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State of NC's Tech Sector

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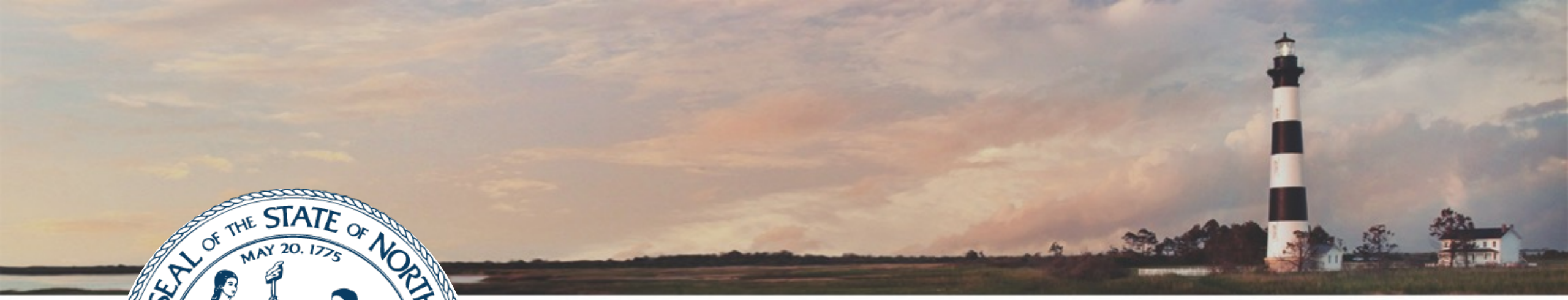


TRIANGLE TECHNOLOGY EXECUTIVES COUNCIL, FEBRUARY 17, 2023, at CAPTRUST

2023 State of North Carolina's Innovation Economy & Tech Sector

DR. JOHN HARDIN, EXECUTIVE DIRECTOR
NC BOARD OF SCIENCE, TECHNOLOGY & INNOVATION (BSTI)
NC DEPARTMENT OF COMMERCE

www.nccommerce.com

Part 1

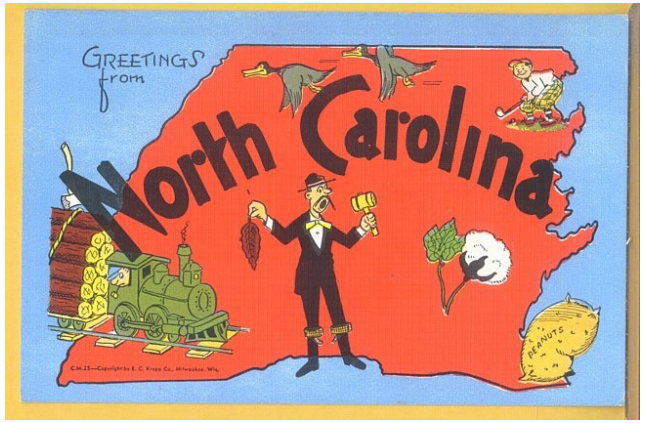
North Carolina's Innovation Economy

NC's Innovation History

1950s North Carolina:

