

# Virginia Manufacturing Competitiveness Index

## November 2018

### Introduction to the Index

As states work to stay competitive in manufacturing the data that measures their progress can be overwhelming. The Virginia Manufacturers Association (VMA) has worked to develop a multifactor Manufacturing Competitiveness Index that allows members and policy-makers to assess complex data and inform strategic choices.

In 2017, the Virginia Manufacturers Association Board reviewed the metrics used in the Manufacturing Competitiveness Index report, which was part of *A New Blueprint – Making the American South's Manufacturing Sector More Competitive by 2030*, a report for the Economic Development Administration. In addition, the VMA held several **manufacturing town halls across Virginia to select and prioritize the individual metrics and rankings**. The original report divided the metrics into five categories: **Business Climate, Workforce, Infrastructure, Innovation and Economic Strength**. For the 2017 report, the categories of metrics were weighted to calculate the final state rankings.

This year's report uses the same metrics as the 2017 report. The data was updated to the most recent available. Six metrics remained unchanged from 2017, because new data was not currently available. Each is noted below on the individual categories. The only significant change from the 2017 report

is that this year's indexes are not weighted in the final overall state rankings. At the direction of the Virginia Manufacturers Association, the index weighting was removed, and all the indexes carry equal weight. A revised unweighted 2017 overall state ranking is included with this report for comparison. In the weighted indexes Virginia's overall state rank was fifth. When the 2017 rankings were revised to be unweighted, Virginia's position changed to 11th most competitive. **In the 2018 unweighted rankings, Virginia improved to ninth.**

Data was gathered from public sources including the Bureau of Economic Analysis, National Science Foundation, Bureau of Labor Statistics, Energy Information Administration, and the US Census Bureau. Indicators were standardized to account for differences in states' population or economy size. The most recent available data was used, meaning most data is from the years 2016 or 2017. To evaluate time trends, a five-year percent change was used. All data, and these tools, are part of a broader competitive picture and should be used in conjunction with other information to further public policy discussion to improve Virginia's economy.

**The five categories' metrics are color coded green, yellow and red. Red demarcates a year-over-year decline in ranking, yellow is no change, and green is an improvement. A "T" next to any ranking indicates a "Tie" with another state.**

# Virginia Manufacturing Competitiveness Index Results

## Business Climate Index

Manufacturing is sensitive to labor costs and other costs of doing business. These factors are often cited as critical reasons when manufacturing companies consider expansion or relocation. The Business Climate Index focuses on wages, taxes, and legal barriers. These metrics are often related to state government policy choices and are opportunities for states to make changes that will improve manufacturing competitiveness. The Business Climate Index consists of nine metrics.

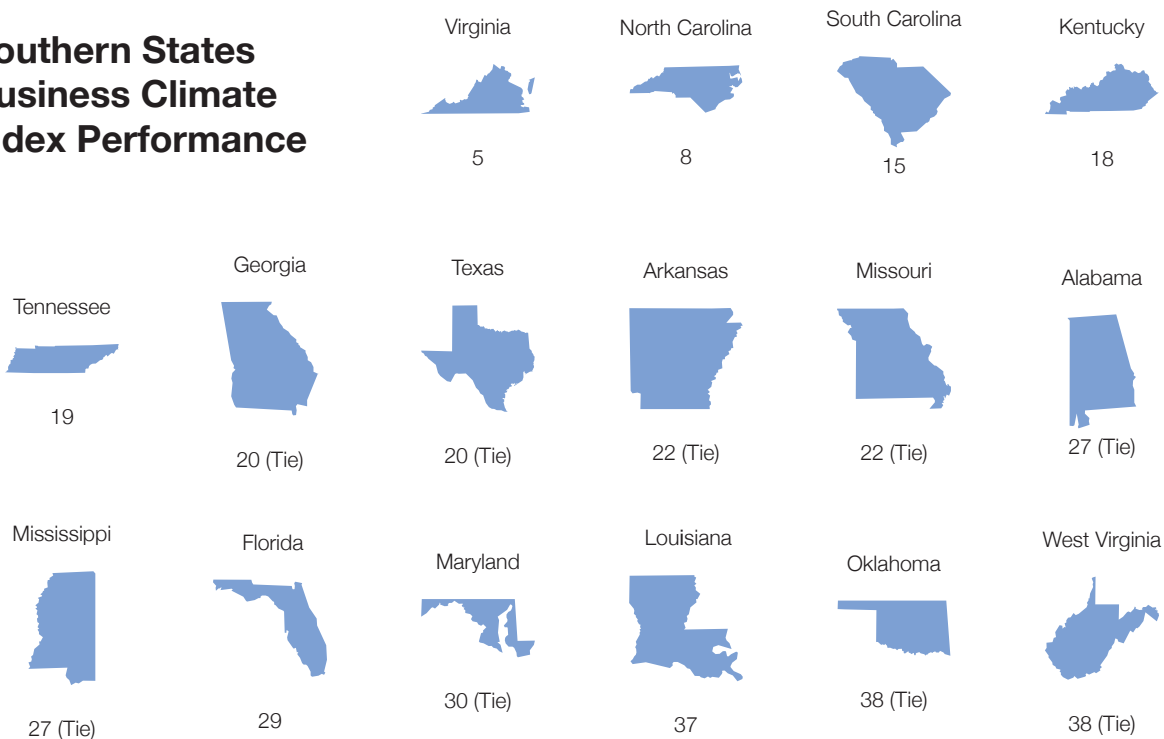
## Business Climate Index Performance

In the 2017 index Virginia ranked as the 4th most competitive state (tied with Nebraska). As can be seen in the new data below, Virginia is now ranked 5th, still ranking at the top of all Southern states. In the individual metrics, Virginia has remained stable, with the rankings staying the same or shifting by one position, except for Top Marginal Corporate Tax Rate which moved from 7th position nationally to 16th, as other states have aggressively reduced their corporate tax rate.

## Business Climate Index Metrics

- Manufacturing Industry Health Scorecard (Conexus Indiana) 2018
- Top marginal corporate tax rate 2018
- Legal Climate Rankings 2017
- Air Quality - Average Exposure to PM2.5 2016
- Workers Comp insurance premium per \$100/payroll 2016 (this metric was not updated as the source report is done every two years)
- State and Local Tax Costs for Capital-Intensive Manufacturing 2014 (this metric was not updated as the source report is done every two years)
- State and Local Tax Costs for Labor-Intensive Manufacturing 2014 (this metric was not updated as the source report is done every two years)
- Value of \$100 2018
- Greenhouse Gas Emissions Per Capita (Metric Tons of CO2) 2015

