1-2016

Kentucky's Educational Performance & Points of Leverage

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CENTER FOR BUSINESS AND ECONOMIC RESEARCH

ISSUE BRIEF

on topics affecting Kentucky's economy

January 2016
No. 19

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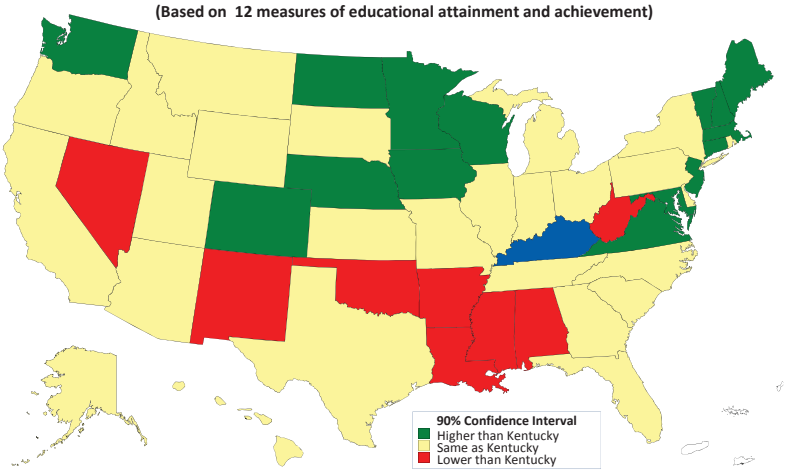
Twenty-five years ago Kentucky's educational reputation was at a low point. Among Kentuckians 25 and older in 1990, only 65 percent had a high school credential and around 14 percent had earned a bachelor's degree—ranking the state 49th (ahead of Mississippi) and 48th (above Arkansas and West Virginia), respectively, on these important measures of educational attainment.

Kentucky has made meaningful educational progress.

Kentucky's educational status has improved since then as a number of legislative and administrative efforts along with substantial investments of public resources have been directed toward improving Kentucky's educational system. How much has it improved? Based on 12 educational attainment and achievement factors combined into a single index, Kentucky is statistically higher than 8 states, lower than 15 states, and not statistically different from 26 states (see Figure 1).[1]

FIGURE 1
Kentucky's Educational Quality Compared to Other States
(Based on 12 measures of educational attainment and achievement)



Despite progress, there is much work remaining to improve education in Kentucky.

The indicators comprising the index measure 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. The percentages of Kentucky 4th and 8th graders scoring proficient or higher on the NAEP exams in 2015 is statistically higher than the national (public) average in just one case—4th grade reading. And Kentucky's 8th graders continue to struggle evidenced by the math scores being statistically significantly lower than the national public average for each of the seven NAEP assessments from 2003 to 2015. 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 AP exam mastery.

TABLE 1
Comparing Education Indicators for Kentucky, United States, and the Top 15 States, 2009-2015
(numbers are percentages)

Education Indicators	Kentucky	U.S.	Average for Top 15 States†
HS Diploma or Higher (2014)	88.3	88.3	91.6
Two-Year Degree (2014)	9.5	9.0	9.5
Bachelor's Degree or Higher (2014)	25.1	32.2	38.3
Adj. Cohort HS Grad Rate (2014)	87.5	81.4ǂ	85.9*
ACT % College/Career Ready (2015)	21.0	28.0	36.6
8th Grade Math NAEP (2015)	27.7	32.1	40.6*
8th Grade Reading NAEP (2015)	36.1	32.7	39.2*
8th Grade Science NAEP (2011)	34.0	31.8	39.0*
4th Grade Math NAEP (2015)	40.5	39.4	45.9*
4th Grade Reading NAEP (2015)	40.4	34.8	40.7*
4th Grade Science NAEP (2009)	44.7	33.7	41.2*
AP Exam Mastery (2014)	17.9	21.6	24.9

†The top 15 states are statistically significantly higher than Kentucky (using a 90% confidence interval): CO, CT, IA, MA, MD, ME, MN, ND, NE, NH, NJ, VA, VT, WA & WI.
ǂThe U.S. rate is for 2013.
*This is the average of the state averages—not a weighted average of these 15 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.