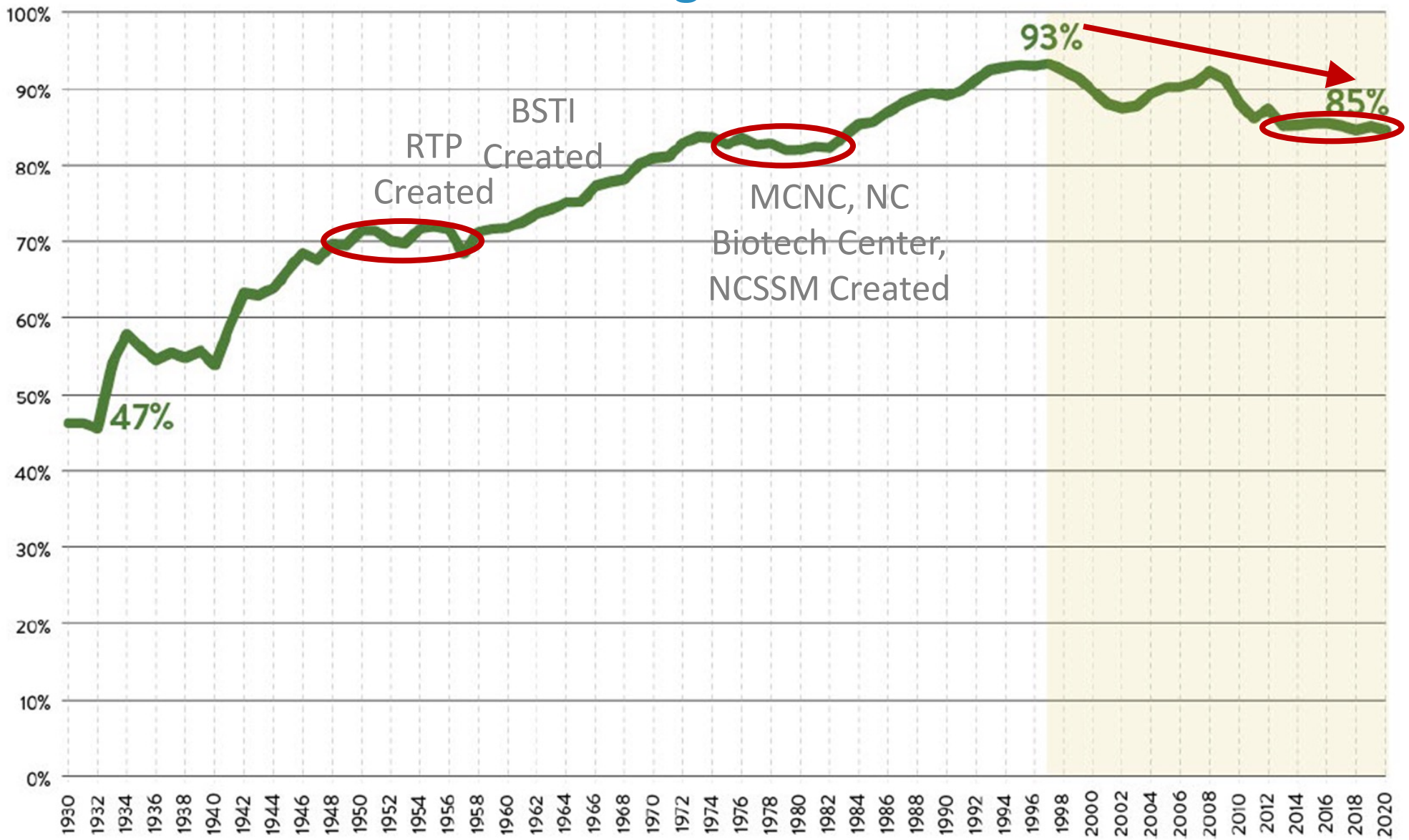
- Concentration in low-wage primary/crop industries
  - Tobacco, Cotton
  - Furniture
  - Textiles
- Low-wage Jobs
  - 49th in per capita income in the US
- "Brain Drain"
- Needed to diversify & expand economy and make it more innovation-based

  (which we did, e.g., RTP, biotech, info tech, nanotech, financial services)