## Southern States Business Climate Index Performance



Business Climate	Manufacturing Industry Health Scorecard (Conexus Indiana) 2018	Top Marginal Corporate Tax Rate 2018	Legal Climate Rankings (2017)	Air Quality - PM 2.5 (2016)	Workers Comp Insurance Premium per \$100/ payroll (2016)	State & Local Tax Costs for Capital-Intensive Manufacturing (2014)	State & Local Tax Costs for Labor - Intensive Manufacturing (2014)	Value of \$100 (2018)	Greenhouse Gas Emissions Per Capita (Metric Tons of CO2) 2014	Average Ranking	State Rank
South Dakota	19	1	1	3	19	4	7	6	26	9.6	1
Ohio	8	1	26	45	11	8	13	8	31	16.8	2
Wyoming	37	1	8	1	28	3	2	26	50	17.3	3
Michigan	1	16	22	36	17	15	9	22	25	18.1	4
Virginia	39	16	10	20	5	19	1	39	15	18.2	5
Arizona	19	10	25	46	13	10	7	25	19	19.3	6
Idaho	8	32	3	6	23	36	36	21	10	19.4	7
North Carolina	16	7	33	25	29	17	19	17	13	19.6	8
Nebraska	32	34	7	15	19	10	5	15	42	19.9	9
Iowa	1	50	13	25	27	1	16	10	39	20.2	10
North Dakota	44	8	17	2	1	18	25	18	49	20.2	11
Minnesota	14	48	4	20	29	2	17	30	24	20.9	12
Oregon	8	33	21	13	7	35	33	36	3	21.0	13
Utah	19	11	12	30	6	26	26	28	34	21.3	14
S. Carolina	1	11	34	25	33	42	20	12	22	22.2	15
Kansas	6	30	18	18	10	29	40	15	35	22.3	16
Nevada	46	1	37	43	9	13	14	29	14	22.9	17
Kentucky	1	16	42	38	15	24	22	5	44	23.0	18
Tennessee	8	24	30	32	21	38	30	11	23	23.0	19
Georgia	37	16	40	41	24	9	3	19	20	23.2	20
Texas	19	1	39	39	11	23	14	27	36	23.2	21
Arkansas	16	24	36	16	3	44	39	3	32	23.7	22
Missouri	19	21	49	33	31	12	6	9	33	23.7	23
Washington	19	1	28	25	36	22	33	42	9	23.9	24
Massachusetts	19	36	14	10	8	36	45	44	4	24.0	25
New Hampshire	14	38	5	6	34	33	38	43	11	24.7	26
Alabama	8	24	43	39	26	19	23	2	40	24.9	27
Mississippi	6	11	44	20	22	49	35	1	36	24.9	28
Florida	39	14	46	13	18	29	21	35	11	25.1	29
Colorado	19	9	35	12	16	41	32	40	27	25.7	30
Maryland	39	39	19	41	13	24	4	46	6	25.7	31
Connecticut	19	39	16	35	46	14	12	45	7	25.9	32
Vermont	19	41	2	3	37	47	41	38	5	25.9	33
Indiana	1	21	15	46	2	50	45	12	43	26.1	34
New York	46	24	29	16	48	6	17	49	1	26.2	35
New Mexico	46	15	32	5	31	27	30	23	38	27.4	36
Louisiana	19	36	50	25	41	15	9	14	46	28.3	37
Oklahoma	32	16	31	30	43	29	29	7	41	28.7	38
West Virginia	19	24	45	24	4	43	47	4	48	28.7	39
Wisconsin	8	35	20	19	39	46	42	20	29	28.7	40
Pennsylvania	32	49	38	48	24	4	11	31	30	29.7	41
Maine	32	44	9	11	37	48	44	31	17	30.3	42
Delaware	46	42	11	43	45	19	26	37	21	31.4	43
Hawaii	46	23	23	6	34	34	49	50	18	31.4	44
Montana	44	29	27	9	40	39	28	24	45	31.7	45
Rhode Island	39	30	24	20	42	39	50	34	8	31.8	46
New Jersey	32	45	41	34	49	7	23	47	16	32.7	47
Alaska	46	46	6	36	46	32	36	41	47	37.3	48
California	19	43	47	50	50	44	43	48	2	38.4	49
Illinois	16	47	48	49	43	38	48	33	28	38.9	50

### Workforce Index

The availability of a skilled labor force is consistently ranked in the top five factors impacting site selection by *Area Development* magazine. In 2018, it was again ranked #3, behind only access to highways and labor costs. Today, manufacturing business leaders often express concern about difficulties finding skilled employees such as **manufacturing technicians**, CNC machinists and other middle-skilled credentialed workers. As manufacturing becomes more advanced and computer-based, the importance of STEM education rises for the manufacturing workforce. The Workforce Index measures education, health of the population, creative class population, and manufacturing productivity. The Workforce Index consisted of the following fifteen metrics:

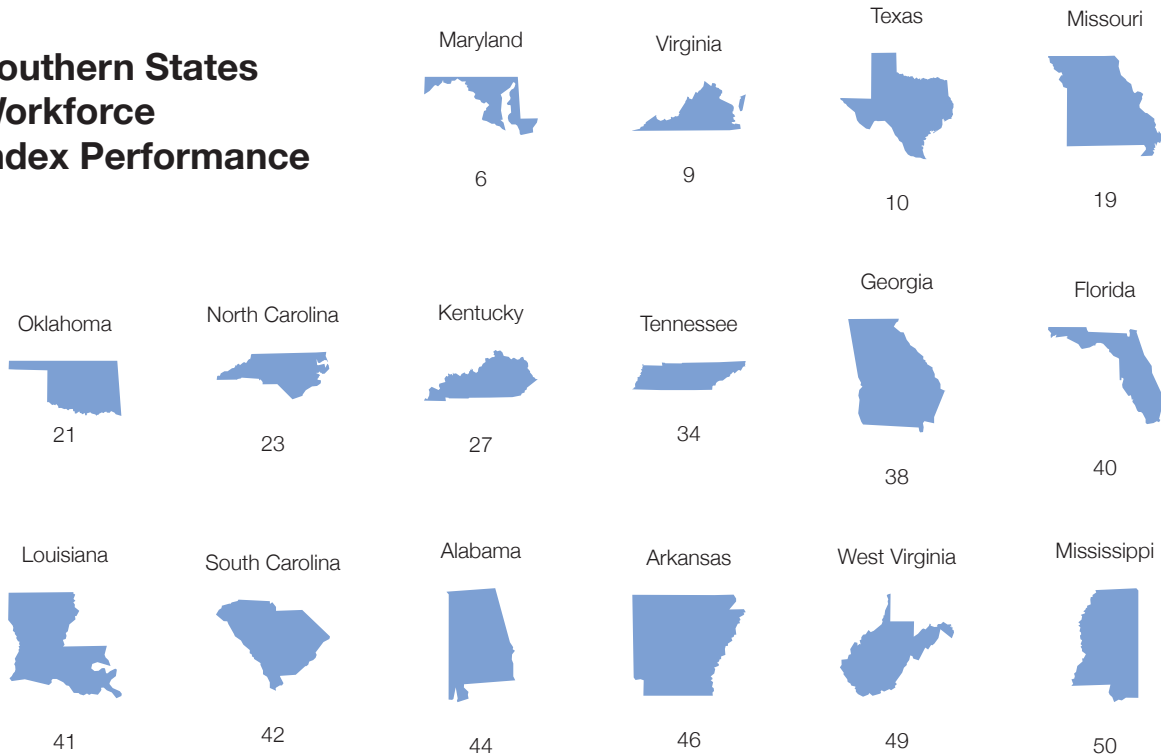
### Workforce Index Metrics

- Percentage of Population with Adult Obesity 2016
- Persons age 18 to 24 not attending school, not working, and no degree beyond high school 2016
- High School Graduation Rate for all students 2015-16
- Labor Force Participation Rate 2017
- Manufacturing Output Per Manufacturing Employee 2017
- Change in Manufacturing Output Per Manufacturing Employee 2010-2017
- Age 25-44 Population Growth 2012-2017
- Completed Tech & STEM Education Programs Per 1,000 Enrolled Students 2016
- Percent Change in Tech & STEM Education Program Completions 2010-2016
- Average 8th Grade Reading Score 2017
- Average 8th Grade Math Score 2017
- Veteran Unemployment Rate 2016
- Veteran % share of total population 2016
- Total number of sub-baccalaureate occupational credentials in manufacturing 2013 (*this metric was not updated as the source report is done every two years*)
- Sub-baccalaureate occupational credentials in manufacturing as % of total credentials 2013 (*this metric was not updated as the source report is done every two years*)

### Workforce Index Performance

Virginia's workforce competitiveness continues to be very good and Virginia remained 9th ranked. In the individual metrics, Virginia improved in the categories of Average 8th Grade Reading Score (from 21st in 2017 to 17th in 2018) and Average 8th Grade Math Score (from 7th in 2017 to 5th in 2018), while in the category of Percent Change in Tech and STEM Education Completions, the state fell from 25th in 2017 to 36th in 2018, and in Ages 25-44 Population Growth Virginia moved from 21st to 32nd.

