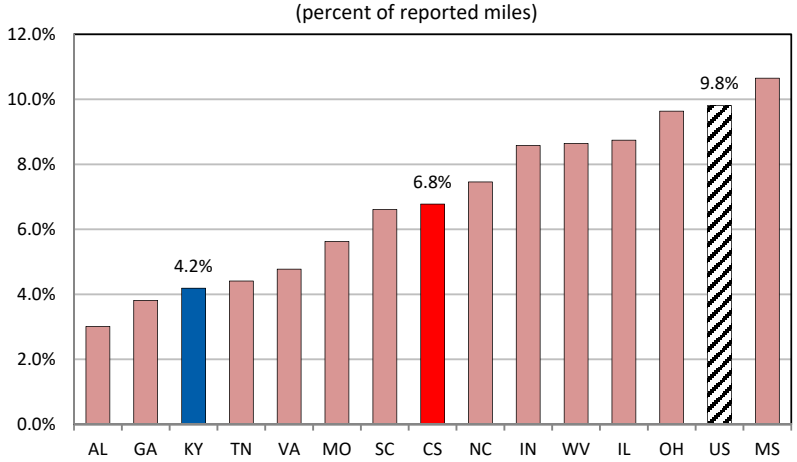


Source: American Community Survey, 2018 5-Year Estimate, Table DP03

ROAD CONDITION

Ideas, innovation, and intellectual capital form the foundation of the evolving knowledge economy. But Kentucky, like most states, is still centered on making and growing things, extracting and transporting raw materials, and moving people and products to markets and workplaces. Thus, the traditional transportation infrastructure—the road system—is still an essential piece of the economic development puzzle. Around 25 percent of Kentucky's economy is in goods-producing industries that are highly dependent on transportation. And even as the nation's economy evolves over the next few decades, the movement of freight along the country's highways, a quintessential "old economy" activity, will continue to grow. An extensive and efficient transportation system, both now and in the future, can facilitate lower industry production costs and consumer prices, widen access to commodities for businesses and consumers, and broaden the pool of workers for business while creating more job opportunities. The bottom line: roads and road quality still matter. In the figure below, road condition depends on pavement roughness, with rougher roads indicating poorer condition; only a small percentage (4.2%) of Kentucky's roads are in poor condition.

Roads in Poor Condition, 2017
Kentucky, Competitor States and the U.S.
(percent of reported miles)

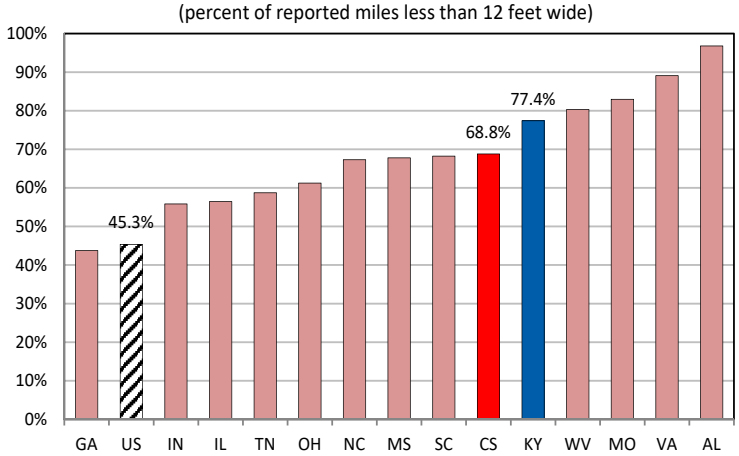


Source: Author's calculations based on Table HM-64, Highway Statistics 2017, Federal Highway Administration.
CS is the weighted average of the competitor states.

NARROW ROADS

This is a measure of lane width for "other principal arterial" roads, minor arterial, and major collector roads. It does not include interstates, other freeways, or expressways. A narrow lane is one that is less than 12 feet wide. Obviously, the more narrow the lane, the more difficult it is to move products and materials with large trucks. Consequently, the state and condition of the transportation infrastructure can affect economic development decisions. Here we focus on rural roads, not urban. An estimated 77.4 percent of Kentucky's other principal arterial, minor arterial, and major collector rural roads are narrow, compared to 45.3 percent nationally and 68.8 percent for the competitor states.

Narrow Rural Roads, 2017
Kentucky, Competitor States and the U.S.
(percent of reported miles less than 12 feet wide)

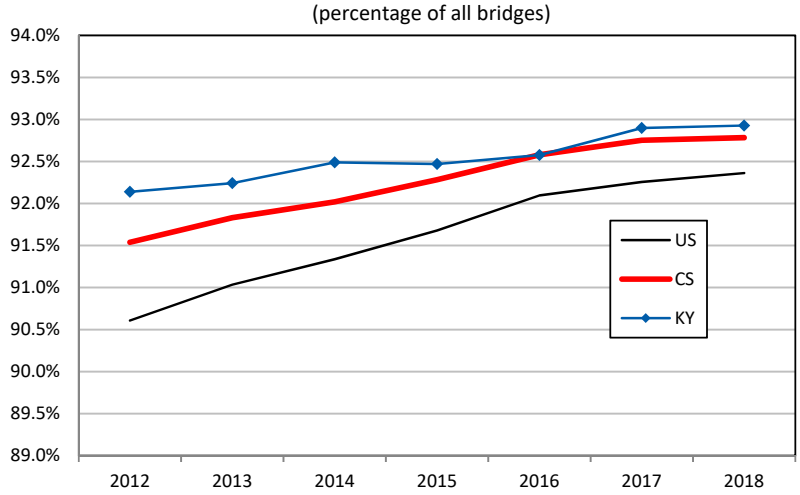


Source: Author's calculations based on Table HM-53, Highway Statistics 2016, Federal Highway Administration.
CS is the weighted average of the competitor states.

Bridges

The Federal Highway Administration (FHWA) categorizes the country's bridges using a "Good-Fair-Poor" condition framework, outlined in the Pavement and Bridge Condition Performance Measures final rule, which was published in January of 2017. Of the 14,368 bridges in Kentucky, 7.1 percent of them are considered to be in poor condition, which is about the same as the competitor states (7.2%), but slightly lower than the U.S. (7.7%). The real difference between Kentucky, the competitor states, and U.S. lies in the distribution of bridges in the other two categories—good and fair. The percentage of Kentucky bridges deemed to be in good condition (36.5%) is much lower than the competitor states (46.1%) or the U.S. (46.0%); and, is much higher in the "fair" category (56.5%) compared to the competitor states or the U.S., where are 46.7 and 46.4 percent respectively. While 92.9 percent of Kentucky bridges were considered to be in good or fair condition in 2018, Kentucky had only the 25th highest percentage among all states. Texas is the highest with 98.7 percent and Rhode Island the lowest with 76.9 percent.

Bridges in Good or Fair Condition,
Kentucky, Competitor States, and the U.S., 2012-2018
(percentage of all bridges)

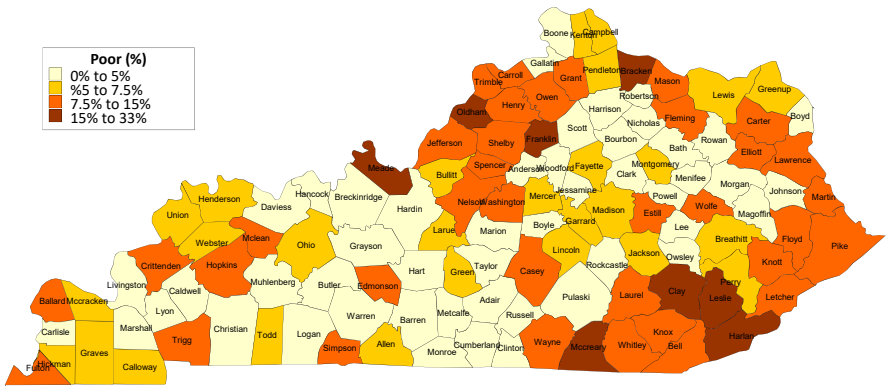


Source: U.S. Department of Transportation, Federal Highway Administration, Office of Bridges and Structures

PROBLEM BRIDGES BY COUNTY

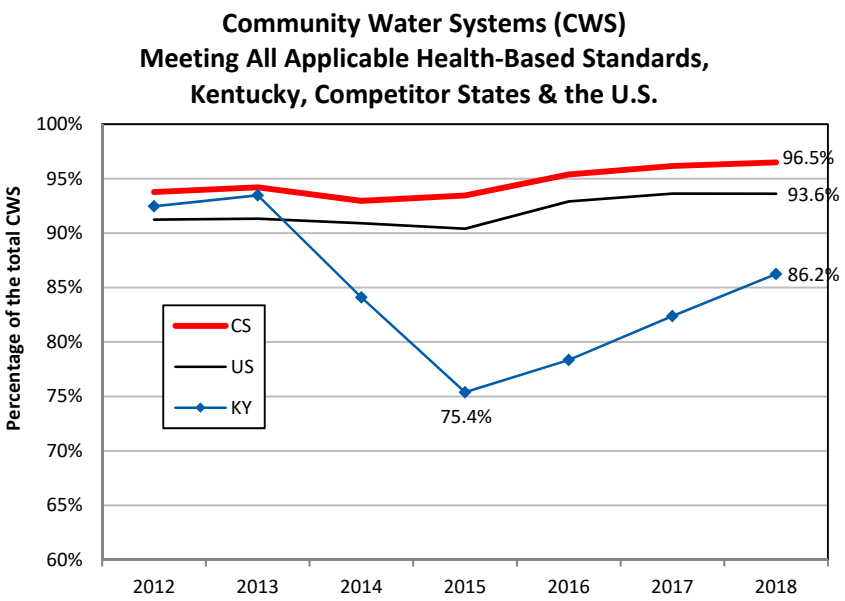
This map shows that the highest concentration of bridges in poor condition are located in the southeastern part of the state. Counties are divided into four groups: 0 to 5 percent of the bridges are in poor condition (49 counties across the state); 5 to 7.5 percent (27); 7.5 to 15 percent (36); and 15 to 33 percent (8). Leslie County has the highest percentage in the state, with 32.4 percent of its bridges deemed to be in poor condition.

Bridge Condition by Kentucky County, 2018



WATER QUALITY

The United States enjoys one of the safest and most reliable supplies of drinking water in the world. The Safe Drinking Water Act of 1974 sought to preserve the nation's water supply while maintaining high standards for quality. Most Americans get their water from a community water system (CWS), 49,100 of which served approximately 309 million people nationally in 2019, according to the Environmental Protection Agency. Around 9 percent of the U.S. population received its water from a community water system that reported at least one health-based violation in 2018, while it was about 10 percent in Kentucky. Of Kentucky's 385 community water systems, an estimated 86 percent met all applicable health-based standards and were free of violations in 2018. For the last five years in Kentucky, the percentage of community water systems meeting all applicable health-based standards has been lower than the competitor states and the U.S., as illustrated in the chart. The low point for Kentucky going back the last several years was in 2015, when only about 75 percent of community water systems were violation-free on health-based standards.

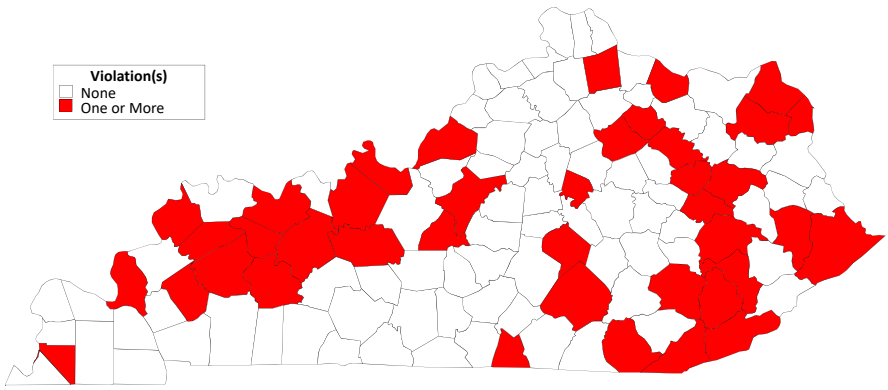


Source: Author's analysis of EPA SDWIS data.

HEALTH-BASED VIOLATIONS

Safe and sanitary drinking water is vital to a community's health and wellbeing. Community (public) water supplies and systems that have difficulty providing water that meets the health-based standards are more likely to be systems that are not adequately maintained or operated. This map shows the 40 Kentucky counties with community water systems (CWS) that experienced one or more *health-based* violations of the Safe Drinking Water Act in 2018. There were nearly 130 violations committed by 54 community water systems (out of 385 total CWS in Kentucky). These violations affected over 440,000 individuals who were served by the 54 systems. Some counties experienced multiple violations, including, but not limited to, Jessamine County (13 violations by 3 community water systems), Lincoln (9 violations by 2 systems), Webster (8 violations by 3 systems), Boyd (7 violations by 1 system), Floyd (7 violations by 2 systems), and Greenup (6 violations by 2 systems).

Community Water Systems with Health-Based Violations, 2018



Source: Author's analysis of EPA SDWIS data.

High-Speed Internet

Access to and use of the internet appear to be increasingly important for anyone becoming politically informed, socially integrated, and economically successful in the Information Age. Studies suggest that enhancing the nation's broadband infrastructure can improve innovation, entrepreneurship, and productivity (Brookings, 2013). However, according to the Federal Communications Commission (FCC), access to advanced telecommunications capability (i.e., at least 25 Mbps download/3 Mbps upload) is not uniformly available. The FCC's *2016 Broadband Progress Report* states that it "is not being deployed to all Americans in a reasonable and timely fashion...especially in rural areas..." Progress has been made since then, but digital gaps still exist. As shown in the table below, an estimated 98 percent of Americans in urban areas have access to high-speed internet while only 74 percent of rural residents do. Compared to the U.S. overall, the estimated percentage of individuals who have adopted high-speed internet is lower in Kentucky (41.0% vs. 60.2%). Finally, at 60.6 megabits per second (Mbps), Kentucky's estimated average sustained download speed is lower than many of the competitor states.

High-Speed Internet Access, Adoption & Speed Indicators, U.S., Competitor States, and Kentucky, 2017
(percent of population)

Area	Access Overall	Urban	Rural	25 Mbps/ 3 Mbps Adoption	AVG DL Speed (Mbps)
US	94	98	74	60.2	72.0
AL	86	98	70	45.7	63.2
GA	93	97	78	55.2	53.3
IL	95	99	61	56.6	66.0
IN	90	99	67	50.5	58.5
KY	**91**	**99**	**80**	**41.0**	**60.6**
MS	80	97	63	31.7	18.8
MO	89	99	65	47.0	84.8
NC	95	100	85	59.4	72.4
OH	95	99	78	48.1	73.8
SC	90	98	74	50.5	69.6
TN	91	99	77	53.4	62.4
VA	92	97	74	68.4	88.7
WV	85	97	73	46.3	52.4

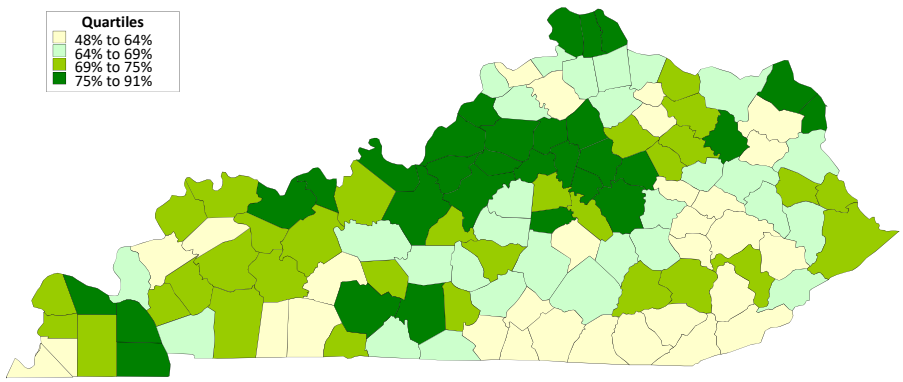
Source: Data in columns 2-5 are from the Federal Communications Commission (FCC), 2019 Broadband Deployment Report, May 2019, while data from column 6 is from the FCC's Eighth Measuring Broadband in America Fixed Broadband Report.
Note: The average download speeds reflect the sustained speed. The US estimate is a median.

HIGH-SPEED INTERNET BY COUNTY

Since the beginning of the "digital age," technology experts, community development specialists, and concerned citizens have expressed concerns about the so-called digital divide. Despite considerable progress, the urban-rural digital divide has been difficult to bridge. As is evident in the map below, Kentucky's urban areas tend to have much higher broadband adoption rates. A June 2017 *Wall Street Journal* article, "Rural America is Stranded in the Dial-up Age," describes the importance of high-speed internet for the economic prospects of rural communities: "Counties without modern internet connections can't attract new firms, and their isolation discourages the enterprises they have: ranchers who want to buy and sell cattle in online auctions or farmers who could use the internet to monitor crops. Reliance on broadband includes any business that uses high-speed data transmission, spanning banks to insurance firms to factories. Rural counties with more households connected to broadband had higher incomes and lower unemployment than those with fewer, according to a 2015 study..." There are a number of Kentucky counties that will continue to face significant economic challenges without access to high-speed internet. The lowest values are located in the rural areas of the state, while the metro areas are generally higher.

Broadband High-Speed Internet Connections, 2014-2018

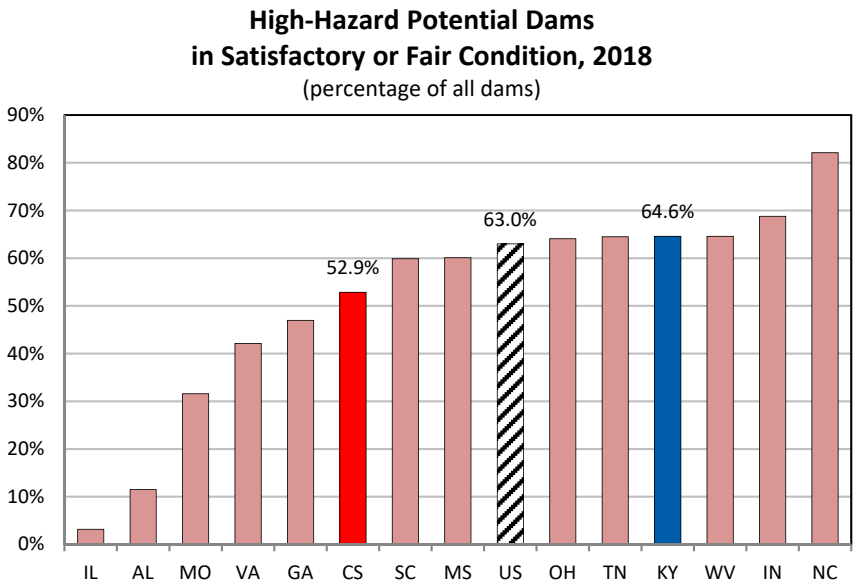
(percentage of households)



Source: American Community Survey, 2018 5-Year Estimate, Table S2801

Dams

The Oroville Dam in Northern California captured the national headlines in February 2017 when the threat of its failure forced the evacuation of almost 200,000 people. Of Kentucky's 1,089 dams, 271 were classified as "high hazard potential" in 2018. Dams are assigned to one of five categories (high, significant, or low hazard potential—and undetermined or not available are options) by Dam Safety Program engineers based on the likely loss of human life, level of property damage, environmental destruction, and economic loss that would likely ensue *if* the structure failed. A high hazard dam is one that, if it failed, may cause loss of life or serious damage to houses, industrial or commercial buildings, important public utilities, main highways or major roads. Of Kentucky's 271 high hazard potential dams, 64.6 percent are deemed to be in "satisfactory" or "fair" condition based on a classification scheme that has the following categories: satisfactory, fair, poor, or unsatisfactory (not rated is also an option). At 64.4 percent, Kentucky has the 31st highest percentage of dams in satisfactory or fair condition among the states. Even though Kentucky is higher than the competitor state (52.9%) and U.S. averages (63%), there are 81 high hazard dams in poor condition and 15 that are not rated.

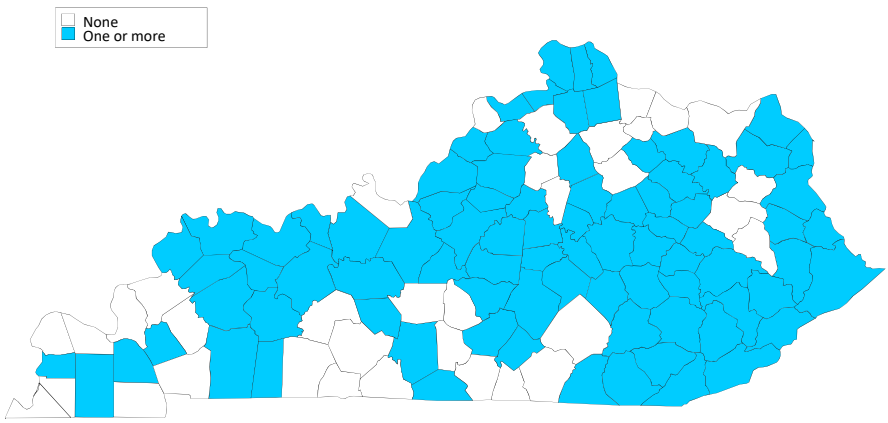


Source: Author's calculations based on from the National Inventory of Dams and data from the Association of State Dam Officials.

HIGH HAZARD POTENTIAL DAMS

This map shows the Kentucky counties that have at least one of the state's 271 high hazard potential dams. As we explain on the facing page, if one of these dams fails, it may cause loss of life or serious damage to houses, industrial or commercial buildings, important public utilities, main highways or major roads. We do not have data on the conditions of specific dams, but we do know that 81 of them are in "poor" condition—nearly 30 percent of all high-hazard dams in Kentucky. Dam owners are encouraged to develop Emergency Action Plans (EAP) for their dams. These plans are a written document that "identifies incidents that can lead to potential emergency conditions at a dam, identifies the areas that can be affected by the loss of reservoir and specifies pre-planned actions to be followed to minimize property damage, potential loss of infrastructure and water resource, and potential loss of life because of failure or mis-operation of a dam." Essentially, an EAP is a plan of action to be taken to reduce the potential for property damage and loss of life in an area affected by a dam failure or large flood. There are 13 high hazard potential dams in Kentucky, all privately owned, that do *not* have an Emergency Action Plan; the rest either have them or an EAP is not required.

High Hazard Potential Dams by Kentucky Counties, 2018

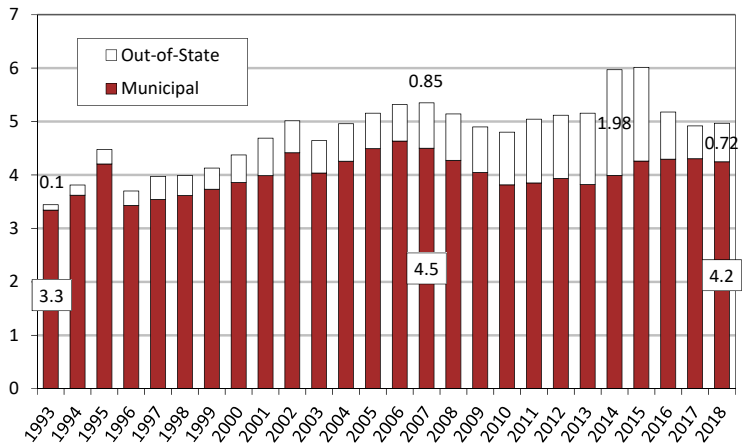


Source: Author's analysis of the 2018 National Inventory of Dams (NID) database.