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The U.S. Chamber of Commerce released a report in 2014 assessing each state across a number of educational categories, including Return on Investment (ROI).[2] Using NAEP proficiency (and higher) as the metric, their assessment found that when considering per pupil expenditures—after adjusting for cost-of-living differences across the states—Kentucky's educational returns per dollar spent on education were close to the national average, garnering the state a grade of "C." However, their assessment did not account for the many obstacles to cost-effective educational spending faced by Kentucky students, such as higher poverty, lower parental education, a larger rural population, a higher obesity rate, and more missed school days (see Table 2 below).

TABLE 2
Selected Obstacles to Cost-Effective Educational Performance, Kentucky, the U.S. & the Top 15 States, 2011-13 (percentages)

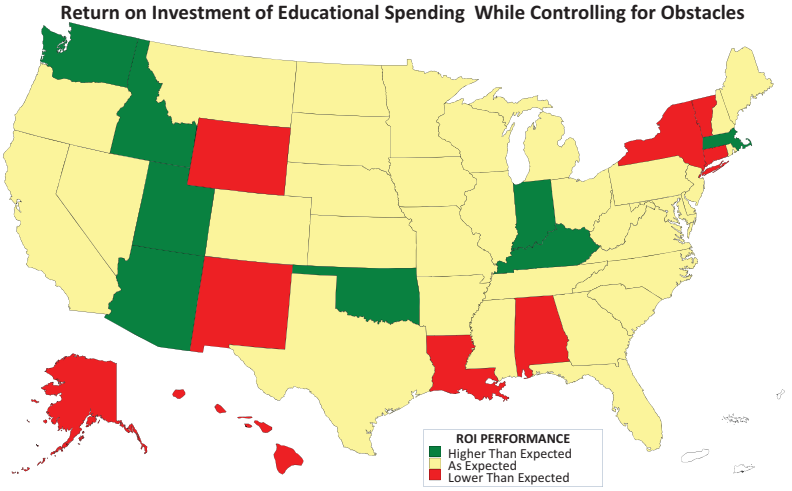
Obstacles	KY	U.S.	Top 15 States†*
Children who have at least one parent with a postsecondary degree	44.5	47.2	56.7
Children eligible for free and reduced priced lunch	54.6	50.3	38.9
Students who live in rural areas	41.1	20.2	25.4
Children and teens (10 to 17) who are overweight or obese	35.7	31.3	28.3
Students with disabilities as a percent of public school enrollment	14.2	12.9	14.2
Limited English proficiency students as a percent of total enrollment	2.7	9.2	5.5
Children (6 to 17) who missed 11 or more school days due to illness or injury	8.4	6.2	6.2
Children under 17 whose overall health is fair or poor	3.2	3.2	2.3

†The top 15 states based on the education index are: CO, CT, IA, MA, MD, ME, MN, ND, NE, NH, NJ, VA, VT, WA & WI.
*These percentages are the averages of the state averages—not a weighted average of the top 15 states.

Kentucky performs better than expected when controlling for obstacles to cost-effective educational spending.

Using more recent data and accounting for these obstacles, we find that Kentucky performs better than expected. Kentucky's 2015 NAEP results show that, on average, an estimated 36 percent of 4th and 8th graders scored proficient or higher on the four math and reading exams. With *adjusted* per pupil expenditures of $10,456, Kentucky gets an estimated 3.46 NAEP proficiency percentage points for every $1,000 in per pupil spending—which is consistent with the Chamber's findings. However, using multiple regression analysis to control for the obstacles to cost-effective educational spending listed in Table 2, we find that Kentucky and 7 other states perform better than anticipated (see Figure 2).[3] These states achieve higher levels of NAEP proficiency per dollar spent on education (i.e., Educational ROI) than one would expect given the considerable obstacles facing many students. Meanwhile, 9 states perform lower than expected and 33 perform as expected (see Table A.2).