## Southern States Workforce Index Performance



Workforce	Percentage of Population With Adult Obesity (2016)	Persons Age 18 to 24 not Attending School, not Working and no Degree Beyond High School (2016)	High School Graduation Rate for all Students	Labor Force Participation Rate	Manufacturing Output Per Manufacturing Employee (2010-2017)	Change in Manufacturing Output Per Manufacturing Employee (2010-2017)	Age 25-44 Population Growth (2012-2017)	Completed Tech & STEM Education Programs per 1,000 Enrolled Students (2016)	Percent Change in Tech & STEM Education Program Completions (2010-2016)	Average 8th Grade Reading Score (2017)	Average 8th Grade Math Score (2017)	Veteran Unemployment Rate (2016)	Veteran % share of total population (2016)	Sub-baccalaureate occupational credentials in manufacturing as % of total credentials (2013)	Total # of sub-baccalaureate occupational credentials in manufacturing (2013)	Average Ranking	State Rank
Wyoming	16	18	39	15	8	13	20	31	15	11	6	4	4	30	1	15.4	1
Montana	6	18	24	26	33	3	8	15	31	20	15	34	2	46	17	19.9	2
Colorado	1	11	45	8	15	25	2	9	12	8	15	22	20	14	12	14.6	3
Washington	19	27	40	22	9	37	3	1	10	6	6	28	6	8	5	15.1	4
N. Dakota	36	2	14	1	32	6	1	11	35	30	8	1	28	43	13	17.4	5
Maryland	24	18	12	10	5	7	29	2	16	20	30	13	31	33	32	18.8	6
Massachusetts	2	2	13	15	6	14	23	6	13	1	1	42	46	35	42	17.4	7
Minnesota	17	2	35	2	23	9	26	41	27	11	2	10	38	17	27	19.1	8
Virginia	21	11	20	17	12	43	32	23	36	17	5	9	3	22	36	20.5	9
Texas	43	36	5	24	3	17	4	24	14	41	24	18	41	2	30	21.7	10
Utah	5	11	27	3	37	48	4	25	3	11	14	14	46	32	26	20.4	11
N. Hampshire	10	2	9	9	34	5	43	48	1	2	3	11	14	48	47	19.1	12
Nebraska	37	7	4	5	39	39	21	46	33	11	8	4	24	36	6	21.3	13
Iowa	37	1	1	7	25	29	24	35	43	17	15	7	31	28	31	22.1	14
Pennsylvania	26	18	21	31	24	18	34	4	38	8	15	29	35	7	9	21.1	15
S. Dakota	23	11	28	4	49	21	17	16	46	20	15	2	14	42	17	21.7	16
Wisconsin	27	7	9	6	42	33	46	27	43	11	8	25	35	20	34	24.9	17
Connecticut	9	7	15	13	14	45	49	18	8	4	21	47	44	19	4	21.1	18
Missouri	34	17	6	23	31	34	29	17	10	26	30	20	20	21	25	22.9	19
Indiana	40	18	19	20	11	47	35	8	41	6	8	25	37	23	36	24.9	20
Oklahoma	42	42	36	38	41	19	14	5	25	39	42	11	11	16	7	25.9	21
Kansas	29	11	23	12	21	8	38	42	40	20	20	16	27	26	21	23.6	22
N. Carolina	35	33	22	36	7	44	26	14	22	34	24	40	24	11	19	26.1	23
Illinois	33	18	25	18	13	23	48	22	20	20	24	43	45	3	15	24.7	24
New Jersey	13	11	2	29	10	36	45	12	33	2	4	45	49	29	45	24.3	25
Hawaii	3	18	32	31	43	1	14	50	28	39	38	8	7	47	36	26.3	26
Kentucky	44	40	7	49	30	39	42	19	28	30	36	22	31	10	3	28.3	27
Ohio	32	27	29	30	26	23	35	10	36	17	8	32	30	12	40	25.8	28
Rhode Island	10	2	31	19	47	15	24	33	49	26	38	36	43	38	11	28.1	29
Maine	24	11	17	25	48	37	44	44	9	11	21	15	4	39	20	24.6	30
Arizona	21	36	43	40	16	12	12	32	46	34	24	33	14	9	24	26.4	31
Vermont	12	10	11	11	50	42	47	34	43	4	8	3	34	50	48	27.1	32
California	4	27	30	33	4	4	14	47	25	34	38	47	48	1	35	26.1	33
Tennessee	45	36	8	40	22	20	21	45	48	38	34	29	24	15	10	29.0	34
Alaska	30	48	47	13	45	2	11	37	19	46	38	18	1	45	29	28.6	35
Oregon	20	27	48	26	2	50	7	39	16	26	24	50	17	37	39	28.5	36
Idaho	13	33	40	21	40	25	10	49	22	8	21	29	11	40	33	26.3	37
Georgia	30	36	44	26	29	31	26	20	22	26	30	36	26	5	6	26.5	38
Delaware	27	40	25	33	17	46	18	26	6	34	36	6	18	49	50	28.7	39
Florida	13	27	37	42	35	10	4	29	16	20	34	40	20	4	41	24.8	40
Louisiana	46	48	46	44	1	49	19	3	7	48	50	22	42	6	2	28.9	41
S. Carolina	39	33	33	45	27	27	19	40	28	41	42	34	7	25	23	30.5	42
New York	6	18	38	39	18	41	33	21	21	33	24	39	50	19	46	29.3	43
Alabama	47	42	16	48	38	22	40	13	50	46	49	25	20	27	22	33.7	44
Nevada	8	42	49	33	36	30	9	30	2	41	42	47	9	44	49	31.4	45
Arkansas	47	46	17	46	46	10	29	43	38	41	45	21	18	24	14	32.3	46

Michigan	40	27	40	36	19	35	37	7	42	30	33	46	40	18	42	32.8	47
New Mexico	18	47	50	47	28	32	38	38	31	49	48	16	9	34	27	34.1	48
West Virginia	50	48	3	50	20	16	49	28	5	45	46	43	11	41	44	33.3	49
Mississippi	49	42	34	49	44	28	41	36	4	49	47	38	38	31	15	36.3	50

### Infrastructure Index

Highway accessibility was ranked as the number one factor for site selection by *Area Development* in 2018 and is always among the top 10 factors. Over 85 percent of managers considered highway accessibility as very important or important when deciding on a new facility, expansion, or relocation. Infrastructure is still tremendously significant for manufacturing firms because of the need to move raw materials in and products out to major markets. The growing trend of large industrial parks (with large distribution centers) and consumer demand for on-time, quick delivery also drives the call for improved infrastructure. The American Society of Civil Engineers currently gives the nation a grade of D+ when it comes to infrastructure, estimating a needed investment of \$3.6 trillion by 2020. These findings show that for economic development, infrastructure is a quantity as well as a quality issue. Improving aging infrastructure not only supports current industry but is also seen as an investment to spur future growth. Broadband was added and is now often a key infrastructure measure. The Infrastructure Index consists of nine metrics.