SOLID WASTE DISPOSAL

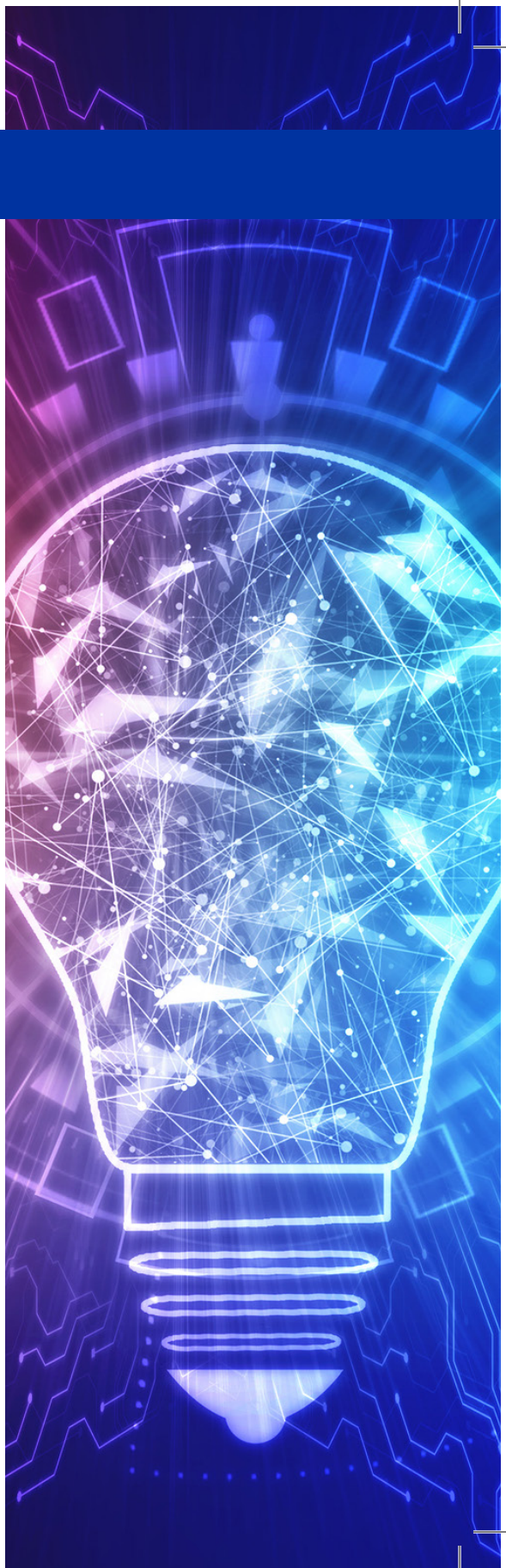
In 1992, the Kentucky General Assembly set the ambitious goal of reducing the amount of municipal solid waste (MSW) deposited in Kentucky landfills in each subsequent year—but waste continues to mount. While the total amount of solid waste deposited in Kentucky landfills trended downward from its peak of 5.35 million tons in 2007 to just over 5 million tons in 2013, the amount deposited in 2014 and 2015 increased to around 6 million tons. A growing portion of the total, as evidenced in 2014 and 2015, is solid waste from *out-of-state sources*; it reached a record high of almost 2 million tons in 2014 and remained high in 2015 with 1.75 million tons, a significant increase since the early to mid-1990s. As a result of this growing trend, out-of-state solid waste constituted 33 percent of the total amount of waste deposited in Kentucky's landfills in 2014—compared to less than 5 percent in the early to mid-1990s. However, there was a sudden decrease in 2016, evidence by a decline to just under a million tons (0.88), and this decreased to just over a half-million tons (0.62) in 2017. In 2018, about 14.5 percent of the state's nearly 5 million tons of solid waste was from out of state. Landfills, "landfarms," and other specially designated areas for solid waste disposal are expensive to open, maintain, operate, monitor, or close. Policies, actions, and incentives to reduce waste disposal are economically beneficial.

Solid Waste Disposed in Kentucky Landfills, 1993-2018
(millions of tons)



Source: KY Division of Waste Management

Innovation



NEARLY 20 YEARS AGO, KENTUCKY created the Office for the New Economy within the Cabinet for Economic Development, and then launched *Kentucky Innovation: A Strategic Plan for the New Economy*. The goal was to capture some of the burgeoning high-tech economic dynamism found along Route 128 in Boston, Silicon Valley in the Bay Area, or, at a minimum, to become the next Research Triangle Park in North Carolina. Kentucky was not alone, as many states jumped on board the innovation train.

Two decades into these efforts to plant and grow the innovation seeds across the heartland, researchers have found that not a lot has changed. Boston, Seattle, San Diego, San Francisco and Silicon Valley garnered 90 percent of the "high-tech jobs" created from 2005 to 2017. Meanwhile, Kentucky is ranked 46th in the *2018 State Technology and Science Index: Sustaining America's Innovation Economy*, which combines several indicators that reflect a state's research and development inputs, risk capital and entrepreneurial infrastructure, human capital investments, technology and science workforce, and technology concentration and dynamism; Kentucky was ranked 45th in 2012.

Our state needs good ideas, adequate finances, and energetic human capital to create and support high-growth enterprises—but it also might need some help to make this happen. Researchers at the Brookings Institution, for example, have called for "a massive federal effort to transform a short list of 'heartland'

continued on the next page

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metro areas into self-sustaining 'growth centers' that will benefit entire regions." (Atkinson, et al., *The case for growth centers: How to spread tech innovation across America*, Brookings, December 9, 2019)

The Kauffman Foundation's *Index of Early-Stage Entrepreneurship*, another index similar to the *State Technology and Science Index*, is based on four factors: 1) the rate of new entrepreneurs; 2) the opportunity share of new entrepreneurs; 3) the startup early job creation; and 4) the startup early survival rate (see page 179 for more explanation of these factors). The *Kauffman Early-Stage Entrepreneurship (KESE) Index* is an equally weighted average or composite of the four indicators. Kentucky's national KESE Index ranking in 2018 is 35th, but it ranks squarely in the middle of the pack among the competitor states. California has the highest KESE Index rank, and Rhode Island the lowest.

Our examination of high-technology establishments over the period of 2003 to 2017 shows that Kentucky has consistently trailed the competitor states and the U.S. In 2017, 9.4 percent of establishments in competitor states and 9.9 percent in the U.S. are considered "high-tech." In the same year only 7.7 percent of Kentucky establishments are considered "high-tech."

Why should anyone care about startups, innovations, and the funding for research and development that powers them? The answer is simple: over the long term, our collective standard of living will likely depend on it. John Fernald at the Federal Reserve Bank of San Francisco and Charles Jones at Stanford University have found that around three-fourths of U.S. economic growth since 1950 was fueled by just two factors—rising educational attainment and research intensity—with the latter accounting for nearly 60 percent of the growth. Despite the tight connections between research intensity, economic growth and job creation, total research and development expenditures as a percentage of gross domestic product are significantly lower in Kentucky (0.95%) compared to the competitor states (1.9%) and the U.S. (2.8%).

As federal research and development funds become more limited, the nation's universities can and should do more to realize their tremendous innovation and commercialization potential. Moreover, as government budgets tighten, policy makers, as well as taxpayers, increasingly expect a positive return on investment from scarce public resources. Kentucky needs good ideas, adequate finances, and energetic human capital to create and nurture high-growth enterprises.

Early-Stage Entrepreneurship

The Kauffman Foundation Index of Early-Stage Entrepreneurship is based on four factors: 1) the *rate of new entrepreneurs*, which reflects the percent of adults becoming entrepreneurs in a given month, as a year average; 2) the *opportunity share of new entrepreneurs*, which shows the percent of entrepreneurs driven by opportunity (instead of necessity); 3) the *startup early job creation*, which reflects the jobs created by startups per 1,000 people; and 4) the *startup early survival rate*, which is the percentage of firms surviving one year after founding. The last column in the table below is the *Kauffman Early-Stage Entrepreneurship (KESE) Index*, an equally weighted average or composite of the four indicators. Kentucky's national KESE Index ranking in 2018 is 35th, but it ranks squarely in the middle of the pack among the competitor states. California has the highest KESE Index rank (2.78), and Rhode Island the lowest (-3.8).

Indicators of Entrepreneurship, 2018

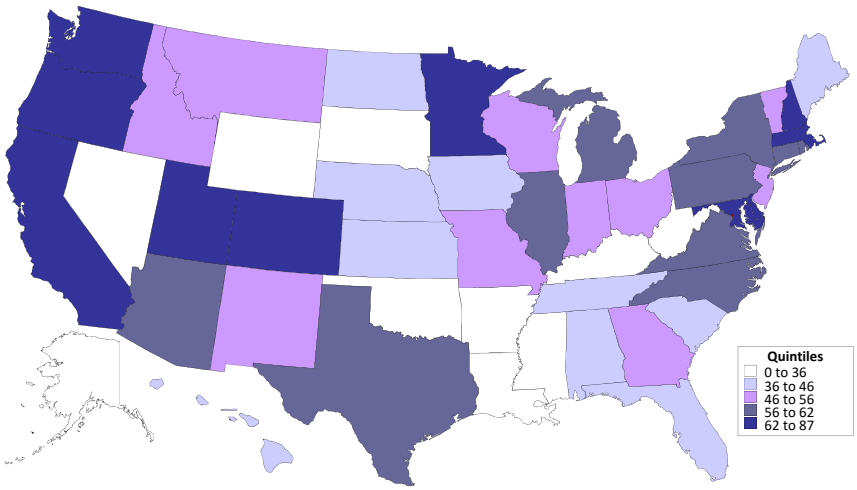
Area	New Entrepreneurs	Opportunity Entrepreneurs	Startup Early Job Creation	Startup Early Survival	KESE Index
US	0.32%	86.16%	5.20	79.43%	0.56
AL	0.21%	84.11%	4.17	79.42%	-1.06
GA	0.42%	90.92%	5.88	76.12%	1.47
IL	0.25%	79.46%	4.48	80.00%	-0.75
IN	0.21%	86.79%	3.72	80.39%	-0.82
KY	**0.26%**	**85.38%**	**4.26**	**78.71%**	**-0.53**
MO	0.32%	83.96%	5.73	70.94%	-1.07
MS	0.32%	86.33%	3.76	81.97%	0.71
NC	0.27%	90.35%	4.61	81.20%	0.44
OH	0.20%	81.40%	3.6	79.58%	-1.5
SC	0.26%	83.31%	4.89	79.68%	-0.34
TN	0.27%	88.11%	4.87	80.32%	0.19
VA	0.18%	76.14%	4.68	78.62%	-1.95
WV	0.21%	90.40%	3.06	80.15%	-0.76

Source: Kauffman Indicators of Entrepreneurship, 2018 National & State Reports on Early-Stage Entrepreneurship, September 2019.

Science & Technology Index

Combining several indicators that reflect a state's research and development inputs, risk capital and entrepreneurial infrastructure, human capital investments, technology and science workforce, and technology concentration and dynamism, the Milken Institute has ranked the states according to their science and technology prowess in a 2018 report, *State Technology and Science Index: Sustaining America's Innovation Economy*. Kentucky is ranked 46th. The top state is Massachusetts, followed by Colorado, Maryland, California, Utah, Washington, Delaware, Minnesota, New Hampshire, and Oregon.

State Technology and Science Index 2018

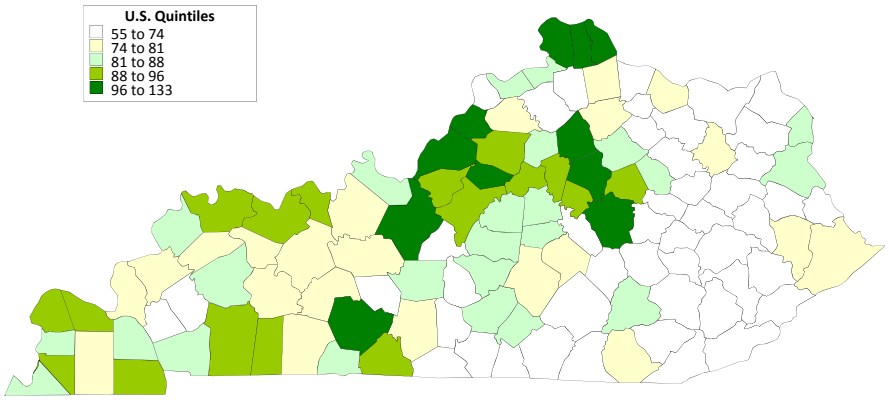


Source: Milken Institute 2018 State Technology and Science Index

County-Level Innovation Index

Kentucky's county-level results from the *Innovation 2.0 Index* are illustrated on the map below, with the highest innovation index values anchoring the three angles of the urban triangle (i.e., the Louisville area, Northern Kentucky, and the Fayette County area) and extending west to Hardin and Warren Counties. The index is based on five broad categories and includes 57 different variables. The five broad categories include Human Capital and Knowledge Creation, Business Dynamics, Business Profile, Employment and Productivity, and Economic Well-Being. Some of the variables include educational attainment, high-technology employment, broadband adoption, venture capital investments, patent creation, worker productivity, proprietor income, the poverty rate, and per capita income. The highest ranked Kentucky county is Boone at 111. San Mateo County, California—which is Silicon Valley—has the highest value of any county in the United States at 133.4; Issaquena County, Mississippi, has the lowest index value in the country at 54.8. The map below shows Kentucky's counties distributed within categories representing the national quintiles, or five equal categories. That is, by taking all counties in the U.S. and ranking them lowest to highest, eleven Kentucky counties are in the top quintile or upper 20 percent of counties nationally. There are 55 Kentucky counties in the bottom quintile.

Innovation Index by Kentucky County

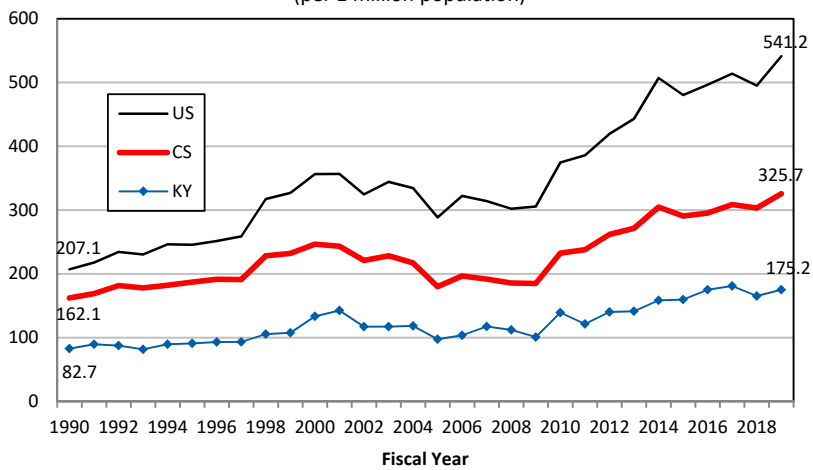


Source: Indiana Business Research Center. "Driving Regional Innovation: The Innovation Index 2.0." August 2016. http://statsamerica.org/ii2/reports/Driving-Regional-Innovation.pdf.

PATENTS

Innovation, as measured by the number of patents issued, is widely regarded as a measure of a state's entrepreneurial energy. Research finds that innovation, along with education, has a significant impact on a state's per capita income. A study by the Federal Reserve Bank of Cleveland shows that states which generate innovation, as measured by patents, can reap economic rewards that endure for generations. The authors conclude, "A state's knowledge stocks (as measured by patents and education levels) are the main factors explaining a state's relative per capita income." In other words, Kentucky's much lower-than-average patent stock—which has trailed the U.S. as well as the competitor states for the last 50 years—along with lagging educational attainment rates, are why the state's per capita income has languished at just over 80 percent of the U.S. average for the last several decades. Overall, the number of patents has increased significantly since 2009, but there is a markedly lower prevalence of patents in Kentucky (175.2 per million population) compared to the U.S. (541.2 per million population) and competitor states (325.7 per million population).

Number of Patents,
Kentucky, Competitor States, and the U.S., 1990-2019
(per 1 million population)

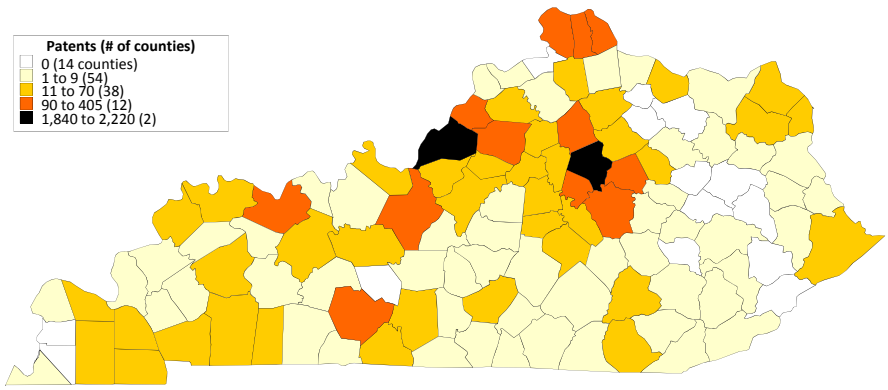


Source: Calculated by the author using US Patent and Trademark Office and U.S. Census Bureau data.
Note: Data include utility, design, plant, and reissue patents.

PATENTS BY COUNTY

From 2000 to 2015, Kentucky businesses and individuals acquired 7,639 utility patents, which are patents for invention. Of this total, 4,066 or 53 percent were from two counties: Fayette and Jefferson. The next 12 counties account for 2,310 or 30 percent. The county-level map illustrates the concentrated nature of patent generation in Kentucky.

Utility Patents by County, 2000-2015

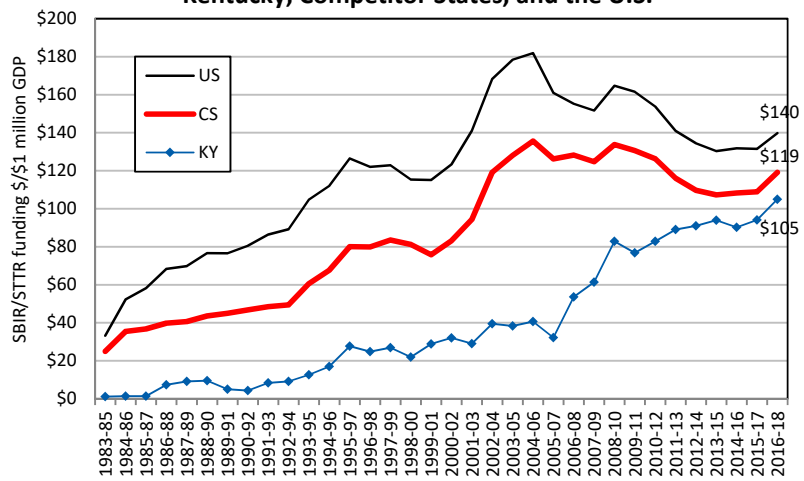


Source: U.S. Patent and Trademark Office, U.S. State Patenting, Breakout by Regional Component, Count of 2000-2015 Utility Patent Grants

SMALL BUSINESS INNOVATION RESEARCH

Small Business Innovation Research (SBIR) and Technology Transfer (STTR) funding is available to companies with 500 or fewer employees; it is designed to stimulate high-technology innovation and facilitate the commercialization of scientific and technological discoveries. According to the National Science Foundation, "a high value indicates that small business firms in a state are doing cutting-edge development work that attracts federal support." When compared to competitor states and the U.S. average, Kentucky has consistently lagged behind—but this appears to be changing. Since the mid-2000s, SBIR/STTR funding as a percentage of gross domestic product has been generally declining in the U.S. and competitor states while steadily increasing in Kentucky. However, as the figure shows, Kentucky's $105 per $1 million in state gross domestic product during the 2016-18 period is below the U.S. ($140) and competitor states ($119).

Small Business Innovation Research (SBIR) & Technology Transfer (STTR) Funding, 1983-2018, Kentucky, Competitor States, and the U.S.

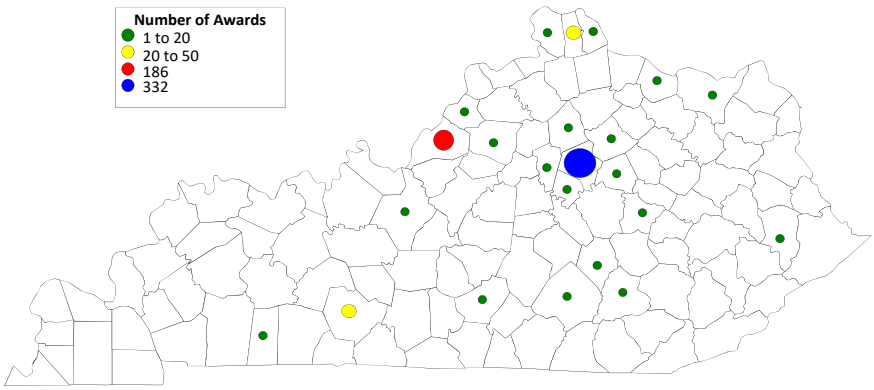


Source: Author's analysis of SBIR/STTR data

SBIR/STTR AWARDS BY COUNTY

Of all the dollars invested through the SBIR and STTR programs from 1983 to 2018, the majority went to ventures in two counties: Fayette and Jefferson. There were approximately 659 awards in Kentucky during this time and 332 were in Fayette County, representing 46 percent of the total *funding*. Jefferson County was the second highest recipient with 186 awards and around 35 percent of the total funding. Kenton, Woodford, and Warren Counties received 86 awards and 13 percent of the total funds. These *five counties* account for virtually all of Kentucky's SBIR/STTR awards (92%) and funding (93%) during this period, which is indicative of the geographic concentration of Kentucky's innovation ecosystem.

Kentucky SBIR/STTR Awards by County, 1983-2018

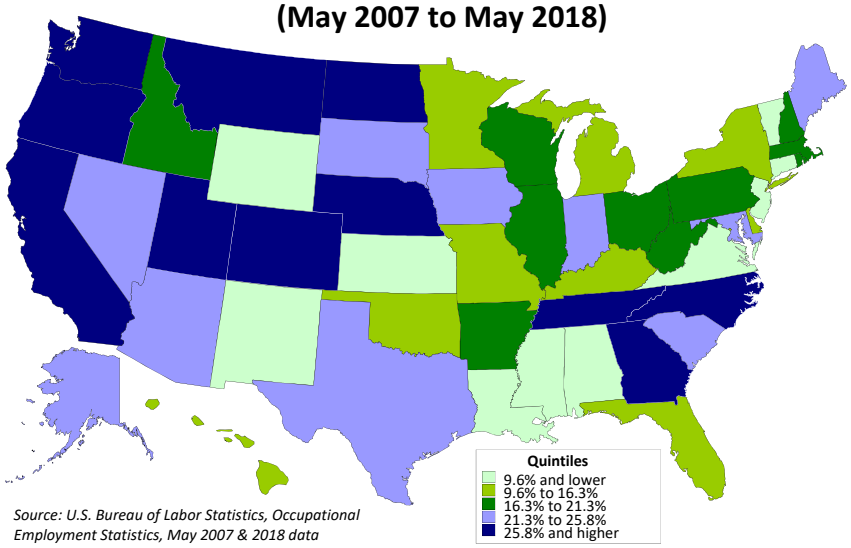


Source: Authors' analysis of data from www.sbir.gov

STEM OCCUPATIONS BY STATE

Science, technology, engineering, and mathematics (STEM) occupations accounted for 6.3 percent of the jobs in the U.S. in 2018, compared to 4 percent in Kentucky. The presence of STEM occupations can be viewed as the successful outcome of an entrepreneurial ecosystem that supports innovation. Over half of the STEM jobs nationally are in two broad areas: computers and engineering. According to the Bureau of Labor Statistics, computer occupations make up about 45 percent of STEM employment, while engineers make up around 20 percent. Wages are generally higher for STEM occupations. The national average wage for all STEM occupations in 2018 was $93,130, nearly double the national average wage for non-STEM occupations ($51,440). The growth of these jobs is obviously desirable, but this growth is spread unevenly across the states. Between May 2007 and May 2018, states that added the largest numbers of STEM jobs included California (259,100), Texas (138,100), North Carolina (70,200), and New York (67,400). On a percentage change basis, North Dakota experienced the largest increase in STEM jobs at 56 percent, followed by Utah (38%), North Carolina (35%), and Georgia (34%). By comparison, Kentucky added about 8,200 STEM jobs from 2007, the peak of the last economic expansion, to 2018. This represents an 12 percent increase—placing the state in the second lowest quintile.

Percentage Employment Change for STEM Occupations by State (May 2007 to May 2018)

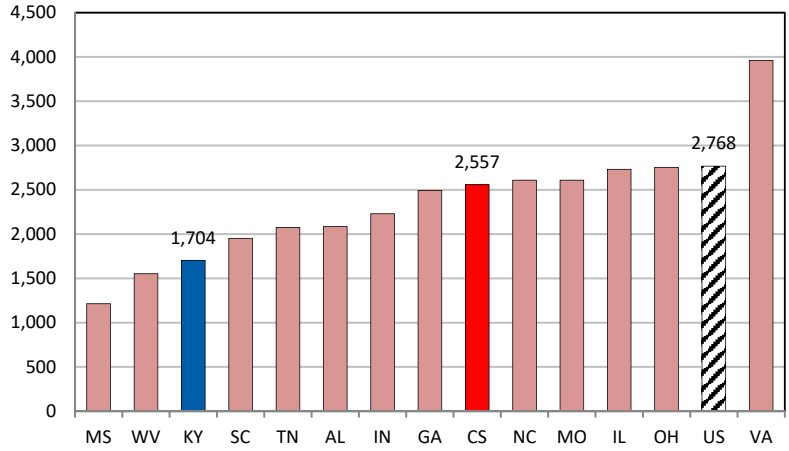


Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics, May 2007 & 2018 data

STEM JOBS

There has been widespread agreement among policy makers nationally for the last few decades regarding the desirability of increasing the numbers of science, technology, engineering, and mathematics (STEM) occupations. These are high-wage jobs in economic sectors that are highly coveted by economic development professionals, community leaders, and individual workers. As noted on the previous page, an estimated 4 percent of occupations in Kentucky are in the STEM area, which translates to about 1,704 jobs per 100,000 population. This number is significantly lower than both the competitor states (2,557) and U.S. (2,768) averages. DC (9,716) and Massachusetts (4,640) are ranked first and second, while Mississippi (1,214) is ranked last. Among the 50 states and DC, Kentucky is ranked 46th.