FIGURE 2
Return on Investment of Educational Spending While Controlling for Obstacles



Obstacles offer points of leverage to improve educational outcomes.

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. Moderating the harmful effects of poverty on learning, as well as cultivating better health habits among children, will help reduce these obstacles and facilitate even higher returns from future educational spending. In short, addressing the academic achievement gaps would enable Kentucky students to perform at dramatically higher levels.

Notes

[1]We use the standard errors for the nine sample-based estimates to calculate 90 percent confidence intervals. The remaining three educational indicators are population-based numbers. The 12 measures are categorized into attainment measures (high school attainment and graduation rate, two-year degree, and bachelor's or higher) and achievement measures (the NAEP measures, ACT college and career ready, and AP mastery). Each category is weighted 50% toward the total index average. Within the achievement measures, all 8 variables are weighted equally (6.3% each toward the total index value). But within the attainment measures, bachelor's and two-year degree attainment are each afforded one-third of the weight (16.7% each toward the total Index value) while high school attainment and the graduation rate share the remaining one-third of the category, or remaining 16.7%.
[2]*Leaders & Laggards: A State-by-State Report Card on Educational Effectiveness*, U.S. Chamber of Commerce Foundation, 2014.
[3]We define under- and over-performers as states whose studentized residuals are outside the range of +1 to -1.

TABLE A.1: Average of the Twelve Educational Indicators for each State					
Order	State	L90%	Mean	U90%	Cross-state significant difference from Kentucky
1	MA	45.0	46.6	48.3	Higher
2	NH	42.9	44.4	45.9	Higher
3	MN	41.7	43.3	44.9	Higher
4	CT	41.2	42.8	44.4	Higher
5	VT	41.1	42.7	44.3	Higher
6	NJ	41.0	42.7	44.3	Higher
7	VA	40.7	42.5	44.3	Higher
8	WI	39.6	41.2	42.8	Higher
9	MD	38.7	40.3	41.9	Higher
10	IA	38.7	40.2	41.8	Higher
11	ND	38.8	40.2	41.6	Higher
12	WA	38.5	40.1	41.7	Higher
13	CO	38.3	40.1	41.9	Higher
14	ME	38.7	40.1	41.5	Higher
15	PA	38.0	39.8	41.7	Same
16	NE	38.3	39.8	41.3	Higher
17	UT	38.2	39.7	41.2	Same
18	SD	37.4	38.9	40.3	Same
19	IN	37.1	38.6	40.2	Same
20	MT	37.1	38.5	40.0	Same
21	OH	36.9	38.5	40.2	Same
22	NY	36.8	38.3	39.8	Same
23	KS	36.2	37.8	39.5	Same
24	RI	36.4	37.7	39.1	Same
25	IL	36.2	37.7	39.2	Same
26	DE	36.4	37.6	38.9	Same
27	MO	35.9	37.5	39.0	Same
28	WY	35.8	37.3	38.8	Same
29	KY	35.1	36.7	38.2	
30	ID	35.0	36.5	37.9	Same
31	OR	34.5	36.1	37.8	Same
32	NC	34.5	36.1	37.6	Same
33	MI	34.2	35.7	37.3	Same
34	FL	34.2	35.7	37.2	Same
35	TX	33.7	35.4	37.2	Same
36	TN	33.1	34.9	36.6	Same
37	AK	33.2	34.8	36.4	Same
38	SC	32.8	34.4	36.0	Same
39	HI	33.0	34.3	35.6	Same
40	GA	32.6	34.1	35.7	Same
41	CA	32.5	34.1	35.7	Same
42	AZ	31.9	33.5	35.2	Same
43	OK	31.1	32.7	34.4	Lower
44	AR	30.4	31.9	33.5	Lower
45	WV	30.1	31.5	33.0	Lower
46	AL	29.7	31.1	32.6	Lower
47	NV	29.7	31.1	32.4	Lower
48	LA	27.3	28.9	30.5	Lower
49	NM	27.6	28.9	30.2	Lower
50	MS	27.2	28.5	29.8	Lower

Note: Kentucky's 36.7 percent reflects the average value of the twelve educational indicators after the weights are applied to each indicator (as outlined in footnote 1). The L90% and U90% show the estimated upper and lower 90 percent confidence interval.