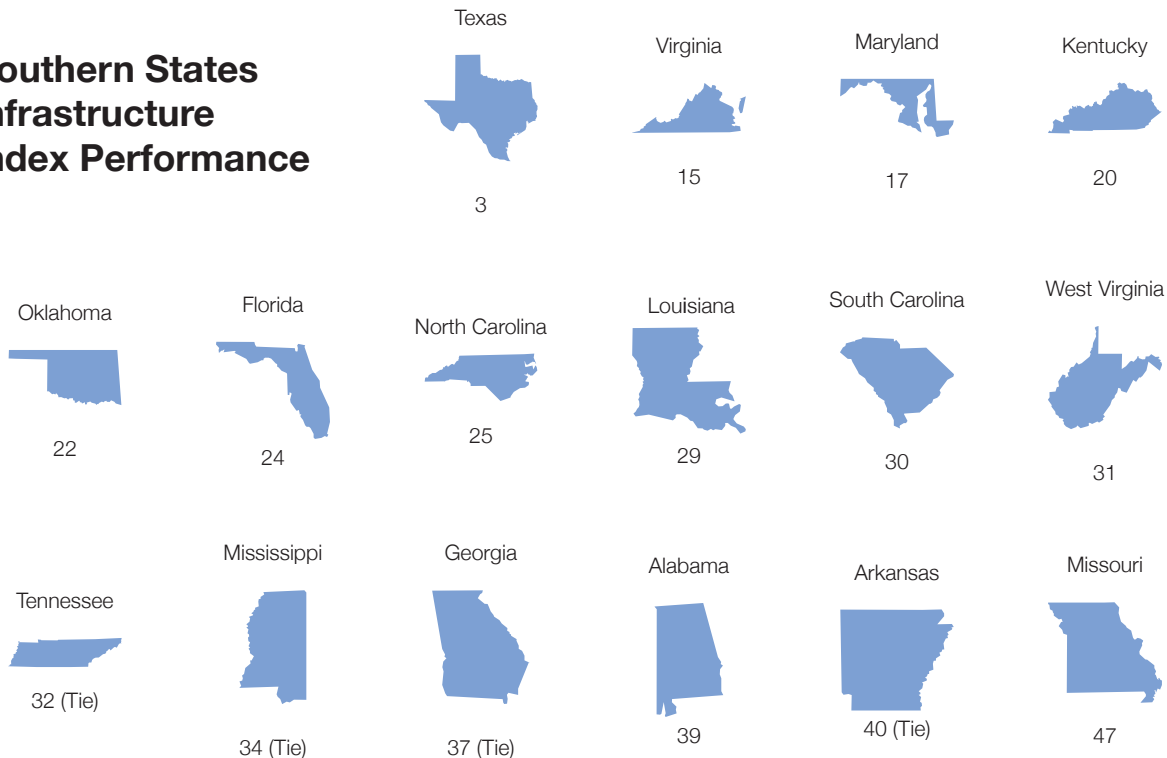
### Infrastructure Index Metrics

- Total State Spending on Highways Per Capita FY 2017
- Average Retail Electricity Price for Industrial Customers, Cents Per kWh May 2018
- Percent of structurally deficient bridges 2017
- Percentage growth in Freight Shipments tons (thousands) 2007-2013
- Percentage growth in Freight Shipments \$\$ (millions) 2007-2013
- Miles of Interstate highways per 10,000 population 2016
- Average Retail Natural Gas Price for Industrial Customers, \$ per thousand cubic feet May 2018
- State Transportation Expenditures as Percent of Total Expenditures FY 2017
- Percentage of Population Without 25 Mbps/3 Mbps Broadband Access - All Areas Dec. 2016

### Infrastructure Index Performance

Infrastructure is another critical area for manufacturers, and Virginia, while dropping in ranking from 11th in 2017 to 15th in 2018, continues to be the second highest ranked Southern state after Texas. In the individual metrics, Virginia improved in the category of Percent Growth in Freight Shipment Weight from 43rd in 2017 to 39th in 2018, while the Percent Growth in Freight Shipment Value ranking dropped from 22nd in 2017 to 28th in 2018. Virginia also improved in the category Deficient Bridges (from 19th in 2017 to 16th in 2018) and State Spending on Transportation per Capita (from 12th in 2017 to 10th in 2018).

## Southern States Infrastructure Index Performance



Infrastructure	Total State Spending on Transportation per Capita (FY2017)	Average Retail Electricity Price for Industrial Customers, Cents per kWh (FY2018)	Percent of Structurally Deficient Bridges (2017)	% Growth in Freight Shipments tons (thousands) (2007-2013)	% Growth in Freight Shipments \$\$ (Millions) (2007-2013)	Miles of Interstate Highway per 10,000 people (2016)	Average Retail Natural Gas Price for Industrial Customers, \$ per thousand cubic feet (May 2018)	State Transportation Expenditures as % of total Expenditures (FY2017)	Percentage of Population Without 25 Mbps/3Mbps Broadband Access - All Areas (2016)	Average Ranking	State Rank
North Dakota	2	40	42	1	1	5	1	4	22	13.1	1
Nevada	33	6	1	5	16	20	28	16	10	15.0	2
Texas	35	8	1	12	9	38	2	16	19	15.6	3
Utah	28	17	5	32	12	9	23	13	9	16.4	4
Idaho	15	26	27	16	10	8	16	5	32	17.2	5
Minnesota	8	38	11	13	19	31	6	11	20	17.4	6
South Dakota	12	35	47	2	4	4	18	2	33	17.4	7
Vermont	6	43	10	9	39	6	12	13	37	19.4	8
Oregon	22	16	12	3	11	24	21	44	24	19.7	9
Iowa	20	12	49	8	16	14	15	27	27	20.9	10
Kansas	32	37	25	9	7	11	13	25	30	21.0	11
Washington	36	1	9	19	6	40	41	36	3	21.2	12
Montana	16	2	31	41	12	3	27	15	48	21.7	13
New Mexico	37	9	20	29	3	7	4	49	44	22.4	14
Virginia	10	24	16	39	28	35	22	6	25	22.8	15
Nebraska	28	32	45	6	15	14	10	27	31	23.1	16
Maryland	7	39	13	23	30	44	44	7	7	23.8	17
Connecticut	3	44	23	13	45	41	40	9	1	24.3	18
Illinois	26	19	26	20	43	28	24	18	15	24.3	19
Kentucky	21	9	23	47	14	23	11	34	38	24.4	20
Arizona	31	25	4	6	27	29	36	27	39	24.9	21
Oklahoma	39	3	42	4	5	17	33	37	49	25.4	22
Pennsylvania	13	21	46	27	21	33	45	12	13	25.7	23
Florida	25	34	3	27	48	45	38	3	11	26.0	24
North Carolina	24	13	34	34	36	37	31	8	18	26.1	25
New Jersey	9	42	29	32	31	48	34	10	2	26.3	26
Wyoming	30	26	32	48	2	1	7	46	46	26.4	27
Maine	18	41	41	17	23	12	39	19	29	26.6	28
Louisiana	47	4	44	23	8	21	5	49	40	26.8	29
S. Carolina	34	14	32	31	37	27	14	22	33	27.1	30
West Virginia	14	22	49	50	25	10	2	33	43	27.4	31
Colorado	43	30	13	39	20	26	25	41	13	27.8	32
Tennessee	50	11	7	35	37	25	20	42	23	27.8	33
Indiana	45	28	21	11	21	22	35	35	35	28.1	34
Mississippi	19	15	39	38	29	12	19	31	50	28.1	35
Delaware	4	29	6	46	44	49	48	23	8	28.6	36
Alaska	1	49	35	49	50	2	26	1	45	28.7	37
Georgia	44	7	7	42	46	39	17	31	25	28.7	38
Alabama	48	18	21	30	33	19	8	42	42	29.0	39
Arkansas	41	5	16	25	32	16	36	48	47	29.6	40
Michigan	38	31	35	15	24	36	32	27	28	29.6	41
Wisconsin	27	36	27	22	40	32	9	40	36	29.9	42
New York	23	20	35	25	41	42	43	37	5	30.1	43
California	42	45	19	18	18	47	29	45	15	30.9	44
Massachusetts	10	47	30	36	42	43	46	24	6	31.6	45
Hawaii	5	50	15	45	49	50	50	20	12	32.9	46
Missouri	46	33	40	43	26	18	30	25	41	33.6	47
New Hampshire	40	46	38	20	46	29	47	21	17	33.8	48
Ohio	49	23	18	36	35	34	42	47	21	33.9	49
Rhode Island	17	48	50	44	33	46	49	39	4	36.7	50



### Innovation Index

The Innovation Index measures states' performance in university technology transfer, patent development, research & development funding, and venture capital funding. Innovation and research help generate new manufacturing companies and products. Innovation is a tool that grows manufacturing from within a region, as businesses are more likely to start and remain close to their original research connection. An area known for innovation and a talented technological workforce is more likely to attract businesses looking to relocate. It is also more likely to draw top talent in the creative class. The Innovation Index consisted of the following seven metrics.