STEM Jobs in 2018
Kentucky, Competitor States, and the U.S.
(per 100,000 population)

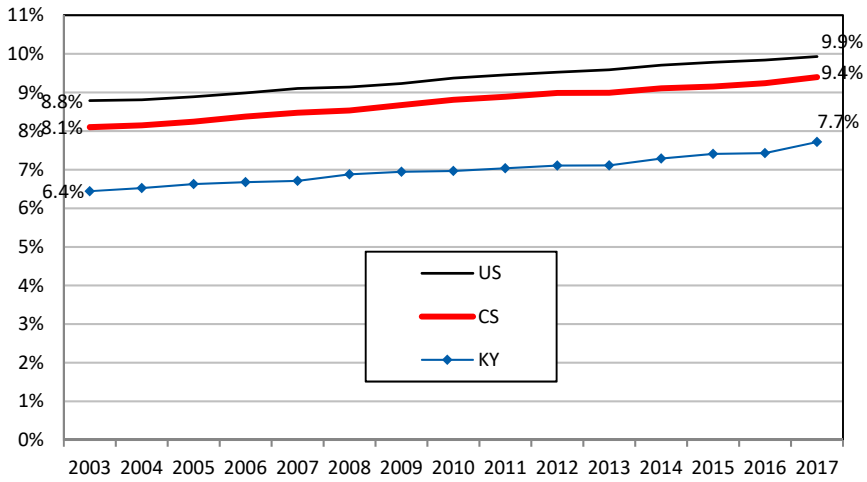


Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics, May 2018 OES Data
Note: CS is the competitor state weighted average

High-Technology Establishments

According to the National Science Foundation (NSF), high-technology industries have at least twice the number of scientific, engineering, and technical occupations compared to the average for all industries. These workers have extensive education and training in the sciences, mathematics, and engineering. We use 50 different industries (at the 4-digit NAICS level) to identify high-technology establishments. Using the 46 sectors identified by NSF and four additional identified by the Milken Institute, we calculate the number of high-technology establishments as a percentage of total establishments. Dating back to 2003 Kentucky has consistently trailed the competitor states and the U.S. In 2017, 9.4 percent of establishments in competitor states and 9.9 percent in the U.S. are considered "high-tech." In the same year only 7.7 percent of Kentucky establishments are considered "high-tech," ranking it 44th nationally. The top ranked state is Virginia with 13.7 percent (DC is higher at 18.6%), and South Dakota is ranked last with 6.3 percent.

High-Technology Establishments,
Kentucky, Competitor States, and the U.S., 2003-2017
(as a percent of total establishments)

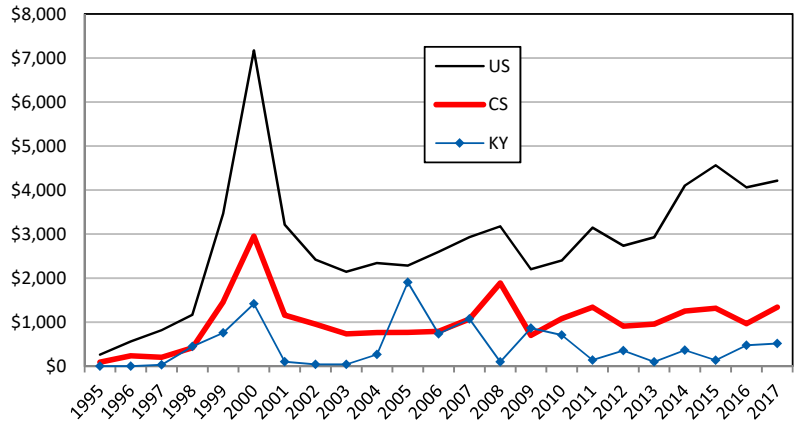


Source: Author's analysis of County Business Patterns, U.S. Census Bureau, various years

VENTURE CAPITAL

According to the Kauffman Foundation, most young companies are started from the savings of their founders and then sustained by positive cash flow. The next largest source of capital for young companies is credit cards, followed by borrowed money from family and friends, banks, and then venture capital. Research also shows that less than 20 percent of the fastest growing companies in the United States took any venture money. Moreover, venture capital investments are typically concentrated in a just few states, such as California, New York, and Massachusetts. In 2016, for instance, these three states accounted for 76 percent of all venture capital funding. Nevertheless, the level of venture capital in a state's economy is frequently used as an indicator of innovation capacity and entrepreneurial energy. In 2017, venture capital investments in Kentucky were $502 per $1 million of state gross domestic product (in constant 2018 dollars)—which was substantially lower than the competitor states ($1,307) and the U.S. average ($4,113).

Venture Capital Investments,
Kentucky, Competitor States, and the U.S., 1995-2017
(Constant 2018 dollars, per $1 million/state GDP)

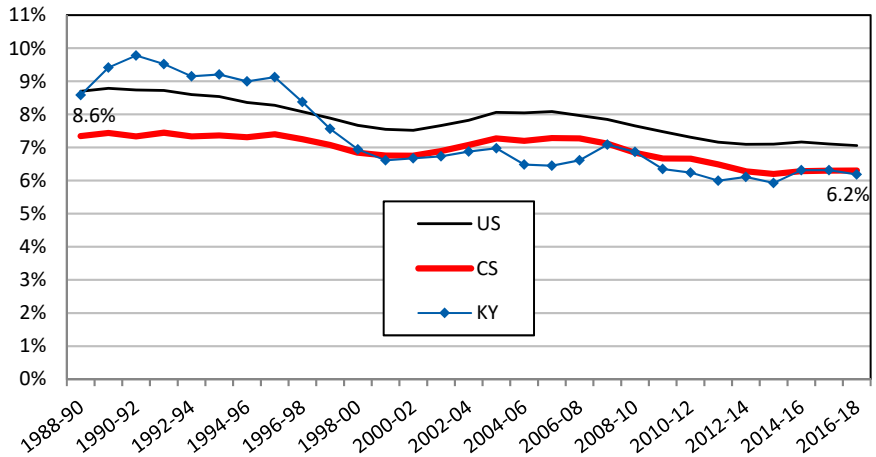


Source: National Science Board. 2018. "Venture Capital Disbursed per $1 Million of Gross Domestic Product." Science and Engineering Indicators 2018, State Indicators. Alexandria, VA: National Science Foundation (NSB-2018-1).

SELF-EMPLOYED

The self-employed include a diverse and broad range of occupations, from farmers to landscapers to doctors. One characteristic that can be attributed to each of them, is the willingness to chart their own economic path. Either out of necessity or opportunity, these individuals demonstrate the spirit needed to create an entrepreneurial economy. Just over 6 percent of full-time working adults in Kentucky are self-employed, which is about the same as the competitor states' average. The percentage of self-employed Americans is somewhat higher at just over 7 percent. Over the last thirty years, these percentages have been trending down, evidenced by the decline in Kentucky from 8.6 percent to 6.2 percent. Nonetheless, around 124,000 individuals are self-employed in Kentucky—compared to over 1.9 million Kentuckians who work for a wage or salary earned at a business.

Self-Employed,
Kentucky, Competitor States, and the U.S., 1988-2018
(as a percent of total jobs, 3-year moving average)

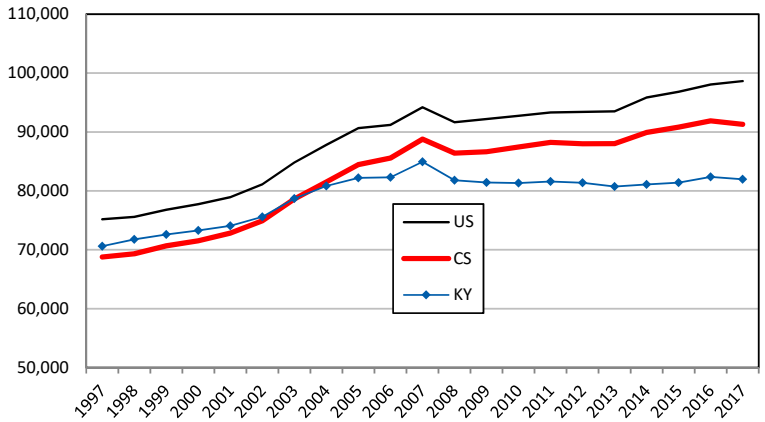


Source: BLS Current Employment Statistics survey for wage and salary worker employment. Self-employment estimates generated by the author using data from Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [ASEC 1988-2018]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V6.0

NONEMPLOYER ESTABLISHMENTS

This is another measure of self-employment. According to the Census Bureau, "A nonemployer business is one that has no paid employees, has annual business receipts of $1,000 or more ($1 or more in the Construction industry), and is subject to federal income taxes." Some examples of these businesses are beauty salons, child-care providers, landscaping services, barber shops, real estate agents, tax preparers, and electricians—just to name a few. These types of small enterprises grew steadily from the late 1990s until the Great Recession in 2008, when the growth rate stalled. Since then, the U.S. and the competitor states have rebounded and are now slightly above their pre-recession rates. Historically, Kentucky's rate has been lower than the competitor states and the U.S., and since the Great Recession Kentucky's rate has been essentially flat.

Nonemployer Establishments,
Kentucky, Competitor States, and the U.S., 1997-2017
(per 1 million population 16 and older)

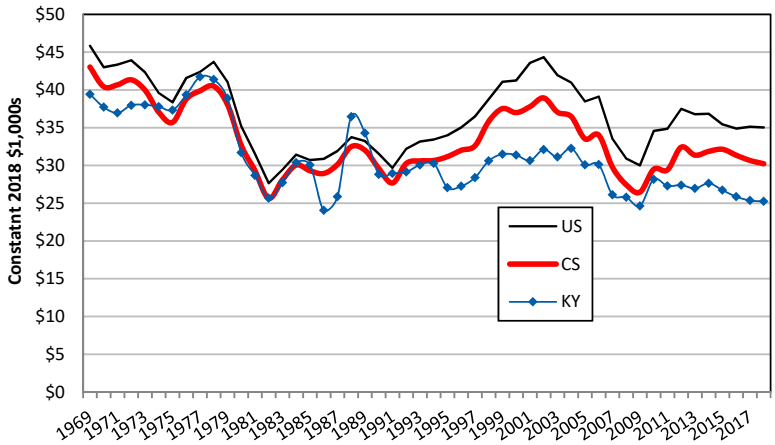


Source: Author's analsyis of data from the U.S. Census Bureau

ENTREPRENEURIAL DEPTH

Entrepreneurship is a particularly promising vehicle for economic development, as reflected in the January 2012 update of the Kentucky Cabinet for Economic Development *Strategic Economic Development Plan*. Entrepreneurs help create new jobs, and generate wealth and new growth. They are innovative users of assets and resources and appear to be a critical mechanism for bringing new ideas and innovations to the marketplace. The depth of entrepreneurship can be gauged by examining the value created by entrepreneurs in a region as measured by the ratio of self-employment income to the number of self-employed workers in an economy. Unlike breadth, which measures the number of entrepreneurs in a region, depth examines the value. High-value entrepreneurs clearly earn more, add more value, and enhance regional growth and prosperity more than other entrepreneurs. Kentucky has generally trailed the United States and competitor states in entrepreneurial depth. In 2018, Kentucky lagged the U.S. and competitor states by approximately $9,800 and $5,000 respectively.

Average Self-Employment Income,
Kentucky, Competitor States, and the U.S., 1969-2018
(nonfarm proprietor income/nonfarm proprietor employment)

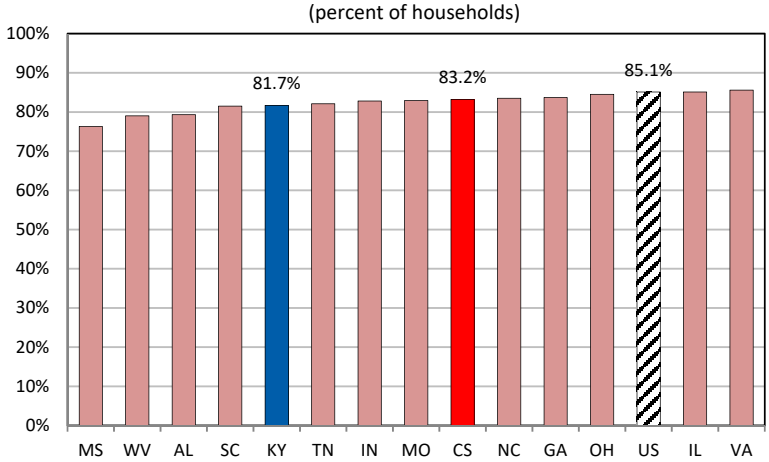


Source: U.S. Department of Commerce, Bureau of Economic Analysis

HIGH-SPEED INTERNET

The nearly instantaneous data transfers enabled by broadband or high-speed internet has accelerated globalization of the economy. Whether it is corporations doing business with one another, workers telecommuting, or consumers shopping for the latest bestselling book, high-speed internet increasingly underpins 21st Century commerce. Access to and use of the internet appear to be increasingly important for anyone becoming politically informed, socially integrated, and economically successful in the Information Age. Studies suggest that enhancing the nation's broadband infrastructure can improve innovation, entrepreneurship, and productivity (Brookings, 2013). Indeed, numerous studies have identified measurable economic benefits associated with widespread access to high-speed Internet. In the United States, an estimated 85.1 percent of the households have a broadband connection, compared to 83.2 percent for the competitor states and 81.7 percent for Kentucky. Mississippi, West Virginia, and Alabama have statistically significant lower rates than Kentucky, while Tennessee and South Carolina are statistically the same as Kentucky (using a 90 percent confidence interval). The rest of the states shown in the bar chart below, as well as the competitor state and U.S. averages, are statistically higher than Kentucky.

Broadband Internet Access from Home, 2018, Kentucky, Competitor States and the U.S.
(percent of households)

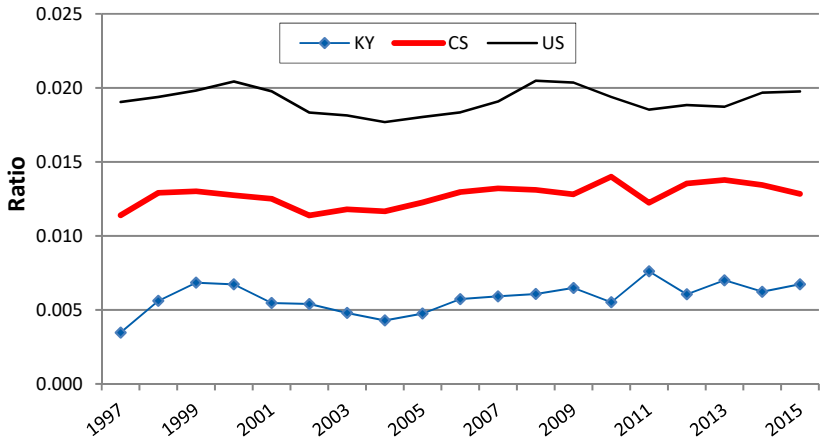


Source: American Community Survey, Table S2801 2018 1-Year Estimate
Note: "CS" is the weighted average of the competitor states.

INDUSTRIAL RESEARCH & DEVELOPMENT

A January 2012 report by Regional Technology Strategies, Inc., *Innovation Capacity: Calibrating Kentucky*, which was prepared for the Kentucky Science and Technology Corporation, states that "while a raft of diverse indicators and metrics are often employed to build a profile of a state's innovation support capacity, the single most important measure is generally held to be industry R&D." The report notes that in 2008 Kentucky was ranked 40th among the states on this measure when expressed as a percentage of total worker earnings. Nationally, funds spent by industry constituted over half of all funding for research and development. It is believed that these funds are directly related to productivity gains and innovation capacity. In Kentucky, the ratio of industrial research and development funds relative to gross domestic product was 0.00673. By comparison, the competitor state average in 2015 was nearly twice as high (0.01284) and the U.S. average was almost three times higher (0.01976). Massachusetts has the highest amount nationally at 0.04392 and Alaska the lowest with 0.00124. In terms of the highest amount expended in absolute dollars among the competitor states, Illinois registered $12.7 billion—compared to Kentucky's $1.3 billion.

Funds for Industrial R&D Performance,
Kentucky, Competitor States, and the U.S., 1997-2015
(ratio of funds relative to gross domestic product)

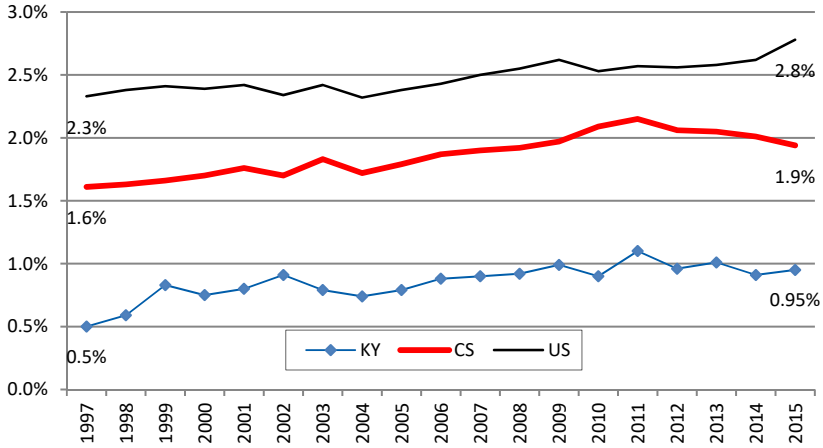


Source: National Science Foundation, Business and Industrial R&D, various years
Note: Missouri data are not available for 2011.

TOTAL RESEARCH & DEVELOPMENT

While industrial research and development performance accounts for close to 72 percent of the national total, colleges and universities, non-profits, federal and state government agencies account for the rest. According to the National Science Foundation (NSF), "a high value indicates that a state has a high intensity of R&D activity, which may support future growth in knowledge-based industries." NSF also points out that "states with high rankings on this indicator also tended to rank high on S&E (science and engineering) doctorate holders as a share of the workforce." When expressed as a percentage of state gross domestic product, the competitor state average in 2015 was just under 2 percent, compared to Kentucky's value of just under 1 percent (0.95%); the U.S. average was about 2.8 percent.

Total Research and Development Expenditures, Kentucky, Competitor States, & the U.S., 1997 to 2015
(as a percentage of state gross domestic product)



Source: National Science Foundation/National Center for Science and Engineering Statistics. National Patterns of R&D Resources, various years. Note: Missouri data are interpolated for 2011.

Population

POPULATION GROWTH IS INDICATIVE of a state's economic energy. Between the peak of the last economic expansion, which was during the fourth quarter of 2007, and the "present" (2018), Kentucky experienced slower population growth (5.0%) than the U.S. (8.6%) or the competitor state averages (6.6%). Because Kentucky is generally more rural, has fewer minority citizens, and is somewhat older, the population has grown slower here compared to the U.S.

During this time period, there were marked regional differences within the state. Kentucky's Urban Triangle experienced a 7.0 percent increase, and South Central Kentucky is not far behind at 4.9 percent. However, the population in Western Kentucky grew less than 1 percent and in Eastern Kentucky it declined by 2.4 percent. And there are several counties with population levels lower in 2017 compared to 2007. In fact, 62 counties, largely in Eastern Kentucky, but several in the Western Kentucky, lost population during this time. The five largest declines were in Lee (-14.5%), Fulton (-8.8%), Leslie (-8.1%), Harlan (-8.1%), and Martin (-7.9%) Counties; with another 16 counties experiencing declines ranging from 4 to 7.5 percent, mainly in the traditional coal producing counties of both Western and Eastern Kentucky. On the other hand, population growth in much of Northern and Central Kentucky has been strong. The eight fastest growing counties all experienced double-digit increases, and include Scott (20.3%), Warren (15.3%), Boone (13.7%),

continued on the next page

continued from the previous page
Shelby (13.6%), Jessamine (12.2%), Oldham (11.5%), Fayette (11.2%), and Spencer Counties (10.2%).

In today's global economy, diversity is increasingly important and recognized as a community asset. In 2018, racial minorities comprised about 28 percent of U.S. and competitor state populations, and only 13 percent of the Kentucky population. While immigration can help diversify and grow a state's population, Kentucky's foreign-born population is relatively small (3.8%). By comparison, the competitor state and U.S. averages are 7.7 and 13.7 percent, respectively. As their numbers increase, immigrants can strengthen our communities and bolster our economy. University of Kentucky economist Dr. Jenny Minier notes that "more than 40% of Fortune 500 companies, including American icons like Apple, Budweiser, Google, and McDonald's, were founded by immigrants or the children of immigrants." Their economic contribution extends across the entire range of jobs in the labor force, from those who harvest agricultural products to those occupying Fortune 500 CEO suites.

One telling statistic of their impact is this: the percentage of U.S. or native-born Kentuckians (25 or older) with a bachelor's degree or higher is 23 percent, while the percentage of foreign-born Kentuckians with a bachelor's or higher is 34 percent—around one out of three compared to about one out of four. Given the importance of education to economic prosperity—at the individual as well as community levels—individuals immigrating into Kentucky increase the potential for growth within the economy.

POPULATION TOTALS

Kentucky's population in the 2010 Census was 4,339,367, representing a 7.4 percent increase from the 2000 Census population of 4,041,769 and ranking it the 26th most populous state. Kentucky's population was essentially flat from 1940 to 1970, growing by just over 13 percent while the U.S. population increased by over 55 percent. However, from 1970 to 2010, Kentucky's population increased by 35 percent, which is lower than the competitor states (41 percent) and the United States (52 percent), but represents a significant increase from the preceding decades. The most recent population estimate (2018) for Kentucky is 4,468,402.
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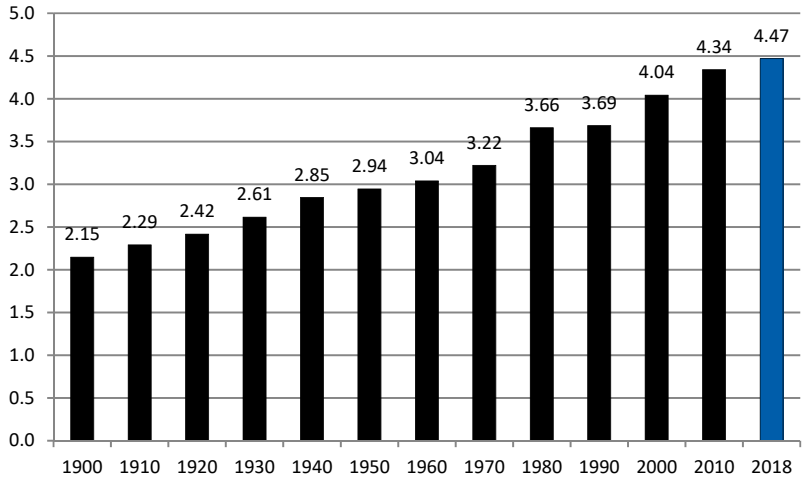
Population Totals, Kentucky, 1900-2018
(millions)

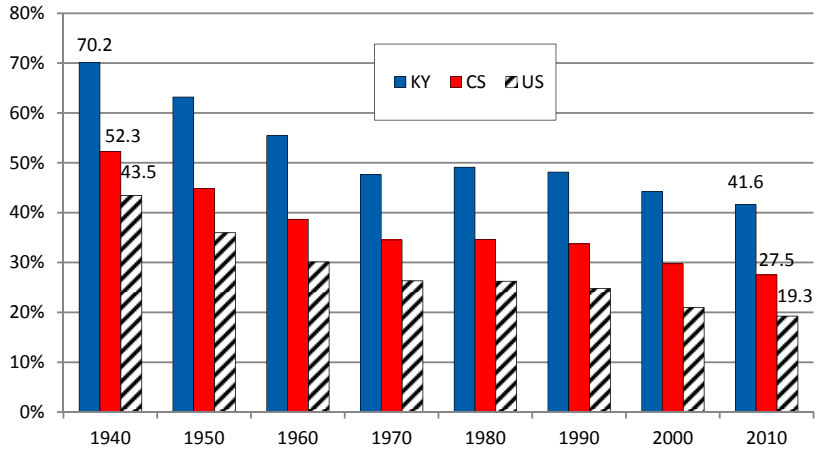


Source: U.S. Census Bureau

RURAL POPULATION

While Kentucky has become increasingly urban over the years, a significant portion of Kentucky's population live in rural areas—especially compared to its competitor states and the U.S. In the 2010 Census, nearly 42 percent of Kentucky's population resided in rural areas (the balance of 58 percent live in urban areas), compared to about 28 percent in the competitor states and around 19 percent in the U.S. Rural communities can have many unique and appealing assets that provide a foundation for economic development activities. For example, natural amenities such as mountains, lakes, streams, forests, and wildlife can be used to leverage economic development and attract individuals hoping to find more idyllic surroundings. At the same time, there are many development challenges associated with building diverse economies and providing an adequate infrastructure in rural areas.