NC Economic Well-Being Over Time

NC Per Capita Income as share of U.S. Per Capita Income, 1930-2020

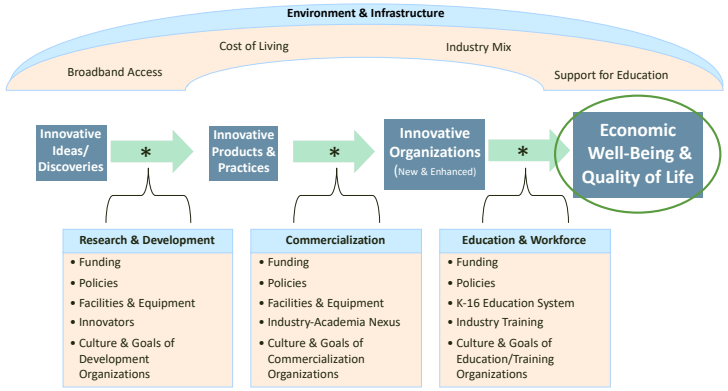


Source: U.S. Bureau of Economic Analysis

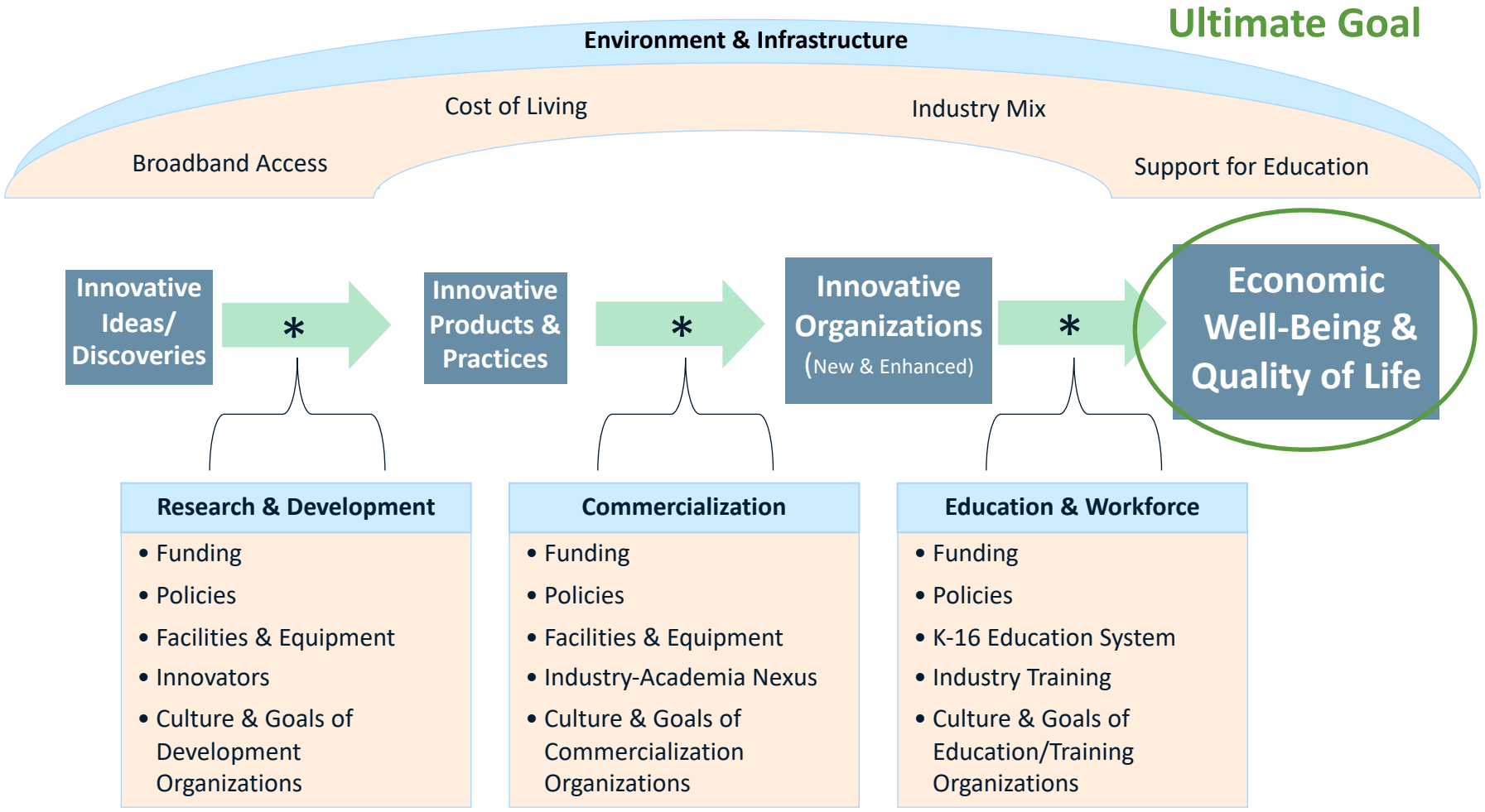
Why is Innovation Important?

- **Innovation: Something new that adds value**
- Between one-third and one-half of **economic growth** in U.S. is attributed to innovation *(Source: U.S. Department of Commerce)*

- Innovation has big (2 – 5x) **multiplier effect** (across sectors & skill levels)
  - Due to higher wages & higher growth, primarily from high Science, Engineering, and Technology (SET) traded industries
- Innovation occurs most efficiently and effectively in a vibrant, healthy **innovation ecosystem** *(see next slide)*



What is an Innovation Ecosystem?



It's a living, breathing, dynamic system that needs continuous care and feeding

There are multiple innovation ecosystems across the state

How do we Measure the Health of NC's Innovation Ecosystem?

115 pages total

"A gripping page-turner!"