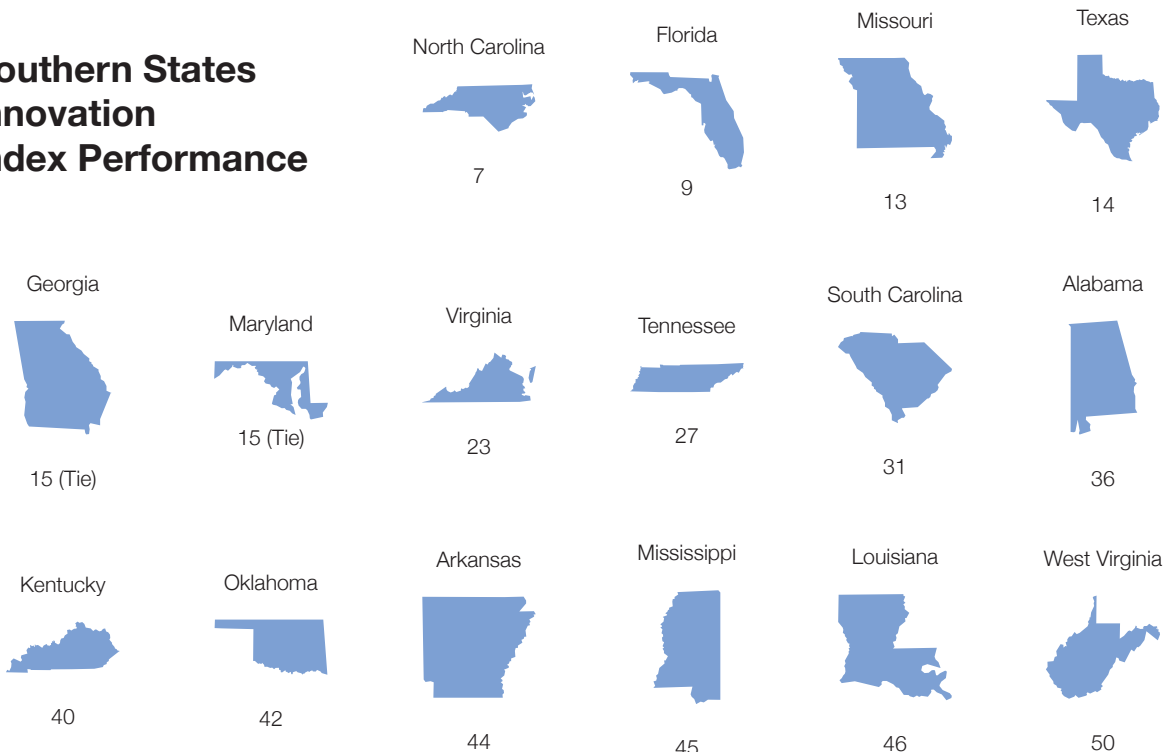
### Innovation Index Performance

Virginia improved in the Innovation Index from 24th in 2017 to 23rd in 2018, remaining in the middle of the Southern states. In the individual metrics, Virginia has remained stable, with the rankings staying the same or shifting by one position, except for Technology Licenses and Options which improved from 24th in 2017 to 20th in 2018, and Technology Industry Employment Growth which improved from 38th in 2017 to 36th in 2018. In the future, a state economic development focus on attracting and growing technology companies and manufacturing firms could provide improvements in this index.

### Innovation Index Metrics

- Technology Licenses and Options Executed from Universities 2016
- Patents Issued 2010-2017
- Total Technology Industry Employment Growth 2012-2017
- Total R&D Percent of GDP 2015
- Business Performed R&D - Percent of Private Industry Output 2015
- Venture Capital Funding Per \$1 Million of GDP 2016
- Start-Up Firms per 1,000 Firms 2016 (*this metric was not updated as new data is not available*)

## Southern States Innovation Index Performance



Innovation	Technology Licenses and Options Executed from Universities (2016)	Patents Issued (2010-2017)	Total Technology Industry Employment Growth (2012-2017)	Total R&D % of GDP (2015)	Business Performed R&D - % of Private Industry Output (2015)	Venture Capital Funding Per \$1 Million of GDP (2016)	Start-Up Firms Per 1,000 Firms (2016)	Average Ranking	State Rank
California	1	1	14	4	2	1	6	4.1	1
Washington	6	5	2	5	4	5	12	5.6	2
Massachusetts	4	4	10	2	1	2	28	7.3	3
Oregon	10	17	9	10	7	17	14	12.0	4
New York	2	3	12	29	26	4	10	12.3	5
Utah	32	23	3	12	11	3	4	12.6	6
North Carolina	8	13	4	17	16	15	18	13.0	7
Michigan	11	7	7	6	5	28	33	13.9	8
Florida	3	10	5	34	32	20	2	15.1	9
Arizona	17	15	15	17	14	21	8	15.3	10
Colorado	22	14	20	20	21	6	7	15.7	11
Minnesota	9	6	23	15	12	12	34	15.9	12
Missouri	19	24	15	15	12	26	2	16.1	13
Texas	7	2	31	30	26	16	5	16.7	14
Georgia	14	16	8	31	28	14	11	17.4	15
Maryland	12	22	27	3	21	11	26	17.4	16
Illinois	18	8	25	20	17	10	25	17.6	17
New Hampshire	16	30	6	11	8	7	48	18.0	18
New Jersey	25	9	35	12	9	19	17	18.0	19
Pennsylvania	5	11	29	20	19	13	42	19.9	20
Idaho	34	26	13	9	10	35	13	20.0	21
Connecticut	40	18	34	8	6	8	45	22.7	22
Virginia	20	20	36	20	28	22	19	23.6	23
Indiana	13	21	26	19	14	34	41	24.0	24
Delaware	44	37	42	6	3	24	14	24.3	25
Ohio	14	12	23	25	19	29	48	24.3	26
Tennessee	23	25	18	31	35	23	24	25.6	27
Wisconsin	26	19	21	25	17	32	44	26.3	28
New Mexico	29	36	38	1	35	30	30	28.4	29
Nevada	46	31	1	50	44	31	1	29.1	30
South Carolina	36	29	11	34	34	41	20	29.3	31
Kansas	27	28	41	28	21	33	31	29.9	32
Iowa	21	27	30	27	21	42	49	31.0	33
Rhode Island	43	39	37	14	25	18	43	31.3	34
Alabama	28	35	32	20	30	45	36	32.3	35
Maine	-	41	17	39	35	25	37	32.3	36
Montana	35	44	33	36	35	27	27	33.9	37
Vermont	46	34	40	33	30	9	47	34.1	38
Kentucky	36	32	45	36	32	43	16	34.3	39
Nebraska	33	40	22	36	35	36	40	34.6	40
North Dakota	24	46	47	41	40	47	9	36.3	41
Oklahoma	38	33	44	44	40	46	21	38.0	42
Arkansas	31	43	43	48	44	39	29	39.6	43
Hawaii	41	45	28	42	47	38	38	39.9	44
South Dakota	42	48	19	47	43	44	39	40.3	45
Wyoming	-	49	50	45	40	40	22	41.0	46
Mississippi	39	42	39	39	47	49	35	41.4	47
Louisiana	30	38	46	49	47	50	31	41.6	48
Alaska	48	50	48	46	50	37	23	43.1	49
West Virginia	45	47	49	43	44	48	50	46.6	50