Population Living in Rural Areas,
Kentucky, Competitor States, and the U.S.
(percent of individuals)

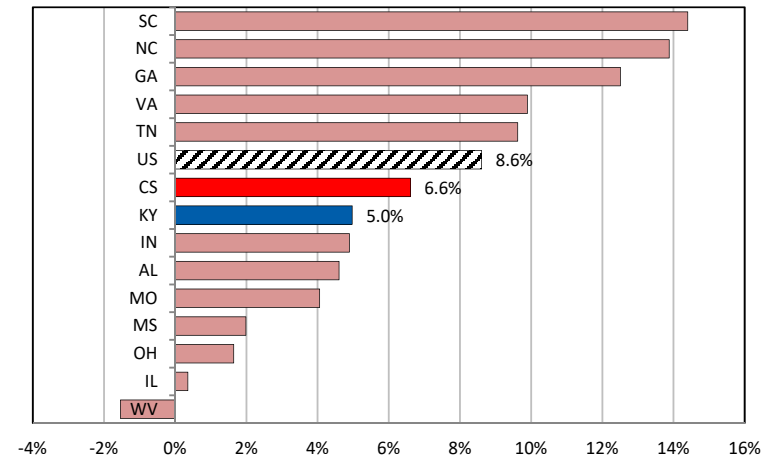


Source: U.S. Census Bureau

POPULATION CHANGE

A state's population growth rate is indicative of its economic energy. Here we present state growth rates between the peak of the last economic expansion, which was during the fourth quarter of 2007, and the "present" (2018). By 2018, the U.S. population was 8.6 percent higher than the peak of the last economic expansion (or in 2007). As evidenced in the chart below, Kentucky experienced slower population growth (5%) than the U.S. or the competitor state average (6.6%). Generally, there is a consistency between these population growth rates and total *private* employment growth during the same time period (see page 50). The populations of South Carolina, North Carolina, Georgia, Virginia, and Tennessee grew at a faster rate than the U.S.; Kentucky, however, grew at about sixty percent of the U.S. rate. At 21.7 percent, Utah has the highest growth rate during this period, and West Virginia has the lowest (-1.5%); Kentucky has the 32nd highest growth rate among the states.

Percentage Change in Population 2007-2018, Kentucky, Competitor States, & the U.S.



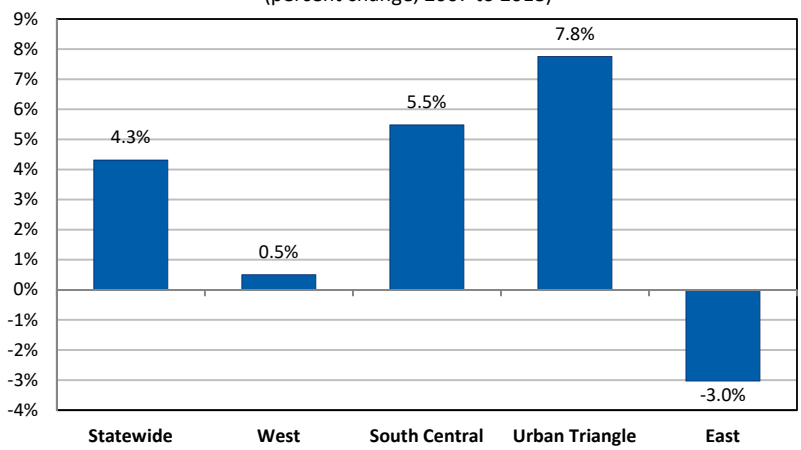
Source: U.S. Census Bureau, ACS 1-year estimates

REGIONAL POPULATION CHANGES

Population growth rates within a state can serve as an indicator of economic trends. The population growth rate of Kentucky and its regions from the peak of the last economic expansion in 2007 to the present (2018) is shown below (a county-level map of these four regions is available in the glossary). Kentucky's Urban Triangle experienced a 7.8 percent increase; South Central Kentucky is not far behind at 5.5 percent. However, the population in Western Kentucky only grew less than 1 percent and in Eastern Kentucky it *declined* by 3.0 percent. For comparison purposes, Kentucky's overall population increased 4.3 percent (ACS 5-year estimate) over the same time period.

Population Change in Kentucky Regions,
Peak of the Last Economic Expansion to the Present

(percent change, 2007 to 2018)

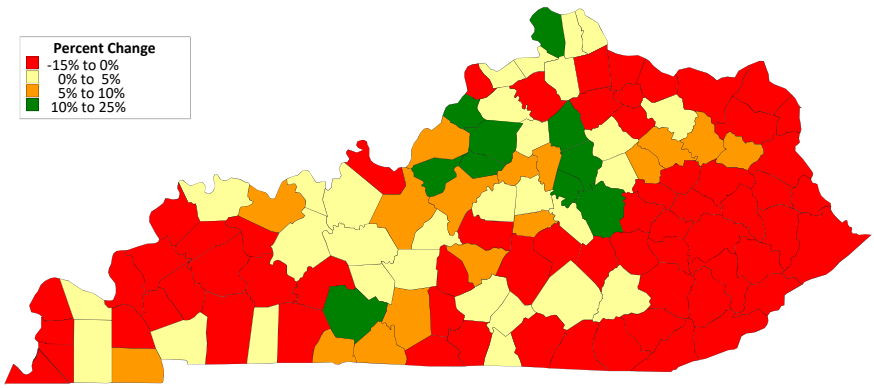


Source: Author's calculations using data from the U.S. Census Bureau, ACS 5-year estimates. See glossary for map of Kentucky regions by county.

COUNTY POPULATION CHANGES

From the peak of the last economic expansion in 2007 to the present (2018), there have been some significant county-level population changes in Kentucky. As illustrated in the map below, the population in several counties was lower in 2018 compared to 2007. Overall, in fact, 64 counties, largely in Eastern Kentucky, but several in the western part of the state, lost population during this time period. The five largest declines were in Lee (-14.1%), Martin (-9.9%), Leslie (-9.6%), Fulton (-9.9%), and Harlan Counties (-9.5%); there were another 16 counties that experienced *declines* ranging from 4 to 9 percent, mainly in the traditional coal producing counties of both Western and Eastern Kentucky. On the other hand, population growth in much of Northern and Central Kentucky has been strong. The ten fastest growing counties all experienced double-digit increases, and include Scott (23.1%), Warren (17.8%), Shelby (16.0%), Boone (14.9%), Jessamine (13.9%), Oldham (12.7%), Fayette (12.5%), Spencer (11.6%), Madison (11.2%), and Bullitt Counties (11.0%). By comparison, Kentucky's population increased by 4.3 percent.

Kentucky County Population Change, 2007 to 2018

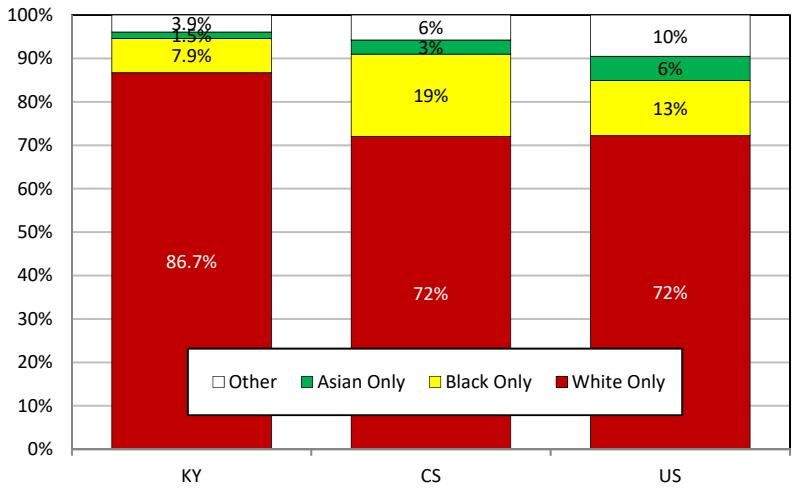


Source: U.S. Census Bureau

Minority Population

In today's global economy, diversity is increasingly important and recognized as a community asset. In 2018, racial minorities comprised about 28 percent of U.S. and competitor state populations, and only 13 percent of the Kentucky population. Kentucky's racial composition breaks down like this: white non-Hispanic (86.7%), black (7.9%), Asian (1.5%), and other (3.9%). Kentucky's minority population is more concentrated in the state's metropolitan areas; in 2010, four of every five minority persons in Kentucky lived in metropolitan areas. While not depicted in the chart below, those who identify as Hispanic or Latino are significantly lower in Kentucky (3.6%) compared to the U.S. (18.3%) and competitor states (8.2%).

Population by Race, 2018,
Kentucky, Competitor States, and the U.S.
(percent of individuals)

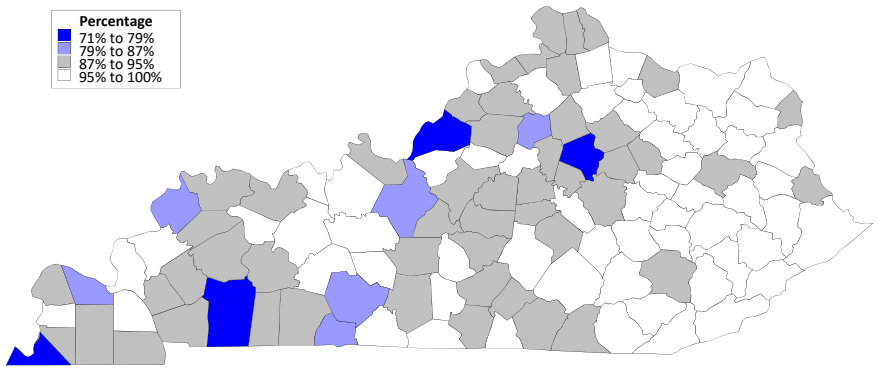


Source: American Community Survey, 2018 1-year estimate

WHITE, NON-HISPANIC POPULATION

An estimated 72.7 percent of the U.S. population and 87.1 percent of the Kentucky population is white (alone), non-Hispanic (based on the 2018 5-Year U.S. Census data). Using this as a measure of diversity, Christian County—where Ft. Campbell is located—is the state's most diverse county at 71.3 percent. Jefferson, Fulton, and Fayette Counties are second, third, and fourth at 71.9, 72.2, and 75.4 percent, respectively. The state's least diverse counties are clustered mainly in the east, with several counties at or above 95 percent comprised of white (alone), non-Hispanic. As we indicated on the previous page, diversity is increasingly viewed as a necessary community characteristic for creating a vibrant and robust local economy.

White Alone (non-Hispanic) Population, 2014-2018

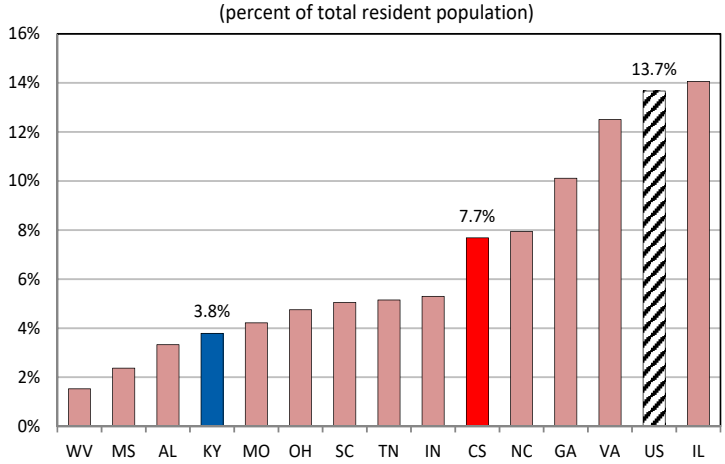


Source: American Community Survey, 2018 5-Year Estimate, Table DP05

Foreign-Born Population

Immigrants strengthen our communities and bolster our economy. In a September 2017 paper, *Immigrants Benefit the Community and Economy*, authored by University of Kentucky economist Dr. Jenny Minier, she notes that "more than 40% of Fortune 500 companies, including American icons like Apple, Budweiser, Google, and McDonald's, were founded by immigrants or the children of immigrants." Moreover, Minier cites a recent study which finds that "over half of the 87 technology startups valued at over $1 billion were co-founded by immigrants, and on average, these companies had created 760 new jobs." The economic contribution of immigrants extends, of course, across the entire range of jobs in the labor force, from those who harvest agricultural products to those occupying Fortune 500 CEO suites. The percentage of foreign-born individuals in Kentucky is 3.8 percent, around a half of the competitor state average (7.7%) and about a quarter of the U.S. average (13.7%).

Foreign-Born Population, 2018,
Kentucky, Competitor States and the U.S.
(percent of total resident population)



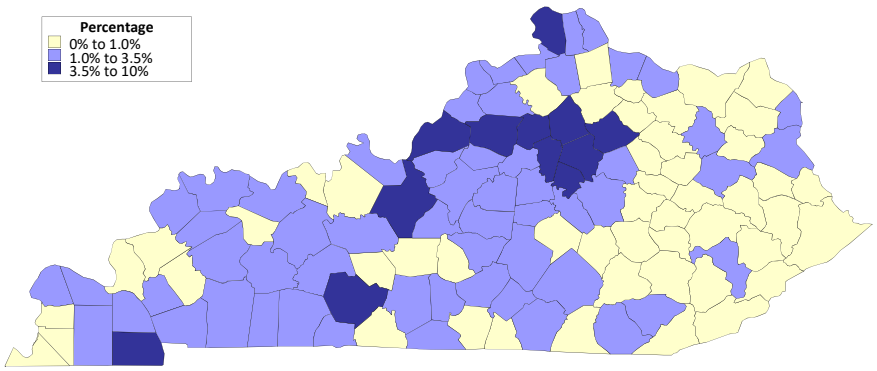
Source: American Community Survey, Table B05002 2018 1-Year Estimate
Note: "CS" is the weighted average of the competitor states.

FOREIGN-BORN POPULATION BY COUNTY

Kentucky's percentage of foreign-born population is relatively low, but it is approaching ten percent in a few areas, such as Fayette (9.5%) and Warren Counties (9.3%). As one can see on the map below, the Kentucky counties with the highest percentages of foreign-born individuals are disproportionately located in the urban triangle, the area of the state's economic engine. Nonetheless, even in counties with a small number of foreign-born individuals, these immigrants frequently play an outsized role in their local communities as business owners, entrepreneurs, and health care providers. Indeed, many are serving in medically underserved areas of rural Kentucky. One telling statistic, that is indicative of their impact, is this: the percentage of U.S. or native-born Kentuckians with a Bachelor's degree or higher is about 23 percent, while the percentage of foreign-born Kentuckians with a Bachelor's or higher is around 34 percent—one out of three.

Foreign-Born Population, 2014-2018

(percentage of total county population)

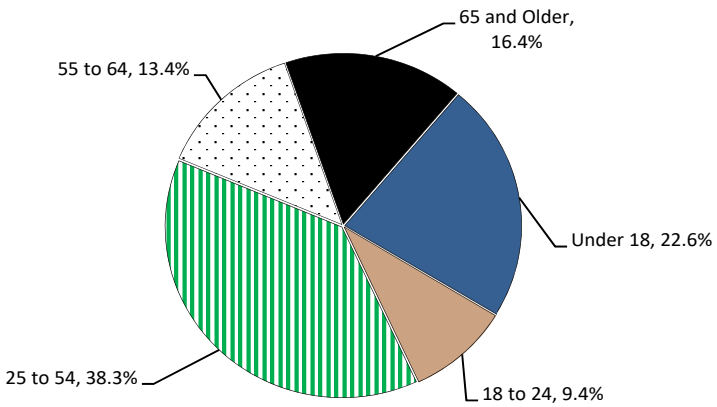


Source: American Community Survey, 2018 5-Year Estimate, Table B05002

Population by Age Group

Kentucky's population is aging, evidenced by the median age increasing from 35.9 years in 2000 to 38.1 in 2010—and on to 39.1 in 2018. The U.S. median age, by comparison, is slightly lower, evidenced by 37.2 in 2010 and 38.2 in 2018. The number of persons in Kentucky aged 65 and above increased by 152,000, or by 26 percent, from 2000 to 2018; by comparison, this age group increased by 30 percent in the U.S. However, at 16.4 percent of Kentucky's total population, it represents about the same proportion as in the U.S. (16%). The same is true for the other age groups—the distribution of age groups in Kentucky is more or less consistent with the U.S. percentages. For example, the prime working age group, 25 to 54, comprises 38.3 percent of Kentucky's total population, compared to 39.2 percent in the U.S.

Kentucky Population Distribution, by Age Group, 2018

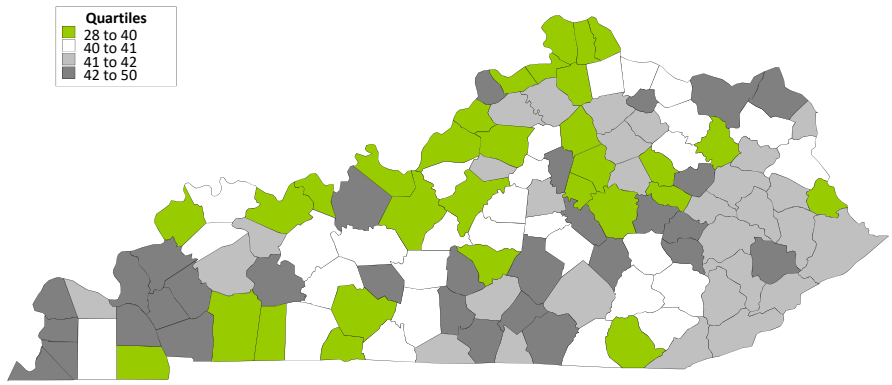


Source: U.S. Census Bureau

MEDIAN AGE

The county-level median age in Kentucky ranges from a low of 28.4 in Christian County to a high of 48.9 in Lyon County. The median is the middle point in a distribution; it is the point where half the population is above and half is below. The median ages for the U.S. and Kentucky are 37.9 and 38.7, respectively. In general, counties with military installations or college campuses will have lower median ages. In addition to Christian, four other counties have median ages below 35: Rowan, Warren, Madison, and Fayette. On the other hand, six Kentucky counties have median ages 45 or older: Livingston, Trigg, Cumberland, Menifee, Hickman, and Lyon.

Median Age by Kentucky County, 2014-2018



Source: American Community Survey, 2018 5-Year Estimate, Table B01002

Public Finance

KENTUCKY RANKS 24TH ON THE Tax Foundation *2020 State Business Tax Climate Index*. This Index is designed to show how well states structure their tax systems. States are evaluated on five state taxes: corporate, individual income, sales, property, and unemployment insurance. Kentucky receives its highest rank on the sales tax (14th) and its lowest on the unemployment insurance tax (49th).

Conversely, Kentucky's overall fiscal condition was ranked 46th by the Mercatus Center at George Mason University in its *2018 Ranking the States by Fiscal Condition* report. Their evaluation, which is derived from fiscal year 2016 state financial data, rests on 13 different financial indicators. Using these indicators, they create five dimensions of solvency to assess each state's short- and long-term fiscal prospects. Unfortunately, Kentucky performs below the U.S. average on each of the five dimensions: 39th on budget solvency, 43rd on trust fund solvency, 43rd on service-level solvency, 40th on cash solvency, and 46th on long-run solvency.

To be certain, there are budgetary challenges on the horizon. Kentucky's public pension programs, for example, are in dire financial shape, as evidenced by an estimated $43 billion unfunded liability (based on 2017 actuarial assumptions). By multiple measures, Kentucky's public pension system ranks as one of the most financially troubled among the 50 states. The funded ratios of the state's major public sector pension plans have decreased over the last two decades,

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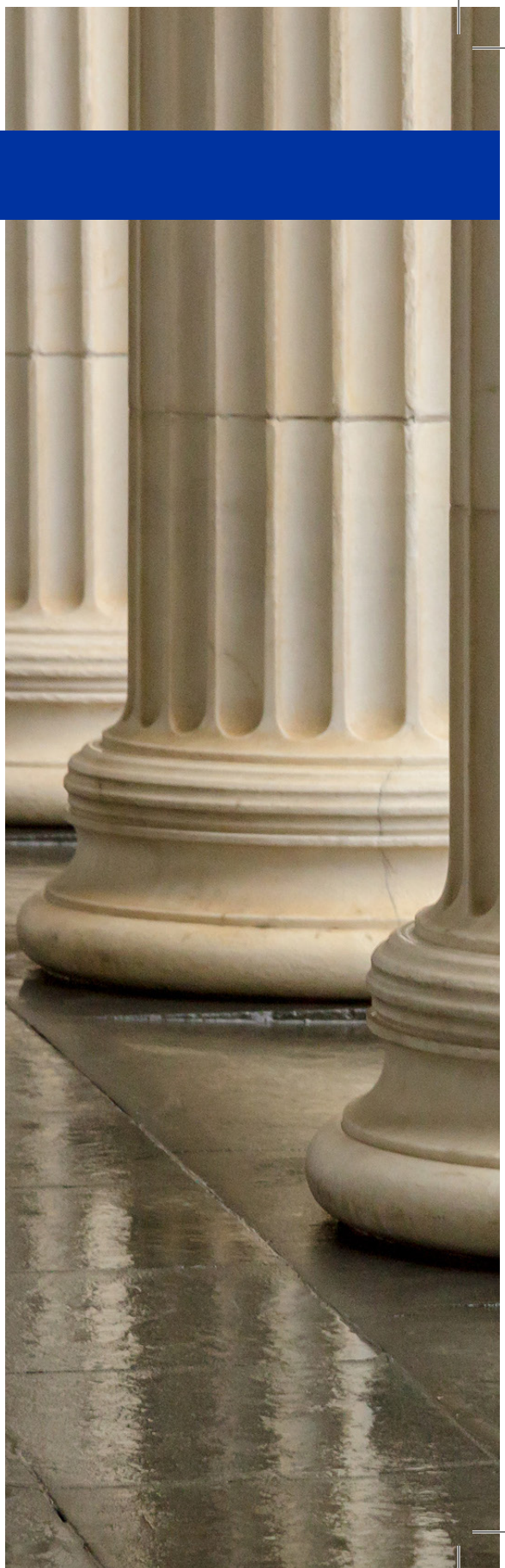


continued from the previous page
from 108 percent in 2001 to 46.2 percent in 2018—the lowest ratio among the states and DC.

Improving the funded ratio of Kentucky's major public sector pension plans will likely require difficult decisions on spending priorities within the state budget. Kentucky's required annual contribution to its public pension programs is equal to nearly 9 percent of state and local general revenue from own sources; Kentucky ranks second to Illinois, which is over 16 percent. If the portion of state and local revenue going to pension funding continues to grow, it will either claim a larger portion of the budget and/or create pressure for increasing revenue to fund vital state programs and services.

Kentucky has had a substantial structural deficit at least since our work with the *Governor's Blue Ribbon Commission on Tax Reform* in 2012. Our updated estimate of tax revenue elasticity is about 0.69—based on trends from 2009 to 2018. This means that, on average, tax revenue increases at about 69 percent of the overall economic growth rate. Ideally, revenue elasticity would be 1.0, indicating that, on average, state revenue changes at the same rate as the state's economy. Since 2009, Kentucky's revenue growth has not kept pace with the economy.

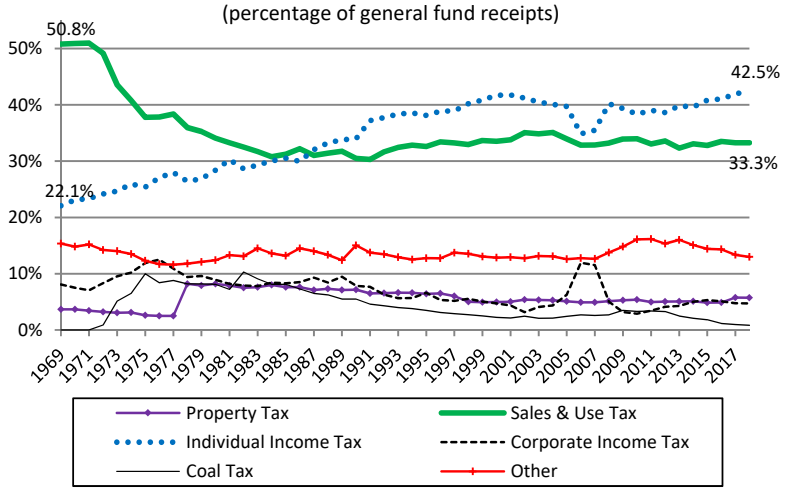
Revenue growth rates are affected by both changes in the revenue base and tax rates. Most states' revenue systems failed to keep pace with overall economic growth during the decade from 2000 to 2009 due to one or both factors. The Great Recession had a significant impact on both taxes and income during this period. Since the economic recovery began in 2009, the ratio of total tax compound annual growth rate and the personal income compound annual growth rate has increased to around 0.95 in the U.S. and about 0.88 among the competitor states, but it is lower in Kentucky (0.69). If the state's underlying financial weaknesses are not addressed, then the state could find itself increasingly unable to fund other necessary government services.