TABLE A.2: Return on Investment (ROI) of Educational Spending While Controlling for Obstacles to Cost-Effective Education Spending

Order	State	NAEP Proficiency Points per $1,000	"Expected" NAEP Proficiency Points per $1,000	Residual	Studentized Residual
1	AZ	4.49	3.04	1.45	2.64
2	UT	5.92	4.69	1.24	2.62
3	IN	3.95	2.62	1.33	2.12
4	ID	4.97	4.10	0.87	1.39
5	MA	3.70	2.95	0.75	1.26
6	OK	3.56	2.85	0.71	1.11
7	**KY**	**3.46**	**2.79**	**0.67**	**1.05**
8	WA	4.38	3.70	0.67	1.03
9	OH	3.07	2.56	0.51	0.82
10	NV	3.37	2.93	0.44	0.79
11	NH	3.64	3.15	0.49	0.78
12	TN	3.74	3.25	0.49	0.77
13	NC	3.98	3.52	0.46	0.73
14	TX	3.93	3.50	0.43	0.69
15	VA	3.85	3.45	0.40	0.61
16	MO	3.31	2.97	0.34	0.54
17	ND	2.95	2.75	0.20	0.35
18	SC	2.92	2.70	0.22	0.34
19	ME	2.97	2.78	0.19	0.30
20	SD	3.68	3.49	0.19	0.30
21	WI	3.40	3.24	0.16	0.24
22	CO	4.62	4.49	0.13	0.21
23	FL	4.01	3.89	0.12	0.19
24	MN	3.96	3.86	0.10	0.16
25	PA	2.87	2.82	0.05	0.08
26	OR	3.63	3.66	-0.03	-0.05
27	KS	3.34	3.40	-0.06	-0.09
28	MT	3.42	3.51	-0.09	-0.14
29	GA	3.20	3.34	-0.14	-0.22
30	MS	2.60	2.73	-0.13	-0.22
31	IA	3.39	3.54	-0.15	-0.23
32	NE	3.15	3.39	-0.24	-0.36
33	WV	2.19	2.40	-0.21	-0.37
34	IL	2.87	3.15	-0.29	-0.43
35	CA	3.43	3.73	-0.30	-0.47
36	NJ	2.87	3.21	-0.34	-0.54
37	MD	2.98	3.39	-0.41	-0.63
38	DE	2.47	2.90	-0.43	-0.64
39	MI	2.64	3.16	-0.52	-0.77
40	RI	2.45	2.96	-0.51	-0.79
41	AR	2.68	3.19	-0.51	-0.88
42	LA	2.16	2.74	-0.58	-1.04
43	VT	2.66	3.31	-0.65	-1.09
44	AL	2.44	3.32	-0.88	-1.38
45	CT	2.67	3.57	-0.90	-1.42
46	NY	1.95	2.87	-0.91	-1.45
47	NM	2.38	3.26	-0.87	-1.46
48	WY	2.45	3.49	-1.03	-1.67
49	HI	3.02	4.15	-1.12	-1.79
50	AK	1.87	3.15	-1.28	-2.20

Note: The order reflects the descending size of the studentized residual (SR). The studentized residual is the residual divided by its standard error. There are 8 states (listed in green) that perform better than expected (SR>=1), 33 (yellow) that perform as expected (-1<SR<1), and 9 (red) that perform below expectations (SR<=-1).