### Manufacturing Economic Strength

Finally, the Economic Strength Index evaluates the existing presence of the manufacturing sector within each state and evaluates indicators of overall economic performance. Existing industry in a state can create a clustering effect and attract manufacturing to the area. Clusters have been known to attract other prospective businesses because of the benefit of higher concentrations of skilled employees and regional suppliers. A strongly performing overall economy beyond manufacturing is important for prospective companies as growth inspires innovation, talent movement, and investment. The Economic Strength Index consisted of the following twelve metrics.

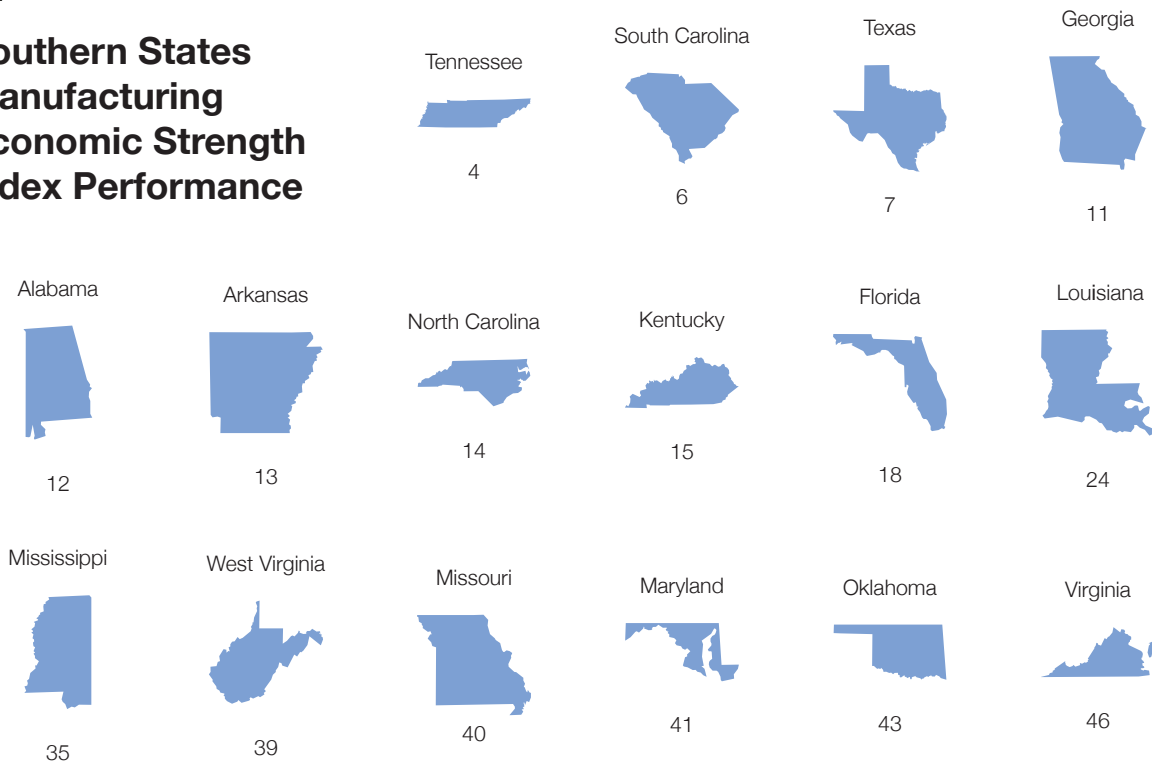
#### Economic Strength Index Metrics

- Manufacturing's Share of Gross State Product 2017
- Change in Manufacturing's Share of Gross State Product 2012-2017
- Growth in Manufacturing GDP 2012-2017
- Total Manufacturing Employment 2017
- Manufacturing Employment as percent of Total Employment 2017
- Change in Real GDP per Capita 2012-2017
- Change in Real Personal Income per Capita 2012-2017
- Change in Real GDP chained 2009 dollars 2012-2017
- Exports of Manufactured Goods Percent change 2016 -2017
- Total Exports of Goods Per Capita 2017
- Manufacturing establishments total capital expenditures (\$millions) 2016
- Manufacturing establishments total capital expenditures per manufacturing employee 2016

#### Economic Strength Performance

Virginia maintained its position at 46th in the economic strength index. In the individual metrics, Virginia improved in the categories of Five Year Change in Manufacturing's Share of GSP (from 43rd in 2017 to 35th in 2018); Five Year Change in Real Personal Income per Capita (from 40th in 2017 to 37th in 2018); Five Year Change in Real GDP (from 41st in 2017 to 38th in 2018) and in Manufacturing Establishments Total Capital Expenditures per Manufacturing Employee (from 37th in 2017 to 23rd in 2018). Virginia dropped slightly in the ranking of Total Exports per Capita (from 39th in 2017 to 43rd in 2018). Despite overall improvements in the national and Virginia's economy in recent years, significant improvements in the state's manufacturing economic index have yet to be seen.