GENERAL FUND RECEIPTS BY SOURCE

Two sources of revenue—the individual income tax and the sales and use tax—account for 75.7 percent of Kentucky general fund revenue (FY2018). This figure illustrates how Kentucky's revenue system has fundamentally changed since 1969. Nearly fifty years ago, the sales and use tax comprised about 51 percent of Kentucky's general fund receipts, while income tax collections accounted for around 22 percent. However, by the mid-1980s, the income tax accounted for more general fund revenue than the sales and use tax. The changing distribution of tax receipts reflects more basic changes in the economy—the gradual shift away from making products and toward providing services. Most states, including Kentucky, tend to apply a *broad-base* sales tax to goods but not services. Consequently, the state's tax base is gradually becoming narrower and losing elasticity—a measure of whether revenue is keeping pace with the economy.

Kentucky's General Fund Receipts by Major Sources, FY69 to FY18

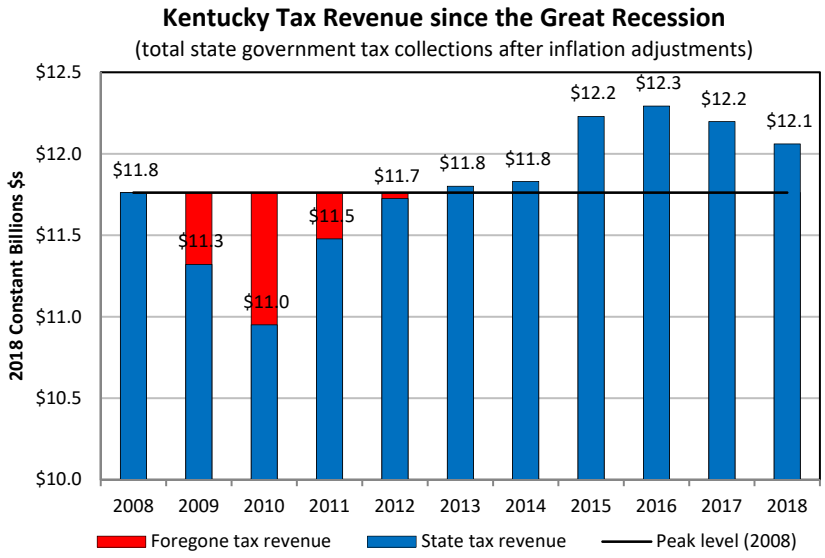
(percentage of general fund receipts)



Source: Authors' calculations based on data from the Kentucky Finance and Administration Cabinet, the Kentucky Revenue Cabinet, and the Office of the State Budget Director.

REVENUE LOSS FROM THE GREAT RECESSION

The Pew Charitable Trust released an issue brief in June 2019 entitled, *'Lost Decade' Casts a Post-Recession Shadow on State Finances*. Pew researchers refer to the years after the Great Recession as a 'lost decade' because of "missed economic and revenue growth." They assert that a conservative estimate of the 50-state foregone tax revenue from 2009 to 2012 is $283 billion. Applying this same method to Kentucky's tax revenue yields an estimate of nearly $1.6 billion. Many of the public finance decisions faced by Kentuckians today—including, but not limited to, public pension funding, SEEK (Support Education Excellence in Kentucky) funding, infrastructure maintenance and construction, workforce development, and Medicaid benefits—reflect, to some degree, the long-term consequences of the Great Recession.

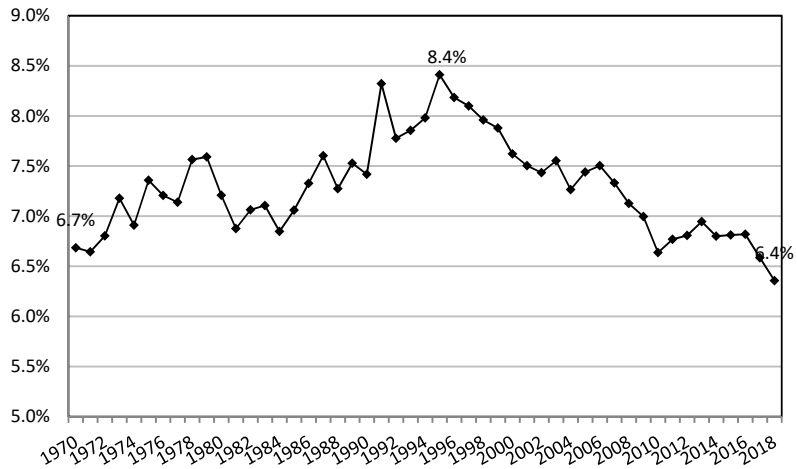


Source: Author's analysis of data from the U.S. Census Bureau's Annual Survey of State Government Tax Collections and the U.S. BEA Implicit Price Deflators for Gross Domestic Product.

TAX COLLECTIONS AND PERSONAL INCOME

Kentucky's recurring budgetary problems are due, in part, to the long-term decline in revenue elasticity. There are several economic, demographic, and political factors contributing to the gradual reduction in elasticity. Regardless of how we assess the adequacy of the revenue structure, Kentucky's main revenue sources are growing slower than its economy. This point is illustrated by examining Kentucky's total tax collections as a percentage of personal income, which has declined steadily from its peak of 8.4 percent in 1995 to 6.4 percent in 2018—a percentage not seen since the late 1960s.

Kentucky Total State-Level Tax Collections as a Percentage of Total Personal Income, 1970-2018

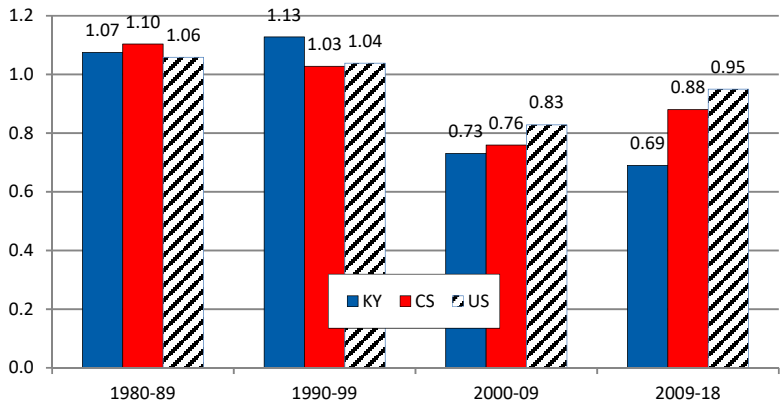


Source: Author's calculations based on data from the U.S. Department of Commerce, Bureau of Economic Analysis and U.S. Census Bureau, State Government Tax Collections, various years

GROWTH RATES, TAXES AND INCOME

Since 2009, Kentucky's revenue growth has not kept pace with the economy. Revenue growth rates are affected by both changes in the revenue base and tax rates. Most states' revenue systems failed to keep pace with overall economic growth during the decade from 2000 to 2009 due to one or both of these factors. The Great Recession had a significant impact on both taxes and income during this period. Using the ratio between the compound annual growth rates (CAGR) of revenue and personal income, we compare Kentucky to the competitor states and the U.S. during four time periods. We use 2009 as the end point in one period and the beginning of the next since it marks the end of the economic contraction and the beginning of the current expansion. A ratio of 1.0 indicates that the revenue is growing at the same rate as the economy—a desirable outcome. In Kentucky, as well as in many of the competitor states, the growth in total tax revenue slowed relative to the economy in the 2000s. As shown in the graph, the ratio between Kentucky's total tax CAGR and personal income CAGR declined to 0.73 with the competitor states declining to 0.76 and the U.S. to 0.83. Since the economic recovery began in 2009, the ratio has increased to around 0.88 and 0.95 among the competitor states and in the U.S., respectively. However, it continues its decline in Kentucky (0.69).

Ratio Between Compound Annual Growth Rates of Total Taxes and Personal Income, Various Periods, Kentucky, Competitor States, and the U.S.

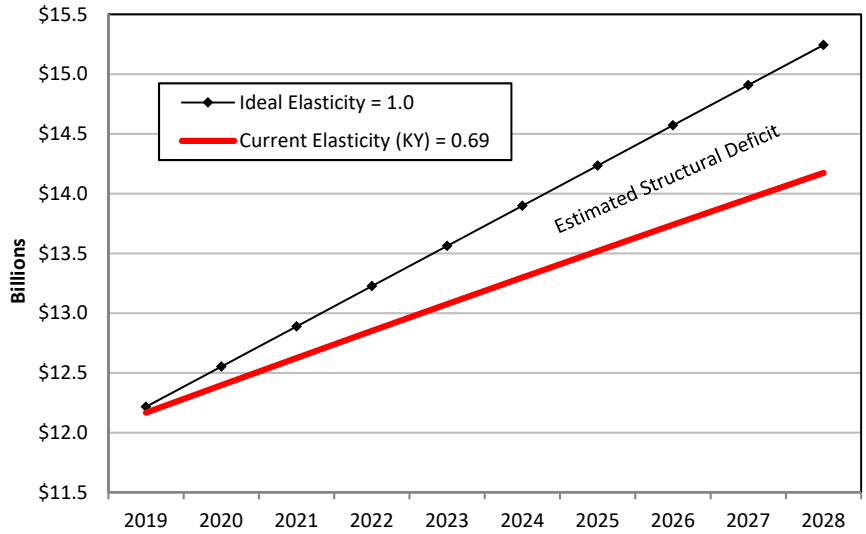


Source: U.S. Census Bureau, Bureau of Economic Analysis & State Government Tax Collections
Note: Total taxes are not adjusted for sales tax increases. Adjustments will produce slightly different results.

STRUCTURAL DEFICIT

The work of the *Governor's Blue Ribbon Commission on Tax Reform* was conducted over seven years ago, and the consulting economists concluded then that the state had a substantial structural deficit. Our updated analysis, which is based on data from 2009 to 2018, suggests that Kentucky still has a significant structural deficit. We estimate that Kentucky's tax revenue elasticity is about 0.69. This means that, on average, tax revenue increases at about 69 percent of the overall economic growth rate. Ideally, revenue elasticity would be 1.0, indicating that, on average, state revenue changes at the same rate as the state's economy. Without fundamental tax reforms, Kentucky could face a large structural deficit by the 2026-2028 biennial state budget. Consequently, the state could find itself increasingly unable to fund necessary government services.

Simulated Kentucky Tax Revenue, 2019 to 2028



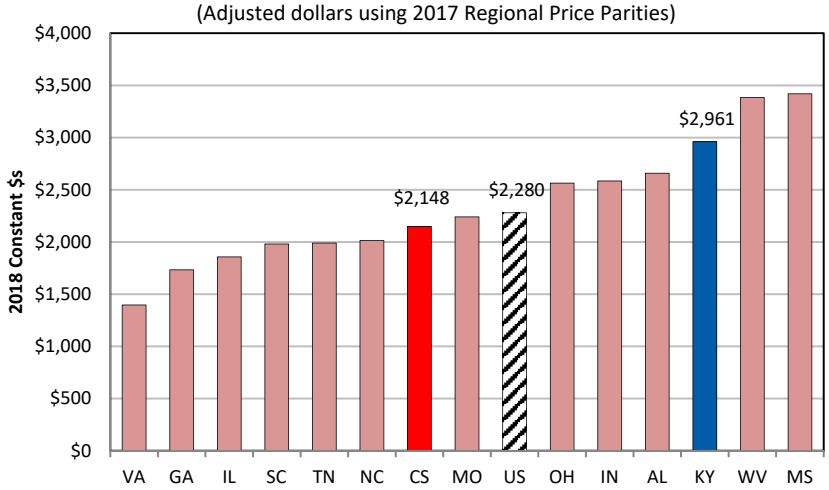
Source: Estimated by the author

REVENUE FROM FEDERAL TRANSFERS

Kentucky receives a significant amount of its total revenue from federal intergovernmental transfers. In 2017, this amounted to 25 percent of Kentucky's total revenue. The competitor state average was about 18.2 percent and the U.S. average was about 18 percent. These transfers are mainly for health care (Medicaid), education, transportation, and public safety. On per capita basis, Kentucky received about $2,961 in revenue from federal transfers, compared to $2,148 and $2,280 for the competitor states and U.S., respectively. Wyoming had the highest amount at $4,818 and Virginia the lowest at $1,397. These dollars have been adjusted to reflect state-level cost-of-living differences using regional price parity estimates from the U.S. Bureau of Economic Analysis.

State and Local Revenue From Federal Transfers, Per Capita, 2017, Kentucky, Competitor States, & the U.S.

(Adjusted dollars using 2017 Regional Price Parities)

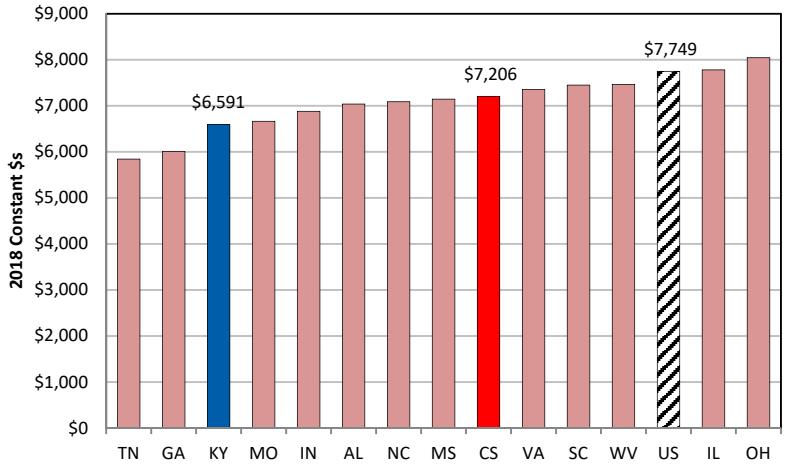


Source: U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances

STATE AND LOCAL OWN SOURCE REVENUE

Since states differ in the relative distribution of tax burdens between state and local governments, any comparison of revenue burdens among states requires a consideration of combined state and local revenue burdens. Here we report state and local own revenue burdens for Kentucky and its competitor states in 2017. On a per capita basis, Kentucky's per capita own-source state and local revenue was $6,591 in 2017 (in constant 2018 dollars), lower than the competitor state average of $7,206 as well as the U.S. average of $7,749. North Dakota had the highest amount at $10,895 and Arizona the lowest at $5,352. These dollars have been adjusted to reflect state-level cost-of-living differences using regional price parity estimates from the U.S. Bureau of Economic Analysis.

State and Local Own Source Revenue, Per Capita, 2017, Kentucky, Competitor States, and the U.S.
(Adjusted dollars using 2017 Regional Price Parities)

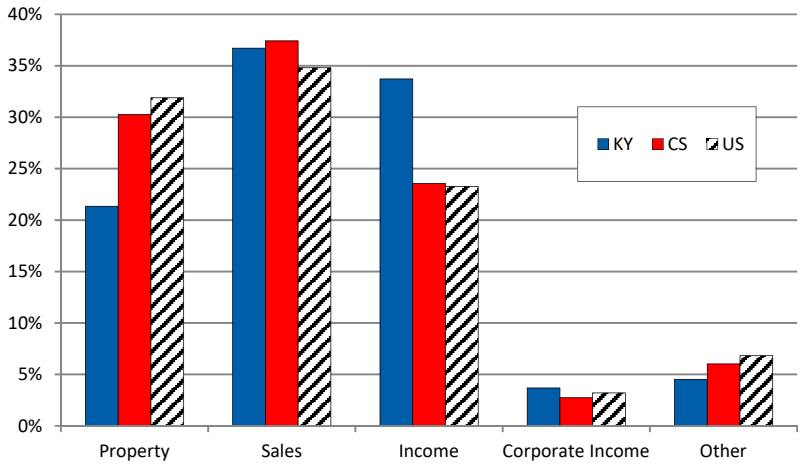


Source: U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances

STATE AND LOCAL TAX REVENUE BY SOURCE

This figure shows the percentage of revenue collected by each reported tax source for Kentucky and a weighted-average of its competitor states and the U.S. (i.e., the average of all states and DC). Kentucky is significantly less reliant on property taxes than its competitors (and the U.S.), who raise a much larger share of local tax revenue from the property tax, and particularly those states to the north of Kentucky. Kentucky has no general sales tax option for any local governments, something a number of its competitor states (and 38 states in the U.S.) allow. Unlike many of its competitors, Kentucky allows local individual income (occupation license) taxation (only 13 states and DC permit local income taxation). Not surprisingly, then, Kentucky collects a smaller share of combined state and local tax revenues from sales taxation and more from income taxation.

State and Local Tax Revenue by Source, 2017
Kentucky, Competitor States, and the U.S.
(percent of total tax revenue)

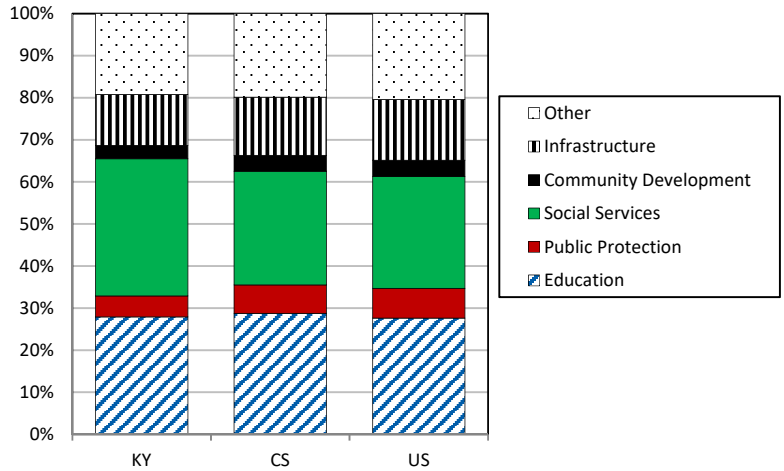


Source: U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances

STATE AND LOCAL EXPENDITURES

Here, we present data that illustrate Kentucky's state and local spending by selected functional categories: *Education,* which includes elementary and secondary education and higher education; *Public Protection*, which includes police, fire, and corrections; *Social Services*, which includes public welfare, public assistance, and Medicaid; *Community Development*, which includes libraries, natural resources, parks and recreation, and housing and community development; and *Infrastructure,* which includes highways, water, sewers, utilities, and solid waste. For Kentucky, the competitor states, and the U.S., these five categories account for around 80 percent of state and local government expenditures (2017). As a percentage of total state and local government expenditures, Kentucky spends about the same on education, more on social services, and less on public protection, community development, and infrastructure compared to the U.S. average. The Other category includes government administration, interest paid on debt, and insurance. However, as the figures on the following pages show (pages 248-257), when comparing per capita expenditures, a slightly different picture emerges. On a per capita basis, Kentucky expenditures are generally lower than the U.S. for every category except social services, where they have been about the same, but exceeded the U.S. since 2015.

Distribution of Selected State and Local Expenditures, 2017, Kentucky, Competitor States, and the U.S.
(percent of total state and local expenditures)

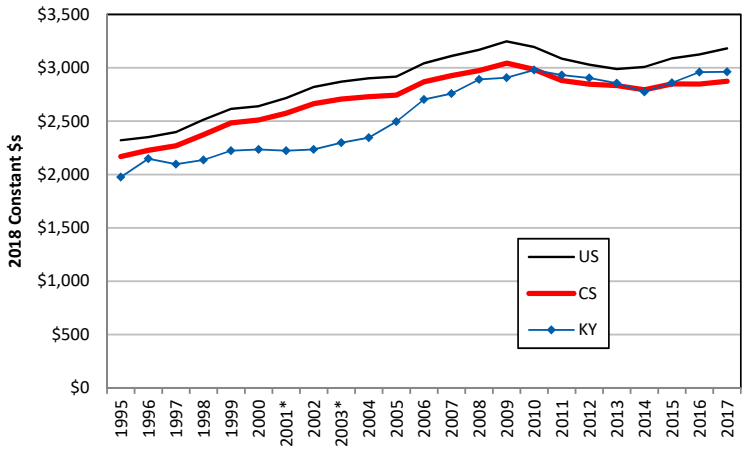


Source: U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances

EDUCATION EXPENDITURES

Education expenditures include elementary and secondary education, higher education, and other education such as adult, technical, or vocational education equal to or less than two years of college. State and local expenditures for education steadily increased on a per capita basis (in constant 2018 dollars) from 1995 until 2009-2010. These expenditures have been more or less stable since 2010 for Kentucky, the competitor states, and the U.S. When viewed over the 23-year period from 1995 to 2017, Kentucky has a higher percentage increase (50%) than the competitor states (33%) or the U.S. overall (37%). Kentucky has expended more of its cumulative gross domestic product on education during this time period (6.0%) than either the competitor states (5.4%) or the U.S. (5.3%). These investments have enabled the state to improve its educational standing relative to the other states. Research shows that investments in human capital—education—are vital for a state's economic success. A highly educated population can create new enterprises with innovative and entrepreneurial activities, and a skilled labor force can attract new plants and factories. The "availability of skilled labor" ranks as the most important factor for respondents to the 2018 *Annual Survey of Corporate Executive and Consultants on Site Selection*, with 90.5 percent ranking it as either "important" or "very important."

State and Local Education Expenditures, Per Capita, 1995-2017, Kentucky, Competitor States, and the U.S.



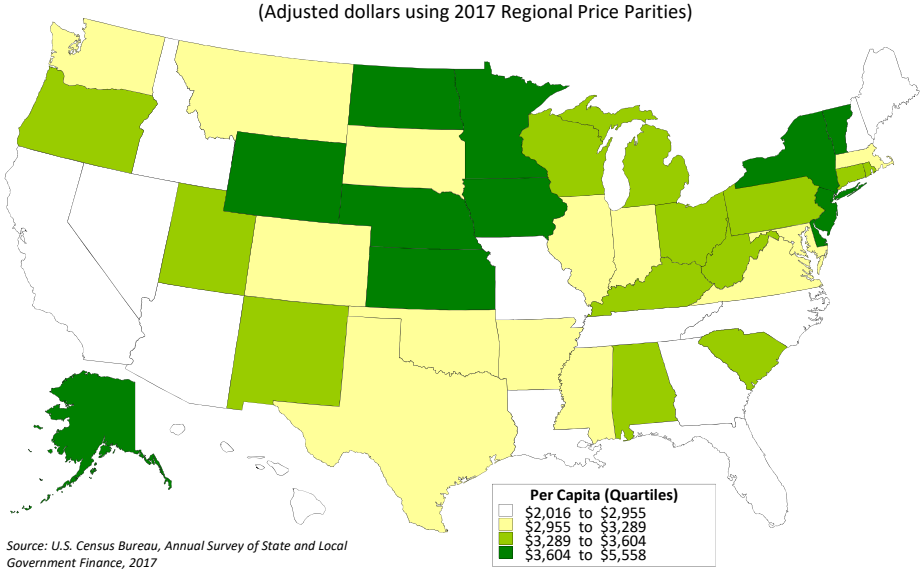
Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance
Note: KY and CS data for 2001 and 2003 are interpolated.

EDUCATION EXPENDITURES IN THE U.S.

One way to reasonably assess a state's position relative to other states is by ranking the states and placing them into four more or less equal groups, or quartiles. Kentucky's per capita state and local expenditures for education in 2017 are in the third quartile of states. Wyoming is the highest at $5,557 and Hawaii is the lowest at $2,016. Kentucky's per capita spending is $3,289. These dollars have been adjusted to reflect state-level cost-of-living differences using regional price parity estimates from the U.S. Bureau of Economic Analysis.

Education Expenditures, 2017

(Adjusted dollars using 2017 Regional Price Parities)

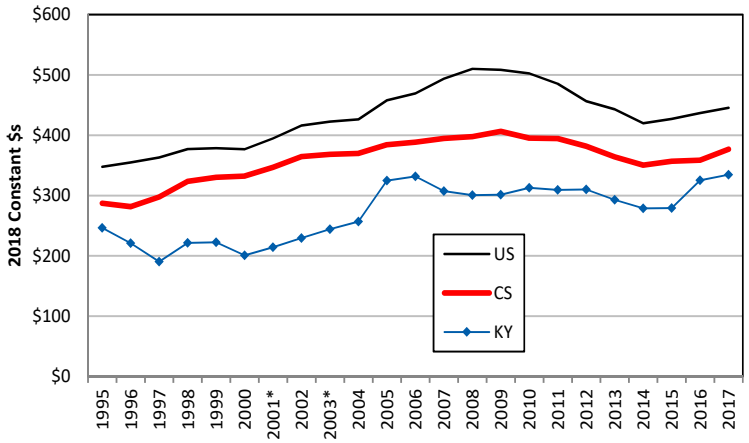


Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance, 2017

COMMUNITY DEVELOPMENT EXPENDITURES

We combine four broad areas—libraries, natural resources, parks & recreation, and housing & community development—into a single category called community development. State and local expenditures for community development in Kentucky steadily increased on a per capita basis (in constant 2018 dollars) from 1995 until 2005-06, but have been more or less stable since that time. When viewed over the 23-year period from 1995 to 2017, Kentucky has a higher percentage increase (36%) than the competitor states (31%) or the U.S. overall (28%). Kentucky has expended less of its cumulative gross domestic product on community development during this time period (0.64%) than either the competitor states (0.71%) or the U.S. (0.79%). Quality of life factors, which can include social amenities like libraries, parks, and natural open spaces, ranks as the sixth most important factor for respondents to the *2018 Annual Survey of Corporate Executive and Consultants on Site Selection*, evidenced by 82.8 percent ranking it as either "important" or "very important."

State and Local Community Development Expenditures, Per Capita, 1995-2017, Kentucky, Competitor States, and the U.S.



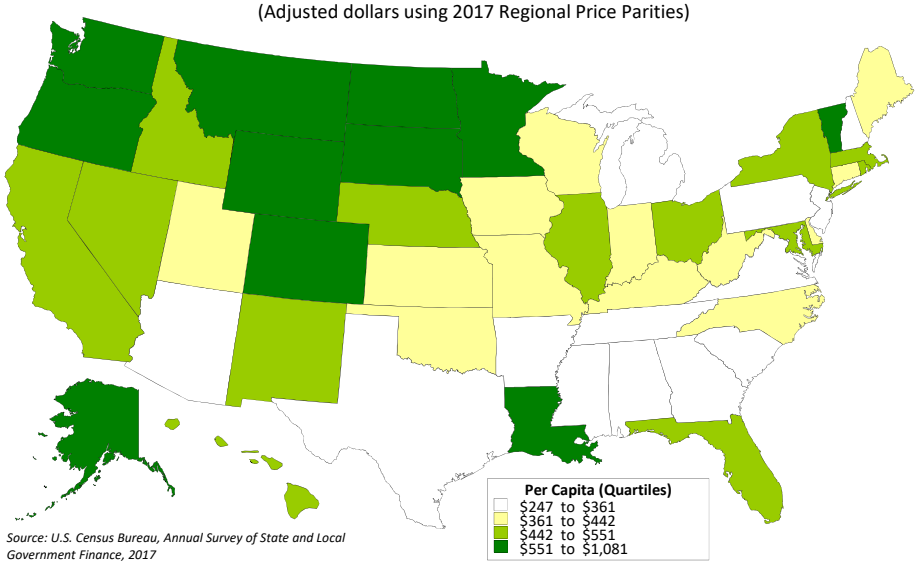
Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance
Note: KY and CS data for 2001 and 2003 are interpolated.

COMMUNITY DEVELOPMENT EXPENDITURES IN THE U.S.

Here we place the states into four approximately equal groups called quartiles. With per capita spending of $372, Kentucky's state and local expenditures for community development in 2017 are in the second lowest quartile. Alaska is the highest state at $1,080 (DC is higher at $1,481) and Texas is the lowest at $247. These dollars have been adjusted to reflect state-level cost-of-living differences using regional price parity estimates from the U.S. Bureau of Economic Analysis.

Community Development Expenditures, 2017

(Adjusted dollars using 2017 Regional Price Parities)

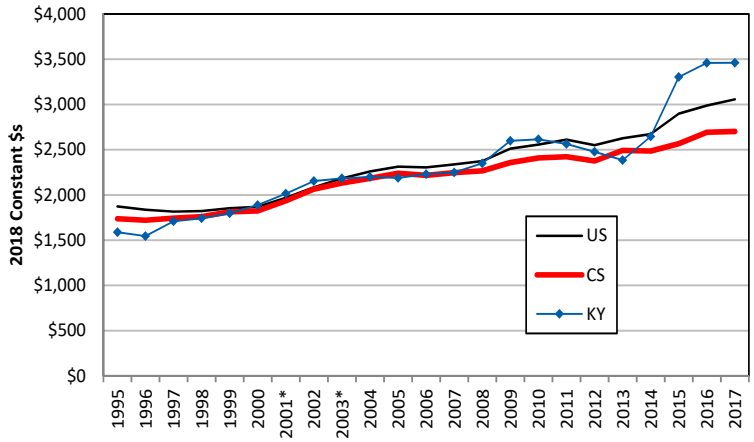


Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance, 2017

Social Services Expenditures

We combine five categories—public welfare, hospitals, health, social insurance, and veteran's services—into a single category called social services; this covers expenditures associated with three Federal programs—Supplemental Security Income (SSI), Temporary Assistance for Needy Families (TANF), and Medicaid. State and local expenditures for social services increased steadily on a per capita basis (in constant 2018 dollars) from 1995 to 2017 in Kentucky, among the competitor states, and in the U.S. overall. The large increase in Kentucky beginning in 2014 reflects the effect of Medicaid expansion. When viewed over this 23-year period, Kentucky has a higher percentage increase (118%) than the competitor states (56%) or the U.S. (63%). Also, Kentucky expended more of its cumulative gross domestic product on social services during this time period (5.5%) than either the competitor states (4.4%) or the U.S. (4.3%).

State and Local Social Services Expenditures, Per Capita, 1995-2017, Kentucky, Competitor States, and the U.S.



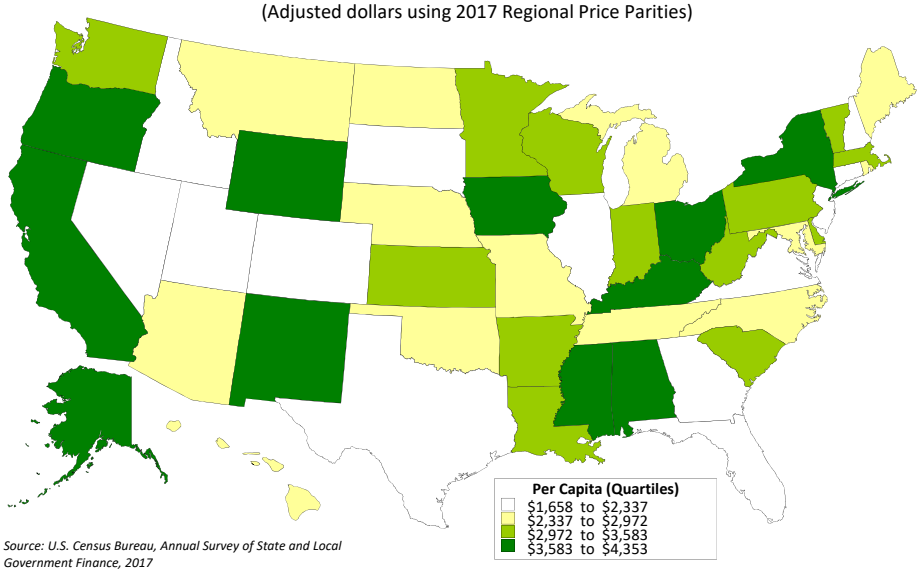
Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance
Note: KY and CS data for 2001 and 2003 are interpolated.

SOCIAL SERVICES EXPENDITURES IN THE U.S.

Here we place the states into four approximately equal groups called quartiles. With per capita spending of $3,843, Kentucky's state and local expenditures for social services in 2017 are in the top quartile. Wyoming is the highest state at $4,352 (DC is higher at $5,710) and Connecticut is the lowest at $1,658. These dollars have been adjusted to reflect state-level cost-of-living differences using regional price parity estimates from the U.S. Bureau of Economic Analysis.

Social Services Expenditures, 2017

(Adjusted dollars using 2017 Regional Price Parities)

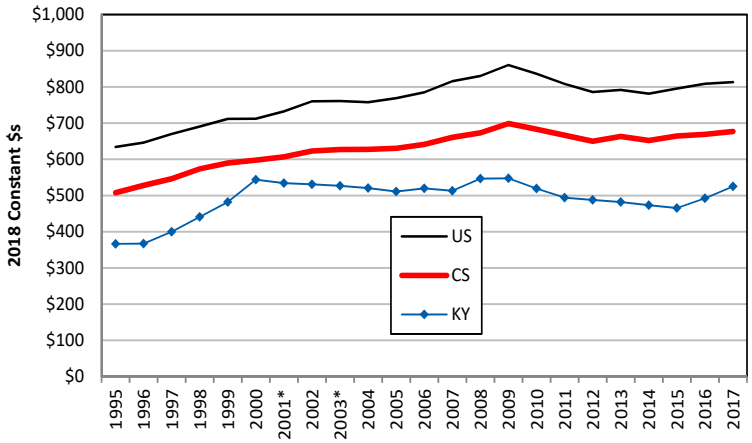


Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance, 2017

Public Protection Expenditures

We combine four categories—police protection, fire protection, corrections (e.g., prisons and jails), and protective inspection (e.g., building & construction inspections and licensing)—into a single category called public protection. State and local expenditures for public protection increased moderately on a per capita basis (in constant 2018 dollars) from 1995 to 2017 in Kentucky, among the competitor states, and in the U.S. overall. When viewed over this 23-year period, Kentucky (43%) has increased at a higher rate than the competitor states (33%) and the U.S. overall (28%). Also, Kentucky expended about the same percentage of its cumulative gross domestic product on public protection during this time period (1.1%) as the competitor states (1.3%) and the U.S. (1.4%).

State and Local Public Protection Expenditures, Per Capita, 1995-2017, Kentucky, Competitor States, and the U.S.



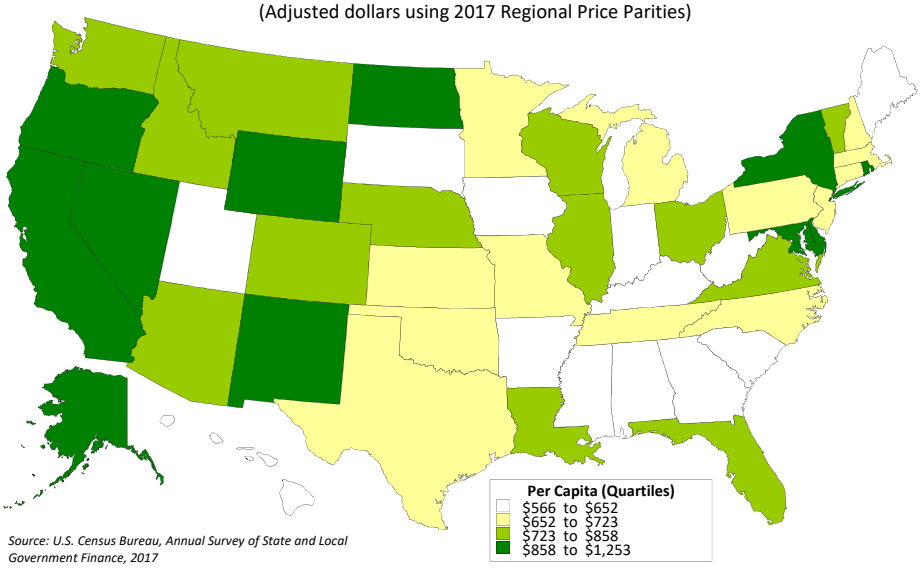
Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance
Note: KY and CS data for 2001 and 2003 are interpolated.

PUBLIC PROTECTION EXPENDITURES IN THE U.S.

Here we place the states into four approximately equal groups called quartiles. With per capita spending of $583, Kentucky's state and local expenditures for public protection in 2017 are in the bottom quartile. In fact, Kentucky has the third lowest value of any state; Utah is the lowest with $566. Alaska is the highest state at $1,252 (DC is higher at $1,454). These dollars have been adjusted to reflect state-level cost-of-living differences using regional price parity estimates from the U.S. Bureau of Economic Analysis.

Public Protection Expenditures, 2017

(Adjusted dollars using 2017 Regional Price Parities)

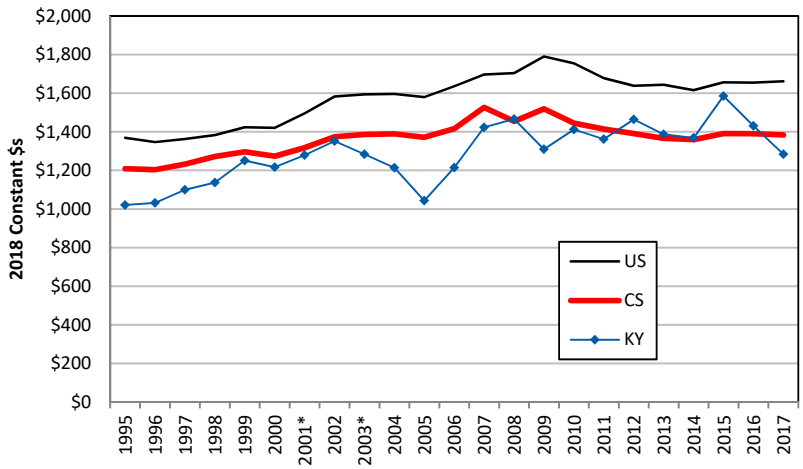


Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance, 2017

INFRASTRUCTURE EXPENDITURES

We combine several expenditure categories into a single catchall to estimate infrastructure expenditures; this includes highways, air transportation, sea & inland ports, parking facilities, sewerage, solid waste management, and utilities like water supply, electric power, gas supply & transit. State and local expenditures for infrastructure have steadily increased on a per capita basis (in constant 2018 dollars). When viewed over the 23-year period from 1995 to 2017, Kentucky has a higher percentage increase (26%) than the competitor states (14%) or the U.S. (21%). Kentucky has expended slightly more of its cumulative gross domestic product on infrastructure (3.0%) than the competitor states (2.7%) or the U.S. (2.9%). Numerous infrastructure factors are ranked high in the *2018 Annual Survey of Corporate Executive and Consultants on Site Selection*, led by "highway accessibility," which listed as the third most important site selection factor with 87.2 percent indicating it is either "important" or "very important."

State and Local Infrastructure Expenditures, Per Capita, 1995-2017, Kentucky, Competitor States, and the U.S.



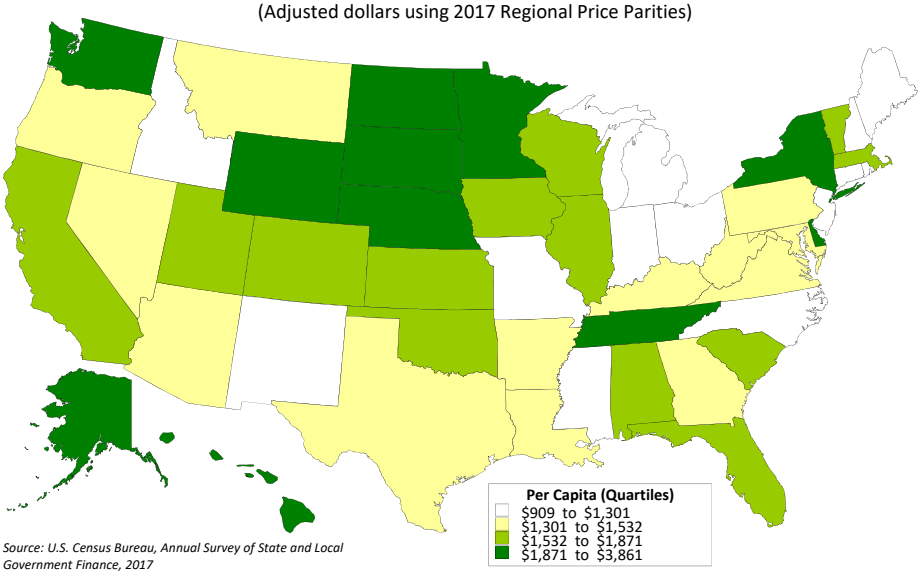
Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance
Note: KY and CS data for 2001 and 2003 are interpolated.

INFRASTRUCTURE EXPENDITURES IN THE U.S.

Here we place the states into four approximately equal groups called quartiles. With per capita spending of $1,425, Kentucky's state and local expenditures for infrastructure in 2017 are in the second quartile. Alaska is the highest state at $3,860 (DC is higher with spending of $6,038) and New Hampshire is the lowest at $909. These dollars have been adjusted to reflect state-level cost-of-living differences using regional price parity estimates from the U.S. Bureau of Economic Analysis.

Infastructure Expenditures, 2017

(Adjusted dollars using 2017 Regional Price Parities)

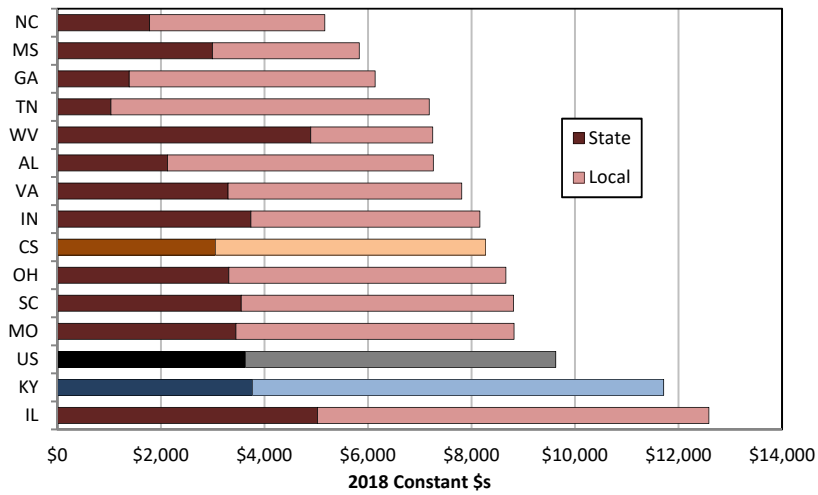


Source: U.S. Census Bureau, Annual Survey of State and Local Government Finance, 2017

DEBT

State and local government debt is defined as "all interest-bearing short-term credit obligations and all long-term obligations incurred in the name of the government and all its dependent agencies, whether used for public or private purposes." Governments issue bonds and incur debt for big-ticket items like roads or large construction projects. Nationally, state and local governments had over $3 trillion in outstanding debt in 2017, with 62 percent at the local government level and 38 percent at the state government level. The figure shows combined state and local debt per capita, with Kentucky second among the competitor states at $11,713, 32 percent of which is held by state government. The U.S. per capita debt for state and local governments is $9,628. These dollars have been adjusted to reflect state-level cost-of-living differences using regional price parity estimates from the U.S. Bureau of Economic Analysis.

Debt Outstanding, Per Capita, 2017
Kentucky, Competitor States, and the U.S.
(state and local debt, by total, RPP adjusted $s)



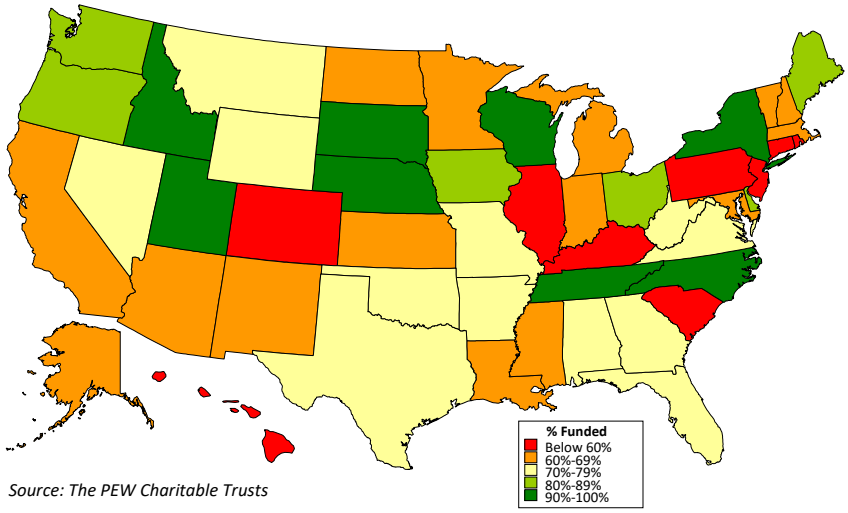
Source: U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances

PUBLIC FINANCE

PUBLIC PENSION FUNDING GAPS

Kentucky's public pension programs are in dire financial shape, evidenced by an estimated $43 billion unfunded liability (based on 2017 actuarial assumptions). By multiple measures, Kentucky's public pension system ranks as one of the most financially troubled among the 50 states. There are eight public pension programs: County Employees' Retirement System (Hazardous & Non-Hazardous); Kentucky Employees' Retirement System (Hazardous & Non-Hazardous); State Police Retirement System; Judicial Retirement Fund; Legislators' Retirement Fund; and the Teachers' Retirement System. In 2017, these pension funds were funded at approximately 34 percent of the level needed to be fully funded—one of the lowest funded ratios in the country. The map below, which is produced from 2017 data published in the PEW Charitable Trusts, *The State Pension Funding Gap: 2017* (June 2019), shows Kentucky's position relative to other states. The state's ability to improve the finances supporting these public pension programs is tightly linked to the state's overall financial health, as discussed on the preceding pages.

State Public Pension Funded Ratios, 2017



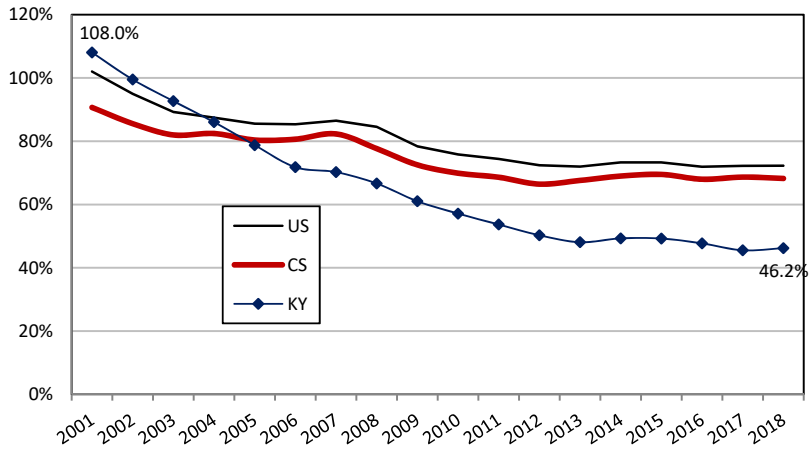
Source: The PEW Charitable Trusts

PENSION FUNDED RATIO

The funded ratios of major public sector pension plans have decreased over the last two decades. The chart below reflects the funded ratios for 190 public pension plans administered by state and local governments from 2001 to 2018. These plans cover 95 percent of public pension membership and assets nationwide. Kentucky's funded ratio dropped precipitously from over 100 percent in 2001 to about 46 percent in 2018, a steeper decline than the competitor states or the U.S. as a whole experienced. This ratio reflects traditional GASB 25 standards and is equal to actuarial assets divided by actuarial liabilities. The Center for Retirement Research at Boston College, which produces this database, includes three Kentucky state pension plans and one local public pension plan: the County Employees Retirement System (CERS); the Kentucky Employees Retirement System (KERS); the Teachers' Retirement System of Kentucky (TRS); and the Lexington-Fayette County Policemen's and Firefighters' Retirement Fund. In 2018, the assets for these four plans equaled about $32.2 billion while liabilities equaled around $69.6 billion. The unfunded actuarial accrued liability (UAAL) equaled $37.4 billion. Kentucky's funded ratio of 46.2 percent ranks 51st, the lowest ratio among the states and DC. Improving the funded ratio will require substantial future financial commitments to the state's public pension systems.

Funded Ratio of Major Public Sector Pension Plans, 2001 to 2018

(actuarial assets divided by actuarial liability)

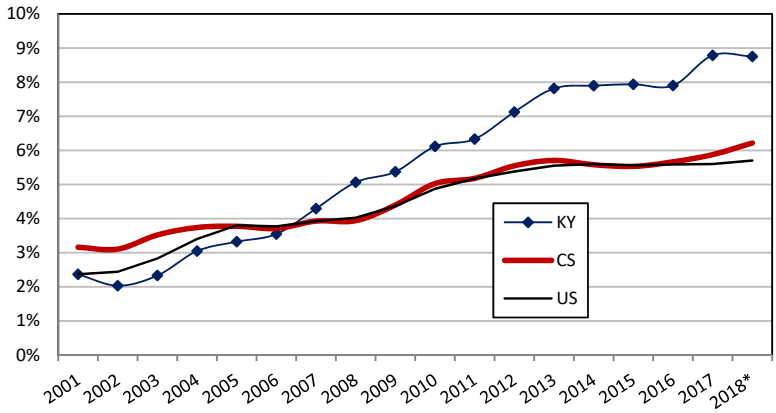


Source: Public Plans Data. 2001-2018. Center for Retirement Research at Boston College, Center for State and Local Government Excellence, and National Association of State Retirement Administrators.