## Southern States Manufacturing Economic Strength Index Performance

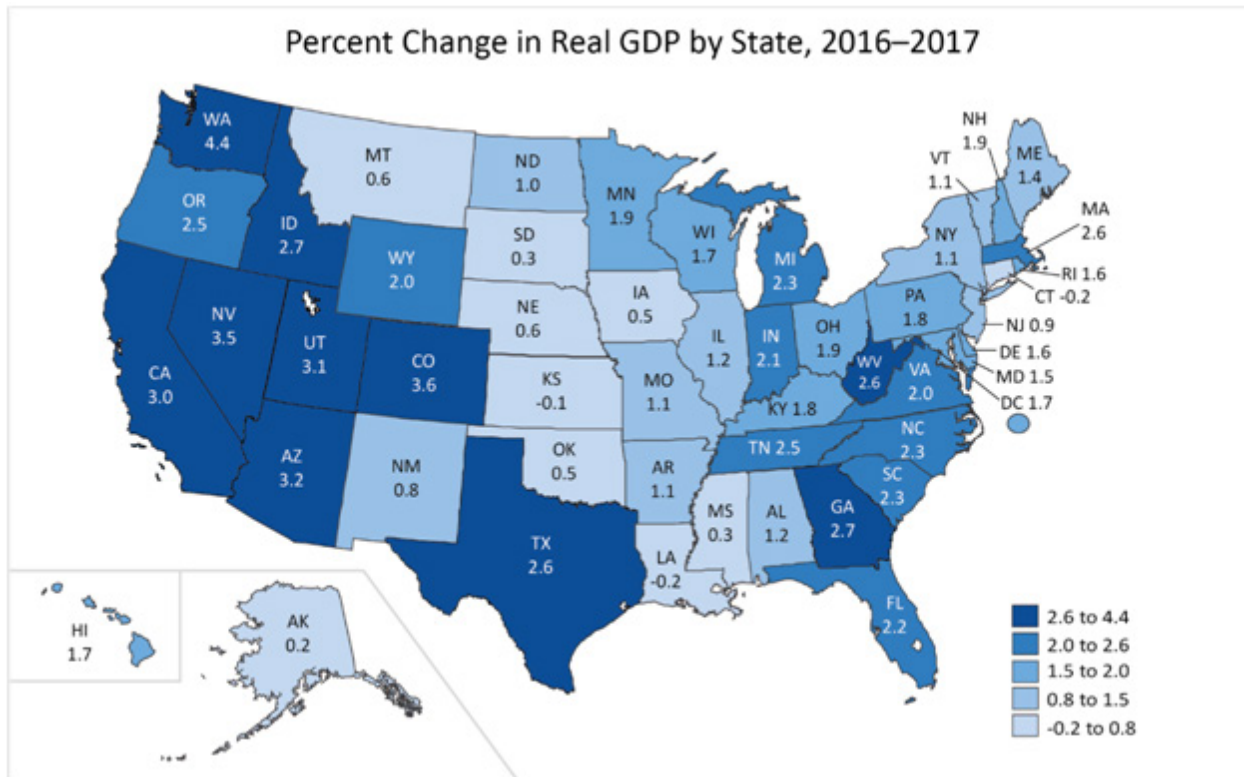


<b>Economic Strength</b>	Manufacturing's Share of Gross State Product 2017	Change in Manufacturing's Share of Gross State Product (2012-2017)	Growth in Manufacturing GDP (2012-2017)	Total Manufacturing Employment 2017	Manufacturing Employment as Percent of Total Employment 2017	Change in Real GDP per Capita (2012-2017)	Change in Real Personal Income per Capita (2012-2017)	Change in Real GDP (2012-2017) Chained 2009 Dollars	Exports of Manufactured Goods % Change (2012-2017)	Total Exports per Capita (2017)	Manufacturing Establishments Total Capital Expenditures (\$millions) 2016	Manufacturing establishments total capital expenditures per manufacturing employees 2016	Average Ranking	State Rank
Indiana	2	8	13	7	1	12	17	19	9	9	7	20	10.3	1
Michigan	3	25	20	4	3	3	8	17	16	8	5	25	11.4	2
California	26	12	5	1	31	1	1	2	23	16	2	42	13.5	3
Tennessee	12	23	16	13	10	9	15	11	27	12	11	14	14.4	4
Ohio	11	14	18	3	8	13	21	26	35	17	3	12	15.1	5
S. Carolina	10	17	11	21	11	20	13	9	30	7	18	15	15.2	6
Texas	19	42	25	2	32	15	41	5	25	3	1	4	17.8	7
Iowa	8	43	31	23	4	5	43	13	9	18	17	9	18.6	8
Pennsylvania	22	17	19	6	19	4	20	24	31	34	6	21	18.6	9
Minnesota	16	8	10	14	13	17	28	14	18	31	19	37	18.8	10
Georgia	27	25	12	11	25	6	6	8	34	32	13	28	18.9	11
Alabama	9	14	26	17	5	39	26	40	31	14	14	10	20.4	12
Arkansas	15	3	8	28	7	25	24	30	17	40	28	22	20.6	13
N. Carolina	4	41	29	8	14	26	29	15	8	33	9	34	20.8	14
Kentucky	5	25	33	18	6	36	33	37	28	5	16	11	21.1	15
Illinois	18	43	44	5	19	22	10	35	14	11	8	27	21.3	16
N. Hampshire	20	2	6	36	15	9	32	20	3	25	39	50	21.4	17
Florida	44	6	4	12	43	22	14	7	22	36	15	35	21.7	18
Wisconsin	6	45	40	9	2	14	27	25	23	24	12	39	22.2	19
Washington	23	47	37	15	27	2	2	1	48	2	24	49	23.1	20
Kansas	12	17	28	26	11	30	48	34	7	23	27	18	23.4	21
Utah	24	35	17	32	26	7	5	3	47	30	31	24	23.4	22
Oregon	2	50	48	24	17	36	4	16	44	10	23	17	24.1	23
Louisiana	7	33	42	31	32	48	41	48	5	1	4	1	24.4	24
Massachusetts	29	33	35	19	34	19	12	20	6	21	25	44	24.8	25
Idaho	21	35	22	37	24	17	9	6	50	39	34	5	24.9	26
Colorado	39	31	15	29	41	6	3	4	18	48	32	36	25.2	27
New Jersey	38	16	24	20	37	38	21	39	13	26	22	31	27.1	28
Nebraska	25	49	46	35	17	9	39	12	12	28	36	29	28.1	29
Montana	42	4	3	47	43	36	35	27	20	46	38	3	28.7	30
New York	45	23	38	10	42	32	19	35	38	27	10	30	29.1	31
Nevada	47	25	27	39	47	35	16	10	4	20	42	40	29.3	32
Delaware	41	17	23	45	40	39	25	28	40	13	41	6	29.8	33
Alaska	49	1	1	49	45	50	47	50	2	6	49	13	30.2	34
Arizona	34	32	30	25	39	41	11	18	45	35	29	26	30.4	35
Mississippi	14	25	38	30	8	43	34	46	36	29	30	32	30.4	36
Rhode Island	36	5	7	42	28	28	30	33	26	38	46	48	30.6	37
S. Dakota	30	8	13	41	16	43	46	31	11	45	45	41	30.8	38
West Virginia	31	17	32	40	35	24	40	44	33	22	37	16	30.9	39
Missouri	17	25	36	16	21	41	38	41	41	37	21	38	31.0	40
Maryland	43	8	9	34	46	29	30	29	42	47	35	33	32.1	41
N. Dakota	40	17	34	46	37	49	50	45	1	4	47	19	32.4	42
Oklahoma	36	45	47	33	30	21	49	22	29	49	26	8	32.9	43
Hawaii	50	6	2	48	50	15	7	23	49	50	50	46	33.0	44
Wyoming	45	12	20	50	48	46	45	47	15	41	43	2	34.5	45
Virginia	35	35	43	22	36	45	37	38	39	43	20	23	34.7	46

Connecticut	28	35	45	27	22	47	44	49	37	19	33	45	35.9	47
Maine	32	35	41	38	28	27	21	32	46	42	44	47	36.1	48
Vermont	33	48	50	43	22	31	17	43	43	15	48	43	36.3	49
New Mexico	48	40	49	44	49	33	35	42	21	44	40	7	37.7	50

# Conclusions

The overall economy in Virginia has begun to rebound from the post great recession challenges that the state faced. From 2011 to 2016, Virginia's change in GDP per capita and real personal income growth were among the lowest in the country. As the chart below shows from 2016-2017 state GDP growth grew at 2 percent, still below some neighboring states, but much improved.