PENSION FUNDING

Improving the funded ratio of Kentucky's major public sector pension plans will likely require difficult decisions on spending priorities within the state budget. Kentucky's required annual contribution to its public pension programs is equal to nearly 9 percent of state and local general revenue from own sources; Kentucky ranks second to Illinois, which is over 16 percent. If the portion of state and local revenue going to pension funding continues to grow, it will either claim a larger portion of the budget and/or create pressure for increasing revenue to fund vital state programs and services. By comparison, the U.S. and competitor state averages are around 6 percent, as illustrated in the figure below.

Annual Required Contribution to Major Public Sector Pension Plans as a Percentage of State & Local General Revenue from Own Sources, 2001 to 2018



Source: Estimated by the author using Public Plans Data. 2001-2018. Center for Retirement Research at Boston College, Center for State and Local Government Excellence, and National Association of State Retirement Administrators, & U.S. Census, Annual Survey of State and Local Government Finances.
**2018 General Revenue from Own Sources extrapolated from 2001 to 2017 values.*

NOTES & SOURCES

Advanced Placement Exam Mastery—College Board, *AP Report to the Nation*, <apreport.collegeboard.org/> and *AP Cohort Data: Graduating Class of 2018*.

Agriculture and GDP—U.S. Department of Commerce, Bureau of Economic Analysis, Gross domestic product (GDP) by state (millions of current dollars).

Air Quality (part 1)—Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division for Air Quality <air.ky.gov/>. The data on air quality trends were obtained via email from the Jennifer Miller, Division for Air Quality on December 15, 2019. Notes about specific pollutants: O_3—Based upon annual statewide averages of all fourth highest daily maximum 8-hour concentrations [29 sites used for 2018 average (ppm)]; NO_2—Based upon annual statewide averages of all 98th percentile daily concentrations 1-hour averages [7 sites used for 2018 average (ppm)]; and SO_2—Based upon annual statewide averages of all 99th percentile daily maximum 1-hour concentrations [12 sites used for 2018 average (ppm)].

Air Quality (part 2)—See the endnote above for detailed information on the source. Notes about specific pollutants: CO—Based upon annual statewide averages of all second highest daily maximum 1-hour concentrations [3 sites used for 2018 average (ppm)]; $PM_{2.5}$—Based upon annual statewide averages of all 98th percentile 24-hour concentrations [19 sites used for 2018 average (μ/m3)]; and PM_{10}—Based upon annual statewide averages of all maximum 24-hour concentrations [8 sites used for 2018 average (μ/m3)].

Associate's Degrees—Estimated by the author using American Community Survey, 2018 1-Year Estimate, Public Use Microdata Sample (PUMS) data.

Banking Status—FDIC *National Survey of Unbanked and Underbanked Households, 2013-2017*.

Bridges & Problem Bridges by County—U.S. Department of Transportation, Federal Highway Administration, Office of Bridges and Structures. The way bridges are classified has changed. Per an email from Samantha Lubkin, with the FHWA Office of Bridges and Structures, on November 6, 2017: Functionally obsolete is a legacy classification that was used to implement the Highway Bridge Program, which was discontinued with the enactment of MAP-21. As a result, fiscal year 2015 was the last year outstanding Highway Bridge Program funds could be obligated on eligible projects, including ones with bridges that were once classified as functionally obsolete. Therefore, FHWA is no longer tracking this measure, and will not be publishing it on our website for the 2016 data forward. Our focus has shifted to a performance-based program as established in MAP-21 and continued in the Fast Act. As such, we encourage the use of the Good-Fair-Poor bridge condition measures outlined in the Pavement and Bridge Condition Performance Measures final rule, published in January of 2017: <www.fhwa.dot.gov/tpm/rule.cfm>. A summary of bridge conditions for the last 5 years can be found here: <www.fhwa.dot.gov/bridge/nbi/condition.cfm>. The bridge data for counties is available here: <www.

fhwa.dot.gov/bridge/nbi/no10/county16a.cfm#ky>.

Bright Spot Performance Points—*Kentucky School Districts as Educational Bright Spots*, Center for Business and Economic Research, <http://cber.uky.edu/brightspots>.

Business Bankruptcies—The Administrative Office of the U.S. Courts <www.uscourts.gov/Statistics/BankruptcyStatistics/quarterly-filings-3-month-chapter-district.aspx>. The establishment data from the County Business Patterns.

Charitable Contributions—Internal Revenue Service, Statistics of Income <www.irs.gov/uac/SOI-Tax-Stats---Historic-Table-2>.

Child Poverty—U.S. Census Bureau, Poverty Status in the past 12 months, 2018 American Community Survey 1-Year Estimates <www.census.gov/acs/www/>.

Children in Single-Parent Families—U.S. Census, American Community Survey, 1-Year estimate, 2018, Table C23008. The citation referenced in the text is Raj Chetty, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez, "Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States," *The Quarterly Journal of Economics*, Vol. 129, Issue 4, November 2014, pp. 1553-1623.

Chronic Disease by County (Number & Percent)—Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2012-2016. To estimate county-level percentages and numbers we use a special grouping of counties developed by the University of Kentucky Markey Cancer Control Program and College of Public Health under the direction of the Kentucky Department for Public Health. The text references this peer-reviewed research: Asay GRB, Roy K, Lang JE, Payne RL, Howard DH. Absenteeism and Employer Costs Associated With Chronic Diseases and Health Risk Factors in the US Workforce. Prev Chronic Dis 2016;13:150503. DOI: http://dx.doi.org/10.5888/pcd13.150503.

Chronic Disease Risk by Age Group—Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2018.

Coal Production—Kentucky Energy and Environment Cabinet, Kentucky Quarterly Coal Reports <energy.ky.gov/Pages/CoalFacts.aspx>.

Coincident Index—State Coincident Indexes was obtained from the Federal Reserve Bank of Philadelphia <www.philadelphiafed.org/research-and-data/regional-economy/indexes/coincident>.

College Attainment by County—U.S. Department of Commerce, American Community Survey, 2014-2018, 5-year estimates <www.census.gov/acs/www/>.

College Attainment—Estimated by the author using American Community Survey, 2018 1-Year Estimate, Public Use Microdata Sample (PUMS) data.

College Readiness—*The Condition of College & Career Readiness*, 2019, various state reports, ACT, Inc. The Competitor States values reflect a weighted average of the 12 states.

Community Development Expenditures (in the U.S.)—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>. We

use the following Census Bureau Item Codes to create this category: E52, F52, G52, E55, F55, G55, E56, F56, G56, E59, F59, G59, E61, F61, G61, E50, F50, and G50.

Commuting—U.S. Census, American Community Survey, 5-Year Estimate, 2014-2018, Table DP03-Selected Economic Statistics.

County Population Changes—Census data obtained from the U.S. Census Bureau.

County-Level Innovation Index—Innovations in America's Regions, a project funded in part by the U.S. Commerce Department's Economic Development Administration. Work was conducted by the Purdue Center for Regional Development, the Indiana Business Research Center at Indiana University's Kelley School of Business, and other research partners. Data are available online at <www.statsamerica.org/innovation/index.html>.

Crime Rate—Federal Bureau of Investigation, *Crime in the United States 2018*, Table 4, Crime in the United States, by Region, and Table 5, Crime in the United States by State <www.fbi.gov/>.

Criminal Offense Rate by County—*Crime in Kentucky, 2018*, Kentucky State Police, available at <www.kentuckystatepolice.org/data.htm>.

Current Smokers—Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011-2018.

Dams—National Inventory of Dams <http://nid.usace.army.mil/>, data is current as of November 2019. The data on the classification of dams into quality categories, such as poor or unsatisfactory, come from the Association of State Dam Officials <http://damsafety.org/> via email, received in March, 2018.

Debt—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate>.

Disability Income (DI)—U.S. Social Security Administration, Office of Retirement and Disability Policy, Office of Research, Evaluation, and Statistics, *Annual Statistical Report on the Social Security Disability Insurance Program, 2018* <www.socialsecurity.gov>.

Disability—U.S. Department of Commerce, American Community Survey, 2018, 1-year estimates <www.census.gov/acs/www/>.

Disconnected Young Adults—Percentages are estimated from 2018 1-year PUMS data. In addition to the age variable (AGEP), there are three variables used to create this recoded variable: ESR—Employment Status Recode (where ESR=3 or 6); SCHL—Educational Attainment (where SCHL<=19); and SCH—School Enrollment (where SCH=1).

Drug Overdose Death Rate—Author's analysis of data from the Centers for Disease Control and Prevention (CDC), National Center for Health Statistics, Multiple Cause of Death 1999-2018 on CDC WONDER Online Database.

Early-Stage Entrepreneurship—Kauffman Indicators of Entrepreneurship, 2018 National & State Reports on Early-Stage Entrepreneurship, September 2019 <https://indicators.kauffman.org/ >.

Earnings Gap—Bureau of Economic Analysis, CA30, Economic Profile, and the 2013 Urban-Rural Continuum Code, available at <www.ers.usda.gov/data-products/rural-

urban-continuum-codes.aspx#.UqR_ZeLs2HY>.

Education Expenditures (in the U.S.)—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>. We use the following Census Bureau Item Codes to create this category: E12, F12, G12, E16, E18, F16, F18, G16, G18, E21, F21, G21, and J19.

Education Index—Refer to Michael T. Childress, "Kentucky's Educational Performance & Points of Leverage," CBER Issue Brief, December 2015 <cber.uky.edu/>.

Educational Achievement Gap—National Center for Education Statistics, NAEP Data Explorer <nces.ed.gov/nationsreportcard/naepdata/dataset.aspx>.

Educational Spending ROI—See Educational Index above.

Elder Poverty—U.S. Census Bureau, Poverty Status in the past 12 months, 2018 American Community Survey 1-Year Estimates <www.census.gov/acs/www/>. The Employee Benefit Research Institute *2017 Retirement Confidence Survey* results are available at <www.ebri.org/surveys/rcs/>.

Employment by Education—Refer to Christopher R. Bollinger, "Want a Job? Get a College Degree," CBER Issue Brief, October 2015 <cber.uky.edu/>.

Employment by Foreign Companies—Foreign Direct Investment in the U.S., Majority-Owned Bank and Nonbank U.S. Affiliates, Employment. Bureau of Economic Analysis, Regional Economic Accounts & International Data.

Employment by Sector—U.S. Department of Labor, Bureau of Labor Statistics <www.bls.gov/sae/>.

Employment Growth by Kentucky Region—U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages <http://www.bls.gov/cew/data.htm>.

Employment Growth by State—U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages <http://www.bls.gov/cew/data.htm>.

Employment-Population Ratio—Estimated by the author using U.S. Census Current Population Survey (CPS) data from Sarah Flood, Miriam King, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 4.0 [Basic Monthly dataset]. Minneapolis, MN: University of Minnesota, 2015. http://doi.org/10.18128/D030.V4.0.

Energy Consumption by End-Use Sector—U.S. Energy Information Administration, State Energy Data System, Table C1: Energy Consumption Overview: Estimates by Energy Source and End-Use Sector, 2017 <www.eia.gov>.

Energy Consumption by Source—U.S. Energy Information Administration, *State Energy Data 2017: Consumption*, and *Kentucky State Energy Profile and Energy Estimates* <www.eia.gov>.

Energy Consumption per GDP—U.S. Energy Information Administration and U.S. Department of Commerce, Bureau of Economic Analysis.

Energy Efficiency—U.S. Energy Information Administration.

Entrepreneurial Depth—U.S. Department of Commerce, Bureau of Economic Analysis, SA4 Personal Income and Employment by Major Component and SA30 Economic Profile.

Exemplar School Districts—*Kentucky School Districts as Educational Bright Spots*, Center for Business and Economic Research, <http://cber.uky.edu/brightspots>.

Exports—U.S. Department of Commerce, International Trade Administration, <tse.export.gov/TSE/TSEhome.aspx>.

Family Income by Education—Estimated by the author using data courtesy Steven Ruggles, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas and Matthew Sobek. IPUMS USA: Version 9.0 [ACS 2014 to 2018]. Minneapolis, MN: IPUMS, 2019. https://doi.org/10.18128/D010.V9.0. To estimate the independent effect of education, we used a multiple regression model that utilized mostly dummy variables (e.g., EMPLOY, LESSHS, SOMECOL, BACHORMORE, NOTMETRO, METROCITY, METRONOTCITY, METROMIXED, GENDER, AGE_25_34, AGE_35_44, AGE_45_54, AGE_55_64, OVER65, WHITEONLY); we also included YEAR. The omitted variables are high school education, aged less than 25, and metropolitan status indeterminable (mixed).

Farm Commodities—United States Department of Agriculture, Economic Research Service, U.S. and State Farm Income and Wealth Statistics <www.ers.usda.gov/data-products/farm-income-and-wealth-statistics.aspx>.

Farm Employment—U.S. Department of Commerce, Bureau of Economic Analysis, SA25N Total full-time and part-time employment by NAICS industry.

Farms—These data come from various sources, including the Kentucky Department of Agriculture's annual report, *Kentucky Agricultural Statistics* and the United States Department of Agriculture, *Farms and Land in Farms*, various years.

Favors for Neighbors—Estimated from U.S. Census, November 2017, Current Population Survey microdata, Civic Engagement Supplement.

Food Insecurity—Author's analysis of data from Sarah Flood, Miriam King, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 4.0 [Food Security CPS Supplement data]. Minneapolis, MN: University of Minnesota, 2015.

Food Stamp Participation—U.S. Department of Agriculture, Food and Nutrition Service and University of Kentucky Center for Poverty Research. 2016. "UKCPR National Welfare Data, 1980-2016." Gatton College of Business and Economics, University of Kentucky, Lexington, KY. http://www.ukcpr.org/data (accessed November 2018).

Foreclosures—Mortgage Bankers Association, National Delinquency Survey.

Foreign-Born Population (by County)—U.S. Census Bureau, ACS 2018 1- and 5-Year Estimates, Table B05002.

Free or Reduced-Price Lunch Eligibility—U.S. Department of Education, ED Data Express, Common Core of Data (CCD), "Public Elementary/Secondary School Universe Survey," 2017–18.

General Fund Receipts by Source—Kentucky Finance and Administration Cabinet and the Kentucky Revenue Cabinet, Annual Reports, various years.

Gini Index (by State and County)—U.S. Census Bureau, American Community Survey, various years.

Growth Rates, Taxes and Income—U.S. Census Bureau, Bureau of Economic Analysis & State Government Tax Collections.

Health by Education—Refer to Christopher R. Bollinger, "Education for Your Health!," CBER Issue Brief, October 2015 <cber.uky.edu/>.

Health-Based Violations—United States, Environmental Protection Agency, Safe Drinking Water Information System data, various years.

Health Insurance Coverage: Children—U.S. Census Bureau, Health Insurance Historical Tables, H1B Series, HIB-5. Health Insurance Coverage Status and Type of Coverage by State—Children Under 18: 1999 to 2012 <www.census.gov/hhes/www/hlthins/data/historical/files/hihistt5B.xls> and American Community Survey (various years, 1-Year estimates).

Health Insurance Coverage: Everyone—U.S. Census Bureau, Health Insurance Historical Tables, H1B Series, HIB-4. Health Insurance Coverage Status and Type of Coverage by State--All Persons: 1999 to 2012 <www.census.gov/hhes/www/hlthins/data/historical/files/hihistt4B.xls> and American Community Survey (various years, 1-Year Estimates).

High Hazard Potential Dams—National Inventory of Dams <http://nid.usace.army.mil/>, data downloaded in November 2019.

High School Attainment—Estimated by the author using American Community Survey, 2018 1-Year Estimate, Public Use Microdata Sample (PUMS) data.

High School Graduation Rate—U.S. Department of Education, EDFacts/Consolidated State Performance Report, 2018: < www2.ed.gov/admins/lead/account/consolidated/index.html>.

High-Speed Internet (by County)—The reported data in the Infrastructure chapter are from two different Federal Communications Commission (FCC) reports, 2019 Measuring Broadband America Fixed Broadband Report <https://www.fcc.gov/reports-research/reports/measuring-broadband-america/measuring-fixed-broadband-report-2019> and the 2019 Broadband Progress Report <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2019-broadband-progress-report>. We obtained the data found in the Innovation chapter from the American Community Survey, 2018 1-Year estimate, Table GCT2801.

High-Technology Establishments—Using the National Science Foundation and Milken Institute designations of 4-digit NAICS codes and County Business Patterns data on number of establishments, we calculation the percentage that are considered high-tech establishments. Here are the 50 NAICS codes used: 1131, 1132, 2111, 2211, 3241, 3251, 3252, 3253, 3254, 3255, 3259, 3332, 3333, 3336, 3339, 3341, 3342, 3343, 3344, 3345, 3346, 3353, 3364, 3369, 4234, 4861, 4862, 4869, 5112, 5161, 5171, 5172, 5173, 5174, 5179, 5181, 5182, 5211, 5232, 5413, 5415, 5416, 5417, 5511, 5612, 8112, 3391, 5121, 5191, 6215.

Hourly Wages—These data are part of the CPS Outgoing Rotation Group. For this analysis, the data were downloaded from the Center for Economic and Policy Research (CEPR) web site at <ceprdata.org>. We use the variable "wage3" for this analysis.

Household Income Growth—Author's analysis of IPUMS-CPS data, courtesy of Miriam King, Steven Ruggles, J. Trent Alexander, Sarah Flood, Katie Genadek, Matthew B. Schroeder, Brandon Trampe, and Rebecca Vick. Integrated Public Use Microdata Series, Current Population Survey: Version 3.0. [Machine-readable database]. Minneapolis: University of Minnesota, 2010.

Household Income Ratio—See Household Income Growth above for data source information.

Household Income—See Household Income Growth above for data source information. Household income includes income of the householder and all other people 15 years and older in the household, whether or not they are related to the householder. The median is the point that divides the household income distribution into halves, one half with income above the median and the other with income below the median. The median is based on the income distribution of all households, including those with no income. The distributional data is a one-year (2018) estimate from the American Community Survey.

Housing Starts—U.S. Census Bureau.

Income Sources by Location—U.S. Department of Commerce, Bureau of Economic Analysis, and the 2013 Urban-Rural Continuum Code, available at <www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx#.UqR_ZeLs2HY>.

Industrial Electricity Costs—U.S. Energy Information Administration <www.eia.gov/beta/state/data.cfm?sid=KY#Prices>.

Industrial Research & Development—National Science Foundation, Business and Industrial R&D, various years <www.nsf.gov/statistics/industry/>.

Infrastructure Expenditures (in the U.S.)—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>. We use the following Census Bureau Item Codes to create this category: E44, F44, G44, E45, F45, G45, E94, F94, G94, I94, E01, F01, G01, E87, F87, G87, E91, F91, G91, I91, E80, F80, G80, E60, F60, G60, E92, F92, G92, I92, E93, F93, G93, I93, E81, F81, and G81.

Infrastructure Expenditures (in the U.S.)—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>.

Job Growth—U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics, total private, all employees, not seasonally adjusted <www.bls.gov/>.

Kentucky Coal Distribution—*Annual Coal Distribution Report 2018*, U.S. Energy Information Administration, <www.eia.gov/coal/distribution/annual/archive.cfm>.

Labor Force Participation (by County) & (by Education)—American Community Survey, U.S. Census Bureau, 2018 1-year estimate (Table S2301). The county-level data are from the ACS 5-Year estimate (Table S2301).

Lead & Copper Rule—United States, Environmental Protection Agency, Safe Drinking Water Information System data, various years. These estimates are generated by the author using a method employed by the Natural Resources Defense Council and described in a May 2017 report, *Threats on Tap: Widespread Violations Highlight Need for Investment in Water Infrastructure and Protections* <https://www.nrdc.org/resources/threats-tap-widespread-violations-water-infrastructure>.

Lead Risk—The methodology used in producing the county-level lead exposure risk levels is based on data from the 2014 American Community Survey 5-Year estimates. Specifically, we used census tract-level housing age and poverty data; each of these is responsible for a different component of lead exposure risk. This data enumerates the number of households in each stratum of building age and poverty level, so to yield county-level data, we simply summed along the first five digits of GeoID2: the county portion of the unique census tract identifier. Proceeding, we used coefficients produced by a team at the Washington State Department of Health and Vox media to produce two regressions: 1) lead exposure risk due to housing; and, 2) lead exposure risk due to poverty. Then each of those were normalized and these z-scores were summed, with 58% weight on housing risk and 42% on poverty. Finally, this "raw score" was sorted into deciles, yielding the lead exposure risk estimates. More information is available at <www.vox.com/a/lead-exposure-risk-map>.

Local Food Suppliers—U.S. Department of Agriculture, *2012 Census of Agriculture* (Table 43: Selected Practices). Personnel with the Kentucky Department of Agriculture provided data on CSA and farmers' markets that is discussed in the narrative.

Median Age—U.S. Census Bureau, ACS 1-Year estimate.

Medicaid Beneficiaries—Kaiser Family Foundation, <www.statehealthfacts.org> and Centers for Medicare & Medicaid Services, State/County Penetration File, (various years).

Mining and Coal—These data are from the Bureau of Economic Analysis and the Energy Information Administration, Annual Coal Report, various years.

Minority Population—U.S. Census Bureau, ACS 1-Year estimate, Table B02001.

Motor Gasoline Expenditures—U.S. Energy Information Administration, State Energy Data System.

Narrow Roads—Federal Highway Administration, Highway Statistics 2017, Table HM-53 <www.fhwa.dot.gov/policyinformation/statistics.cfm>.

Natural Gas Supplanting Coal—U.S. Energy Information Administration, Electricity Net Generation Total (All Sectors).

Neighborhood Quality—2016 National Survey of Children's Health <childhealthdata.org>.

Net Earnings per Capita (by County)—U.S. Department of Commerce, Bureau of Economic Analysis.

Net Earnings—U.S. Department of Commerce, Bureau of Economic Analysis.

Nonemployer Establishments—U.S. Census Bureau, Nonemployer Statistics <www.census.gov/econ/nonemployer/historical.htm>.

Nonprofits—Internal Revenue Service, Exempt Organizations Business Master File (2019, October).

Number At Risk for Risk Behaviors—Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2018.

Opioid Prescription Rate—Centers for Disease Control and Prevention (CDC), Opioid Overdose, U.S. County Prescribing Rates, 2017, available at <https://www.cdc.gov/drugoverdose/maps/rxcounty2017.html>.

Oral Health—Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2018 <www.cdc.gov/brfss/technical_infodata/index.htm>.

Organic Farming—USDA *2017 Census of Agriculture*.

Patents (by County)—U.S. Patent and Trademark Office, Utility Patents <www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_utlh.htm>. Population data are from the U.S. Census Bureau <www.census.gov>. The competitor states is a weighted average of AL, GA, IL, IN, MS, MO, NC, OH, SC, TN, VA, and WV.

Per Capita Personal Income—U.S. Department of Commerce, Bureau of Economic Analysis, SA1-3 Personal income summary.

Performance on Standardized Tests—U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), various assessments, <nces.ed.gov/nationsreportcard/naepdata/>.

Pension Funded Ratio—Center for Retirement Research at Boston College, State and Local Public Plans Database <https://publicplansdata.org/public-plans-database/download-full-data-set/>.

Pension Funding—Center for Retirement Research at Boston College, State and Local Public Plans Database <https://publicplansdata.org/public-plans-database/download-full-data-set/>.

Personal Bankruptcies—The Administrative Office of the U.S. Courts <www.uscourts.gov/Statistics/BankruptcyStatistics/quarterly-filings-3-month-chapter-district.aspx>. The population data are from the U.S. Census.

Population by Age Group—U.S. Census, American Community Survey, 2018 1-Year Estimates.

Population Change—U.S. Census Bureau, Decennial Census, 2000 and the American Community Survey 2018 1-year estimate.

Population Totals—U.S. Census Bureau, Urban and Rural Population: 1900 to 1990 <www.census.gov/population/www/censusdata/files/urpop0090.txt>. The 2000 and 2010 population totals were obtained from the Census totals available at <www.census.gov>. The competitor state average of 41 percent increase is a weighted average of the 12 competitor states.

Poverty Rate by County—U.S. Census Bureau, American Community Survey, 2018 5-Year Estimates.

Poverty Rate—Estimated by the author using the CPS-IPUMS constructed variable OFFPOV (Official Poverty Status, person-level variable). Courtesy of Miriam King, Steven Ruggles, J. Trent Alexander, Sarah Flood, Katie Genadek, Matthew B. Schroeder, Brandon

Trampe, and Rebecca Vick. Integrated Public Use Microdata Series, Current Population Survey: Version 3.0. [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2010.

Premature Death—Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute, *County Health Rankings 2019*, <www.countyhealthrankings.org>.

Public Assistance by Education—U.S. Census Bureau, Public Use Microdata Sample (PUMS), ACS 2018.

Public Participation in the Arts—Authors' analysis of data from Sarah Flood, Miriam King, Steven Ruggles, and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 5.0 [CPS Public Art Supplement]. Minneapolis, MN: University of Minnesota, 2017.

Public Pension Funding Gaps—The PEW Charitable Trusts, Public Sector Retirement Systems <www.pewtrusts.org/en/projects/public-sector-retirement-systems>.

Public Pre-K Enrollment—*The State of Preschool 2018: State Preschool Yearbook*, The National Institute for Early Education Research, estimates derived from Table 4 <nieer.org/yearbook>.

Public Protection Expenditures (in the U.S.)—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>. We use the following Census Bureau Item Codes to create this category: E04, F04, G04, E05, F05, G05, E62, F62, G62, E24, F24, G24, E66, F66, and G66.

Quarterly Percentage Change in Real GDP, U.S.—U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Account Tables, Section 1 <www.bea.gov/national/nipaweb/DownSS2.asp>.

Recycling—Kentucky Energy and Environment Cabinet, Division of Waste Management, *Annual Report—Fiscal Year 2017* <waste.ky.gov>.

Regional Employment Shift—Data used in the shift-share analysis are from the Bureau of Labor Statistics (BLS), Current Employment Statistics (CES), all employees, not seasonally adjusted, for national estimates <http://www.bls.gov/ces/>, and BLS, State and Metro Area Employment (SAE), all employees, not seasonally adjusted, for the state estimates, <http://www.bls.gov/sae/>.

Regional Population Change—U.S. Census Bureau.

Renewable Energy Production—U.S. Energy Information Administration, State Energy Data Production, State Energy Data System (SEDS), 1960-2017 estimates <www.eia.gov/state/seds/>.

Residential Electricity Costs—U.S. Energy Information Administration, *Electricity* <www.eia.gov/electricity/sales_revenue_price/xls/table5_a.xls>.

Revenue from Federal Transfers—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>. These per capita estimates have been adjusted to reflect cost-of-living differences across the states using the 2014 regional price parity estimates from the Bureau of Economic Analysis.

Revenue Loss from the Great Recession—Method borrowed from, '*Lost Decade' Casts a Post-Recession Shadow on State Finances,* Pew, June 4, 2019, < https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2019/06/lost-decade-casts-a-post-recession-shadow-on-state-finances>.

Risk Behaviors and Chronic Disease—Centers for Disease Control and Prevention (CDC). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2018.

Road Condition—Federal Highway Administration, Highway Statistics 2017, Table HM-64 <www.fhwa.dot.gov/policyinformation/statistics.cfm>.

Rural Population—U.S. Census Bureau, Urban and Rural Population: 1900 to 1990 <www.census.gov/population/www/censusdata/files/urpop0090.txt>. The 2000 and 2010 population totals were obtained from the Census totals available at <factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>. The competitor state average is a weighted average of the 12 competitor states.

SBIR/STTR Awards by County—Small Business Innovation Research, Small Business Technology Transfer <www.sbir.gov/past-awards>.

Science & Technology Index—Milken Institute, *2018 State Technology and Science Index* <www.milkeninstitute.org>.

Science and Engineering Graduates—Calculated from the Integrated Postsecondary Education Data System (IPEDS) using 2013 STEM-designed CIP codes. Note that the STEM degrees are normalized using the number of individuals in the population 20 to 24 years old, but this does not mean that all of these degrees were conferred upon individuals in this age range.

Selected Educational Indicators—Refer to Michael T. Childress, "Kentucky's Educational Performance & Points of Leverage," CBER Issue Brief, December 2015 <cber.uky.edu/>.

Selected Obstacles to Education— Refer to Michael T. Childress, "Kentucky's Educational Performance & Points of Leverage," CBER Issue Brief, December 2015 <cber.uky.edu/>.

Self Employed—BLS Current Employment Statistics survey for wage and salary worker employment. Self-employment estimates generated by the author using data from Sarah Flood, Miriam King, Renae Rodgers, Steven Ruggles and J. Robert Warren. Integrated Public Use Microdata Series, Current Population Survey: Version 6.0 [ASEC 1988-2018]. Minneapolis, MN: IPUMS, 2018. https://doi.org/10.18128/D030.V6.0.

Small Business Innovation Research—Small Business Innovation Research, Small Business Technology Transfer <www.sbir.gov/past-awards>.

Social Capital Index—Using principal component analysis, we generate county-level scores based on associational density data from 2013 County Business Patterns (NAICS 713910, 713940, 713950, 713990, 813110, 813410, 813910, 813920, 813930, and 813940), voter turnout for the 2014 general election data from the Kentucky State Board of Elections, the county-level response rate to the 2010 U.S. decennial census (U.S. Census Bureau), and the number of tax-exempt non-profit organizations (Business Master File, March 2016) from the National Center for Charitable Statistics. We follow a

method outlined in A. Rupasingha et al., "The production of social capital in US counties," *The Journal of Socio-Economics* 35 (2006) 83-101. Also see A. Rupasingha et al., "Social Capital and Economic Growth: A County-Level Analysis," *Journal of Agricultural and Applied Economics*, 33 (2000) 565-572.

Social Determinants of Health—We use 24 variables organized around five broad thematic areas used in the U.S. Department for Health and Human Services, Healthy People 2020 framework: HEALTH (using data from County Health Rankings and the Area Resource File, we use the Population to Dentists ratio, Population to Mental Health Providers ratio, Population to Primary Care Physicians ratio, other Primary Care Providers ratio, and percentage of the population with health insurance); EDUCATION (high school graduation is obtained from the adjusted cohort graduation rate data and, where necessary, weighted estimates are produced at the county-level where there are multiple high schools in a county, successful transition to adulthood using higher education, work, and military, language and literacy data from EXPLORE benchmark, and early childhood education and development data on kindergarten readiness); ECONOMIC STABILITY (poverty rate from the U.S. Census ACS, unemployment rate from BLS, food insecurity from County Health Rankings, housing stability using foreclosure data from HUD, and Gini Index values from the Census ACS); SOCIAL (associational density data from 2013 County Business Patterns (NAICS 713910, 713940, 713950, 713990, 813110, 813410, 813910, 813920, 813930, and 813940), voter turnout for the 2014 general election data from the Kentucky State Board of Elections, the county-level response rate to the 2010 U.S. decennial census (U.S. Census Bureau), and the number of tax-exempt non-profit organizations (Business Master File, March 2016) from the National Center for Charitable Statistics.); NEIGHBORHOOD & BUILT ENVIRONMENT (ESHE Index on the availability of health food, severe housing problems using data from County Health Rankings, specified as the number of households experiencing overcrowding, high housing costs, or lack of kitchen or plumbing facilities. These data come from the Census Bureau and HUD's Comprehensive Housing Affordability Strategy, crime rate data from the Kentucky State Police, a lead risk index generated from housing age and poverty, air pollution data from EPA, and water quality data from County Health Rankings which uses EPA data on health-based violations). We perform a principal component analysis on each of the five thematic areas and average the results at the county-level to generate a county score. All data are transformed and ordered so that a high positive number is considered "good" for health outcomes.

Social Services Expenditures (in the U.S.)—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>. We use the following Census Bureau Item Codes to create this category: J67, J68, E74, E75, E77, F77, G77, E79, F79, G79, E73, E67, E36, F36, G36, E32, F32, G32, E22, F22, G22, E85, F85, G85, and J85.

Solid Waste (Disposal)—Kentucky Energy and Environment Cabinet, Division of Waste Management, *Annual Report—Fiscal Year 2017* <waste.ky.gov>.

Sources of Personal Income—U.S. Department of Commerce, Bureau of Economic Analysis, SA04 State income and employment summary.

State and Local Expenditures—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>.

State and Local Own Source Revenue—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>. More information about the BEA Regional Price Parities is available at <www.bea.gov/regional/pdf/RPP2015.pdf>.

State and Local Tax Revenue by Source—U.S. Census Bureau, 2017 Annual Surveys of State and Local Government Finances <www.census.gov/govs/estimate/>.

Structural Deficit—Update of William Hoyt, William Fox, Michael Childress, and James Saunoris, *Final Report to the Governor's Blue Ribbon Commission on Tax Reform*, September 2012, University of Kentucky, Center for Business and Economic Research <cber.uky.edu>.

Supplemental Security Income (SSI)—Social Security Administration and University of Kentucky Center for Poverty Research. 2018. "UKCPR National Welfare Data, 1980-2015." Gatton College of Business and Economics, University of Kentucky, Lexington, KY. http://www.ukcpr.org/data (accessed November 2019).

Tax Collections and Personal Income—U.S. Department of Commerce, Bureau of Economic Analysis, and U.S. Census Bureau, State Government Tax Collections, various years <www.census.gov/govs/statetax/>.

Technology Use by Education—Estimated using Current Population Survey Computer and Internet Use Supplement, November 2017. This is a measure of Internet use from any location and is constructed using these variables, where PEINHOME=1 OR PEINWORK=1 OR PEINSCHL=1 OR PEINCAFE=1 OR PEINTRAV=1 OR PEINLICO=1 OR PEINELHO=1 OR PEINOTHR=1. More information available at the U.S. Department of Commerce, NTIA, Digital Nation Data Explorer <www.ntia.doc.gov/other-publication/2016/digital-nation-data-explorer>.

Temporary Assistance for Needy Families—The Administration for Children and Families, U.S. Department of Health and Family Services and University of Kentucky Center for Poverty Research. 2016. "UKCPR National Welfare Data, 1980-2018." Gatton College of Business and Economics, University of Kentucky, Lexington, KY. http://www.ukcpr.org/data (accessed November 2018).

Total Research & Development—National Science Foundation/National Center for Science and Engineering Statistics. National Patterns of R&D Resources, various years <www.nsf.gov/statistics/natlpatterns/>.

Toxic Releases—U.S. Environmental Protection Agency, Toxics Release Inventory, TRI Explorer <iaspub.epa.gov/triexplorer/tri_release.chemical>. These data are TRI On-site and Off-site Reported Disposed of or Otherwise Released (in pounds), for All industries, for All chemicals, 2018.

Transfer Payments by County—Bureau of Economic Analysis.

Transition from Goods to Services: Employment—U.S. Department of Labor, Bureau of Labor Statistics <data.bls.gov>. The denominator is seasonally adjusted total nonfarm employment (SMS21000000000000001). The three numerators are private-sector service providing (SMS21000000800000001), goods producing (SMS21000000600000001), and government employment (SMS21000009000000001)—all seasonally adjusted.

Transition from Goods to Services: GDP—U.S. Department of Commerce, Bureau of Economic Analysis <www.bea.gov/itable/>. Using the NAICS and SIC classifications, we categorize these industries as "goods producing": agriculture, forestry, fishing, and hunting; mining; construction; and manufacturing. The rest of the industries are considered "service providing." Government includes federal, state and local.

Value-Added Food Production—U.S. Census Bureau, Annual Survey of Manufactures, various years.

Venture Capital—PricewaterhouseCoopers, National Venture Capital Association, Money Tree Report, historical trend data, <www.pwcmoneytree.com/MTPublic/ns/nav.jsp?page=historical>.

Volunteer Hours—These data are from the 2017 Current Population Survey (CPS) September Volunteer Supplement results, based on adults aged 15 and older.

Volunteer Rate by Education—These data are from the 2017 Current Population Survey (CPS) September Volunteer Supplement results, based on adults aged 25 and older.

Volunteer Rate—These data are from the 2017 Current Population Survey (CPS) September Volunteer Supplement results, based on adults aged 15 and older. Volunteers are considered individuals who performed unpaid volunteer activities through or for an organization at any point during the 12-month period, from September 1 of the prior year through the survey week in September of the survey year.

Wage & Salary Growth by Kentucky Region—U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages, private, all industries, all establishment sizes, <www.bls.gov/cew/>.

Wage & Salary Growth by State—U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages, private, all industries, all establishment sizes, <www.bls.gov/cew/>.

Wages and Education—CPS Outgoing Rotation Group. For this analysis, the data were downloaded from the Center for Economic and Policy Research (CEPR) web site at <ceprdata.org>. We use the variable "wage3" for this analysis.

Water Quality—United States, Environmental Protection Agency, Safe Drinking Water Information System data, various years. These estimates are generated by the author using a method employed by the Natural Resources Defense Council and described in a May 2017 report, *Threats on Tap: Widespread Violations Highlight Need for Investment in Water Infrastructure and Protections* <https://www.nrdc.org/resources/threats-tap-widespread-violations-water-infrastructure>.

White, Non-Hispanic Population—U.S. Census Bureau.

Women, Infants, and Children (WIC)—U.S. Department of Agriculture, Food and

Nutrition Service, and University of Kentucky Center for Poverty Research. 2016. "UKCPR National Welfare Data, 1980-2015." Gatton College of Business and Economics, University of Kentucky, Lexington, KY. http://www.ukcpr.org/data (accessed November 2017).

Youth Alcohol and Drug Abuse—Centers for Disease Control and Prevention, *Youth Risk Behavior Surveillance System (YRBSS)*, <www.cdc.gov/healthyyouth/yrbs/index.htm>.

Youth Health-Related Behaviors—Centers for Disease Control and Prevention, Y*outh Risk Behavior Surveillance System (YRBSS)*, <www.cdc.gov/healthyyouth/yrbs/index.htm>. See Rasberry CN, Tiu GF, Kann L, et al. Health-Related Behaviors and Academic Achievement Among High School Students — United States, 2015. *MMWR Morb Mortal Wkly Rep* 2017;66:921–927. DOI: http://dx.doi.org/10.15585/mmwr.mm6635a1.

Youth Obesity—Centers for Disease Control and Prevention, *Youth Risk Behavior Surveillance System (YRBSS)*, various years <www.cdc.gov/healthyyouth/data/yrbs/data.htm>.

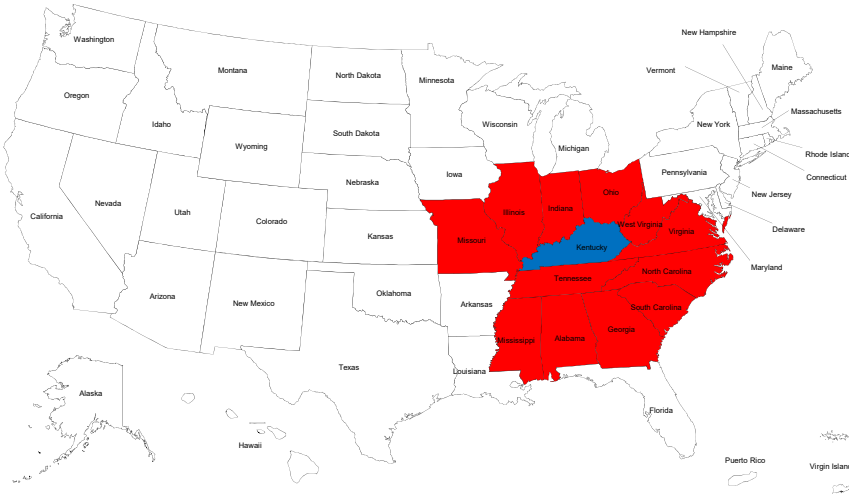
GLOSSARY

Bankruptcy—A legal proceeding involving a person or business that is unable to repay outstanding debts.

Commodity—A product, either raw or manufactured, that can be purchased or traded.

Competitor States—States that are similar to Kentucky in terms of economic and demographic characteristics which are viewed as the main competitors to Kentucky for industrial development. There are twelve states: Alabama, Georgia, Illinois, Indiana, Mississippi, Missouri, North Carolina, Ohio, South Carolina, Tennessee, Virginia, West Virginia.

Kentucky's Principal Competitor States



Compound Annual Growth Rate (CAGR)—The rate of increase in the value of a quantity that is compounded over several years.

Constant dollars—Nominal or current dollar amounts that are adjusted to remove the effect of inflation.

Consumer Price Index (CPI)—The U.S. Department of Labor, Bureau of Labor Statistics, defines the CPI as a "measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services."

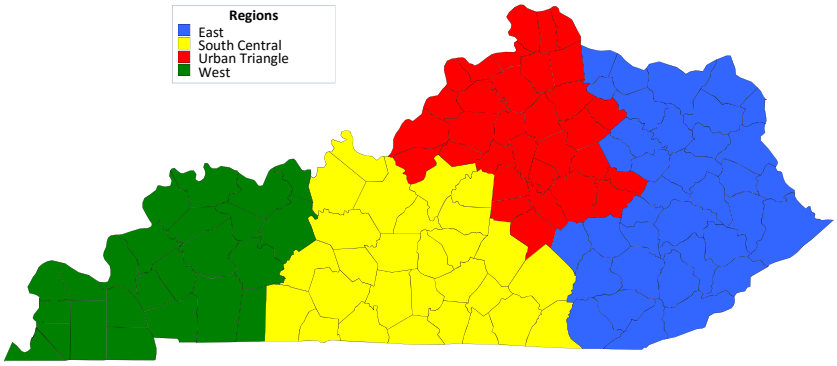
Current dollars—Also called nominal dollars, these dollar amounts are not adjusted to remove the effect of inflation and represent the current value of the dollar during a given year.

Dividends—The portion of the profits generated by a corporation that is dispersed to its shareholders.

Eastern Kentucky—Counties in Kentucky located in the eastern most Area Development Districts (ADDs), including Bath, Bell, Boyd, Bracken, Breathitt, Carter, Clay, Elliott, Fleming,

Floyd, Greenup, Harlan, Jackson, Johnson, Knott, Knox, Laurel, Lawrence, Lee, Leslie, Letcher, Lewis, Magoffin, Martin, Mason, Menifee, Montgomery, Morgan, Owsley, Perry, Pike, Robertson, Rockcastle, Rowan, Whitley, and Wolfe Counties.

Kentucky Regions



Export—Goods and/or services generated in one country and sold in another.

Functionally Obsolete (FO) (Bridges) —"A bridge is considered 'functionally obsolete' when it does not meet current design standards (for criteria such as lane width), either because the volume of traffic carried by the bridge exceeds the level anticipated when the bridge was constructed and/or the relevant design standards have been revised." See "2010 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance."

Gini (coefficient) Index—A measure of income dispersion, ranging from zero, which indicates perfect equality, to one, which indicates absolute inequality. A higher number indicates more concentration of income in fewer hands, with a value of one indicating that one person holds all the income.

Globalization—An adjective describing the interdependent relationship between national economies that has both positive and negative impacts on international markets.

Great Recession—The period of decline in annual real world gross domestic product per capita experienced in the U.S. from December of 2007 until June of 2009, leading to a decrease international trade, a notable rise in unemployment, and deflated commodity prices.

Gross Domestic Product (GDP)—The total value of a country's goods and services. This includes private consumption, investment, government spending, and exports (subtracting imports from this value).

Inflation—The phenomenon where the price of goods and services increases, while the value of the currency used to purchase those items remains stagnant; getting less

"bang for your buck."

Interest—The rate lenders charge borrowers to compensate for risk attributed to making funds available to borrowers, also known as the cost of borrowing

Mean (*syn* Average)—The sum of all values divided by the total number of values.

Median—The most central number in a data set; the number separating the upper half of the sample/population from the lower half.

Middle-class—The Census Bureau has no official definition of middle-class. See U.S. Census Bureau; "Middle Class in America," (2010) U.S. Department of Commerce, Economics and Statistics Administration. However, there are many definitions of "middle class" and opinions on what should be included when categorizing households (e.g., income, net worth, government transfers, etc.).

Nominal dollars—An unadjusted dollar value that reflects the historical value; it has not been adjusted to remove the effect of inflation.

Outsourcing—Transferring business activities outside of a firm in order to reduce costs.

Patent—A property right granted by the government of the United States of America to an inventor "to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States" for a limited time in exchange for public disclosure of the invention when the patent is granted.

Per Capita—An adjustment made to reflect the size of the population. For example, per capita income represents the level of income for every child, woman, and man in the base population.

Personal Income—Income received by persons from all sources. It includes income received from participation in production as well as from government and business transfer payments. It is the sum of compensation of employees (received), supplements to wages and salaries, proprietors' income with inventory valuation adjustment (IVA) and capital consumption adjustment (CCAdj), rental income of persons with CCAdj, personal income receipts on assets, and personal current transfer receipts, less contributions for government social insurance.

Poverty Rate—The percentage of people (or families) living below the poverty line ($12,488 for individuals; $25,094 for a family of four, 2017 thresholds).

Poverty—The Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but they are updated for inflation using Consumer Price Index (CPI-U). The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps)..

Property Crimes—In the FBI's Uniform Crime Reporting (UCR) Program, property crime includes the offenses of burglary, larceny-theft, motor vehicle theft, and arson. The object of the theft-type offenses is the taking of money or property, but there is no

force or threat of force against the victims.

Real dollars—Analogous to constant dollars, it reflects the nominal dollar that has been adjusted to remove, for example, the effect of inflation over a period of time.

Real Growth—Represents growth in real or constant dollars.

Recession—In general usage, the word recession connotes a marked slippage in economic activity. The National Bureau of Economic Research (NBER) is charged with officially marking the beginning and ending of a recession. The NBER recession is a monthly concept that takes account of a number of monthly indicators—such as employment, personal income, and industrial production—as well as quarterly GDP growth.

Return on Investment (ROI)—ROI measures the amount the return on an investment relative to the cost of the investment.

Rural—The 2013 Rural-Urban Continuum Codes form a classification scheme that distinguishes metropolitan counties by the population size of their metro area, and nonmetropolitan counties by degree of urbanization and adjacency to a metro area. The official Office of Management and Budget (OMB) metro and nonmetro categories have been subdivided into three metro and six nonmetro categories. Each county in the U.S. is assigned one of the 9 codes.

Social Capital—The networks of relationships among people who live and work in a particular society, enabling that society to function effectively.

South Central Kentucky—Counties in Kentucky located in the Area Development Districts (ADDs) to the south of the Bluegrass District (greater Fayette County), including Adair, Allen, Barren, Breckinridge, Butler, Casey, Clinton, Cumberland, Edmonson, Grayson, Green, Hardin, Hart, Larue, Logan, Marion, McCreary, Meade, Metcalfe, Monroe, Nelson, Pulaski, Russell, Simpson, Taylor, Warren, Washington, and Wayne Counties.

Structurally Deficient (SD) (Bridges)—A bridge that is characterized by deteriorated conditions of significant bridge elements and potentially reduced load-carrying capacity. See "2010 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance."

Urban (*syn* Metropolitan)—The 2013 Rural-Urban Continuum Codes form a classification scheme that distinguishes metropolitan counties by the population size of their metro area, and nonmetropolitan counties by degree of urbanization and adjacency to a metro area. The official Office of Management and Budget (OMB) metro and nonmetro categories have been subdivided into three metro and six nonmetro categories. Each county in the U.S. is assigned one of the 9 codes.

Urban Triangle—Counties in Kentucky located in the Area Development Districts (ADDs) encompassing Louisville, Lexington, and the Cincinnati area of Northern Kentucky, including Anderson, Boone, Bourbon, Boyle, Bullitt, Campbell, Carroll, Clark, Estill, Fayette, Franklin, Gallatin, Garrard, Grant, Harrison, Henry, Jefferson, Jessamine, Kenton, Lincoln, Madison, Mercer, Nicholas, Oldham, Owen, Pendleton, Powell, Scott, Shelby, Spencer, Trimble, and Woodford Counties.

Value Added—The gross output of an industry or a sector less its intermediate inputs;

the contribution of an industry or sector to gross domestic product (GDP). Value added by industry can also be measured as the sum of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus.

Venture Capital Investments—Capital invested in a project in which there is a substantial element of risk, typically a new or expanding business.

Violent Crimes—In the FBI's Uniform Crime Reporting (UCR) Program, violent crime is composed of four offenses: murder and nonnegligent manslaughter, rape, robbery, and aggravated assault. Violent crimes are defined in the UCR Program as those offenses which involve force or threat of force.

Western Kentucky—Counties in Kentucky located in the western most Area Development Districts (ADDs), including Ballard, Caldwell, Calloway, Carlisle, Christian, Crittenden, Daviess, Fulton, Graves, Hancock, Henderson, Hickman, Hopkins, Livingston, Lyon, Marshall, McCracken, McLean, Muhlenberg, Ohio, Todd, Trigg, Union, and Webster Counties.

Notes

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Center for Business and Economic Research
244 Gatton College of Business and Economics
University of Kentucky
Lexington, KY 40506-0034

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