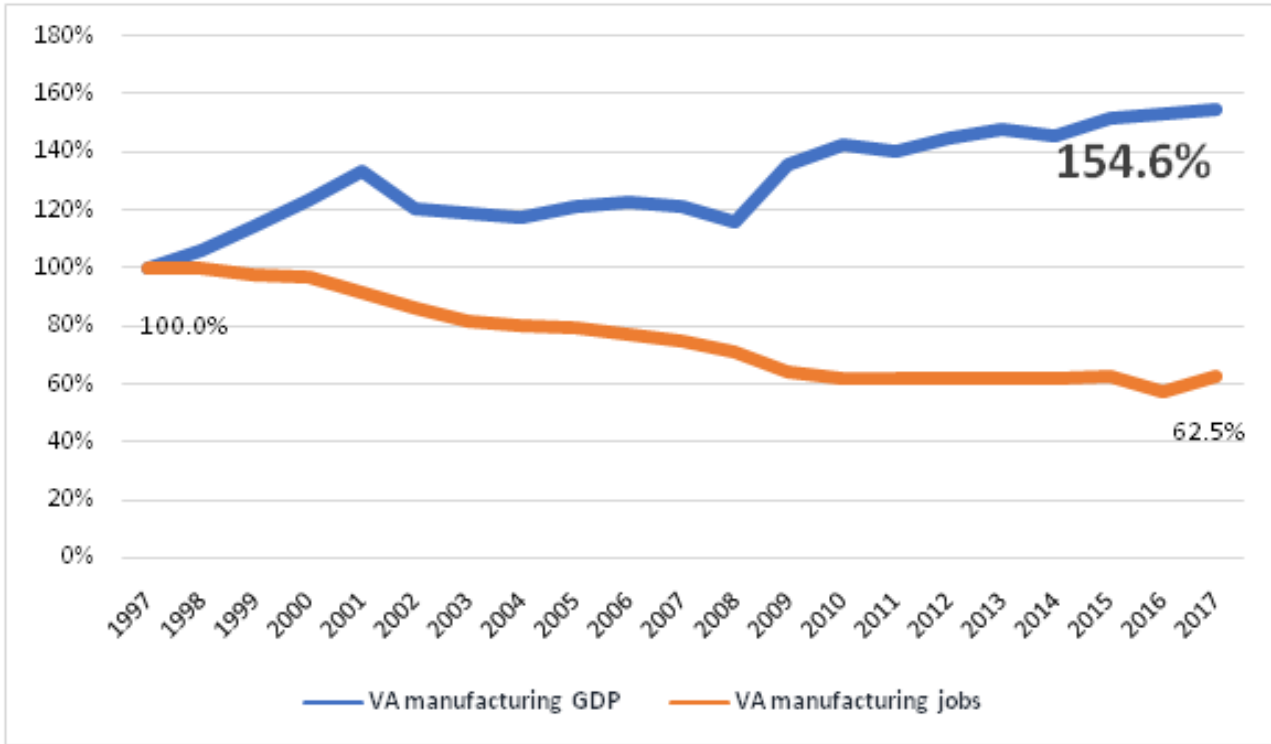


U.S. Bureau of Economic Analysis

The fundamentals of the Virginia economy's business climate and workforce appear to be positioned as one of the most competitive states, but some headwinds remain. The Federal government's large and rising debt will likely limit future investment and, as home to significant military facilities and government contractors, will impact the state. Another concern is the widening gap between prosperous areas of the state and those that have yet to experience new growth.

A economic development prioritization to strengthen Virginia's manufacturing sector could take better advantage of the state's skilled workers, sound infrastructure and stream of innovative ideas. New manufacturing investment and jobs could also better spread prosperity across more of Virginia. While manufacturing jobs have declined over the past 30 years due to many factors, including automation, per employee output expanded significantly. The chart on page 17 shows that despite fewer jobs, manufacturing GDP has risen over 50 percent in the past 20 years.

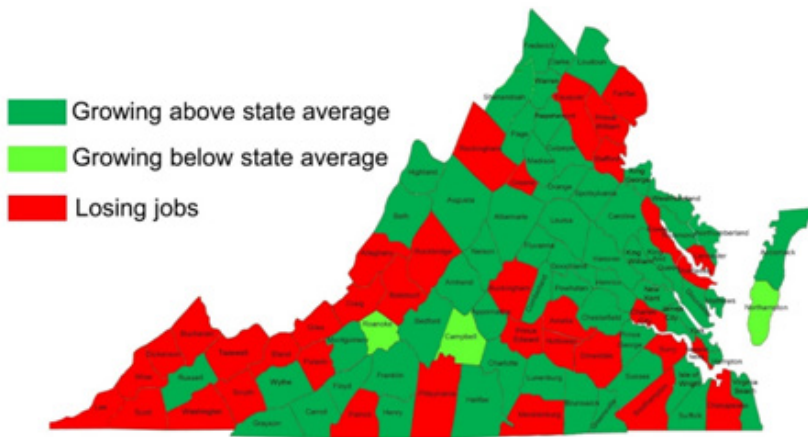
## Virginia Manufacturing Jobs and Manufacturing GDP Growth 1997 – 2017 (normalized as percent of levels in 1997)



This map shows that manufacturing job expansion over the past five years has been widespread across the state, bringing growth and prosperity to places that have been experiencing economic hardship.

Manufacturing can be better supported by a strategic commitment to improve the business climate, focus on middle skill job training, increased global trade, improved innovation commercialization, a cluster approach to economic development and to sustain private sector engagement. Virginia can be a national leader in nurturing tomorrow's manufacturing sector. The foundation is strong. The Virginia Manufacturers Association is a ready and willing partner.



## Percent Manufacturing Job Growth 2012 to 2017 Virginia average 0.8%



Source: US Bureau of Labor Statistics

## 2018 Overall Manufacturing Competitiveness Index All States

In addition to each of the five indexes a composite index was created using all of the 52 data points. As the chart below shows, Virginia is ranked as the ninth most competitive state in overall manufacturing competitiveness, an improvement from its 11th overall ranking (unweighted) in 2017. Close neighbors North Carolina and Maryland also scored high finishing #6 and #19T. The chart below provides a quick visual reference with states ranked among the 15-best coded in green and states scoring in the bottom 15 coded red. A "T" next to any ranking indicates a "Tie" with another state.

Top 15  Bottom 15 

		Business Climate	Workforce	Infrastructure	Innovation	Economic Strength
1	Minnesota	12	8	6	12	10
2	Texas	20T	10	3	14	7
3	Utah	14	11	4	6	21T
4	Washington	24	4	12	2	20
5	Iowa	10T	14	10	33	8T
6	North Carolina	8	23	25	7	14
7	Oregon	13	36	9	4	23
8	Idaho	7	37	5	21	26
9	Virginia	5	9	15	23	46
10	North Dakota	10T	5	1	41	42
11	Michigan	4	47	40T	8	2
12	Kansas	16	22	11	32	21T
13T	Arizona	6	31T	21	10	35T
13T	Colorado	30T	3	32T	11	27
15	Massachusetts	25	7	45	3	25
16	South Dakota	1	16	6	45	38
17T	Nebraska	9	13	16	40	29
17T	Pennsylvania	41	15	23	20	8T
19T	Maryland	30T	6	17	15T	41
19T	Ohio	2	28T	49	25T	5
21	Indiana	34	20	34T	24	1
22	Tennessee	19	34	32T	27	4
23	Kentucky	18	27	20	39	15
24	Florida	29	40	24	9	18
25T	Georgia	20T	38	37T	15T	11
25T	New Hampshire	26	12	48	18T	17
27	Wyoming	3	1	27	46	45



		<b>Business Climate</b>	<b>Workforce</b>	<b>Infrastructure</b>	<b>Innovation</b>	<b>Economic Strength</b>
28	South Carolina	15	42	30	31	6
29	Illinois	50	24	18T	17	16
30	Nevada	17	45	2	30	32
31	Montana	45	2	13	37	30
32	California	49	33	44	1	3
33	Connecticut	32T	18	18T	22	47
34	Missouri	22T	19	47	13	40
35T	New Jersey	47	25	26	18T	28
35T	Wisconsin	38T	17	42	28	19
37T	Alabama	27T	44	39	35T	12
37T	New York	35	43	43	5	31
39	Vermont	32T	31T	8	38	49
40	Arkansas	22T	46	40T	43	13
41	Oklahoma	38T	21	22	42	43
42	Delaware	43T	39	36	25T	33
43	New Mexico	36	48	14	29	50
44	Louisiana	37	41	29	48	24
45	Maine	42	30	28	35T	48
46	Mississippi	27T	50	34T	47	35T
47	Rhode Island	46	28T	50	34	37
48T	Alaska	48	35	37T	49	34
48T	Hawaii	43T	26	46	44	44
50	West Virginia	38T	49	31	50	39

Top 15  Bottom 15 