~Everyone who has read it

MEASURE	N.C. RANK	N.C. % OF U.S. AVERAGE VALUE	PERFORMANCE OVER TIME[1] N.C.	PERFORMANCE OVER TIME[1] U.S.
ECONOMIC WELL-BEING & QUALITY OF LIFE	30	0% 20% 40% 60% 80% 100% 120% 140% 160% 180% 200%		
Per Capita Gross Domestic Product, 2020	31	86%	↑	↑
Per Capita Income, 2020	40	85%	↑	↑
Median Household Income, 2019	39	87%	↑	↑
Average Annual Wage, 2020	23	88%	↑	↑
Unemployment Rate, 2020	26	90%	↑	↑
Percentage of Citizens in Poverty, 2019	39	111%	↓	↓
Population growth, 2000-2020	10	167%	↑	↑
RESEARCH & DEVELOPMENT	14	0% 20% 40% 60% 80% 100% 120% 140% 160% 180% 200%		
Total R&D Expenditures as a Percentage of GDP, 2018	13	93%	↑	↑
Business-Performed R&D as a Percentage of Private-Industry Output, 2019	11	98%	↑	↑
Academic Science & Engineering R&D per $1,000 of State GDP, 2019	5	148%	↑	↑
Federal R&D Obligations per Employed Worker, 2019	23	57%	↑	↑
Academic S&E Article Output per 1,000 SEH Doctorate Holders in Academia, 2019	16	100%	↑	↑
COMMERCIALIZATION	16	0% 20% 40% 60% 80% 100% 120% 140% 160% 180% 200%		
Average Annual SBIR & STTR Funding per $1 Million of GDP, 2016-18	16	109%	↑	↑
Academic Patents Awarded per 1,000 S&E Doctorate Holders in Academia, 2019	19	79%	↑	↑
Patents Awarded per 1,000 Individuals in S&E Occupations, 2020	24	71%	↑	↑
Venture Capital Dispersed per $1 Million of GDP, 2019	19	40%	↑	↑
Venture Capital Dispersed per Venture Capital Deal, 2019	19	66%	↑	↑
Academic License Inc. (Gross) as a Percentage of Academic R&D Expend., 2018-2019	12	61%	N/A	N/A
Academic License Inc. (Running) as a Percentage of Acad. S&E R&D Expend., 2018-2019	13	63%	↓	↓
Avg. Number of University Startups Formed per $1M of Academic S&E R&D Expenditures, 2018-2019	8	143%	↑	↑
INNOVATIVE ORGANIZATIONS	21	0% 20% 40% 60% 80% 100% 120% 140% 160% 180% 200%		
High SET Employment Establishments as Percentage of All Business Establishments, 2020	10	121%	↑	↑
Employment in High SET Employment Establishments as a Percentage of Total Employment, 2020	14	101%	↑	↑
Average Monthly Number of Entrepreneurs per 100,000 People, 2018-2020	30	82%	↓	↑
Average Opportunity Share of New Entrepreneurs, 2018-2020	20	106%	↑	↓
Exports as a Percentage of GDP, 2020	32	71%	↓	↓
EDUCATION & WORKFORCE	21	0% 20% 40% 60% 80% 100% 120% 140% 160% 180% 200%		
Individuals in S&E Occupations as a Percentage of the Workforce, 2020	16	101%	↑	↑
Employed SEH Doctorate Holders as a Percentage of the Workforce, 2019	17	98%	↑	↑
Engineers as a Percentage of All Occupations, 2019	26	86%	↑	↑
Bachelor's Degrees in S&E Conferred per 1,000 Individuals 18–24 Years Old, 2019	33	90%	↑	↑
Science & Engineering Degrees as a Percentage of Higher Education Degrees Conferred, 2019	14	105%	↑	↑
Educational Attainment of Residents Aged 25 and Over (Composite Score), 2019	23	99%	↑	↑
Average Years of Education Among In-Migrants, 2019	22	100%	↑	↑
In-Migration of College Educated Adults as a Percentage of Total State Population, 2019	18	124%	↑	↑
ENVIRONMENT & INFRASTRUCTURE	20	0% 20% 40% 60% 80% 100% 120% 140% 160% 180% 200%		
Elementary & Secondary Public School Current Expend. as a Percentage of State GDP, 2018	48	81%	↓	↓
Approp. of State Tax Funds for Higher Education as a Percentage of State GDP, 2019	5	179%	↓	↓
Broadband Deployment at 25 Mbps/3 Mbps or Faster, 2019	28	100%	N/A	N/A
Broadband Adoption Rate 25 Mbps/3 Mbps or Faster, 2019	17	104%	N/A	N/A
Cost of Living Index, 2021	13	92%	N/A	N/A
Manufacturing GDP a Percentage of State GDP, 2020	7	150%	↓	↓
AVERAGE N.C. RANK ACROSS ALL MEASURES	20[2]			

How Well is NC Performing?

2021 Index
Dashboard Overview
39 Indicators

Currently 20th in the nation, up from 21st place ranking in 2019

NC placed 23rd in 2017 and 2015, and 24th in 2013

What Does Tracking Innovation 2021 Find?

- **NC's average rank (across all measures) among 50 U.S. states is 20th from top**
- NC's highest single measure rank is 5th; lowest single measure rank is 48th: most common is 23rd
- Since 2000, NC's performance relative to itself:
  - improved on 28 measures
  - declined on 7
  - remained the same on 4
- The same held for the U.S overall

Overall, NC's innovation ecosystem is moderately healthy,
has improved since the early 2000s,
and at a rate essentially the same as the US overall

However, improvements are disproportionately larger (and well above U.S. average)
in counties with high population and/or research universities

Which Factors Matter Most for Economic Well-Being?

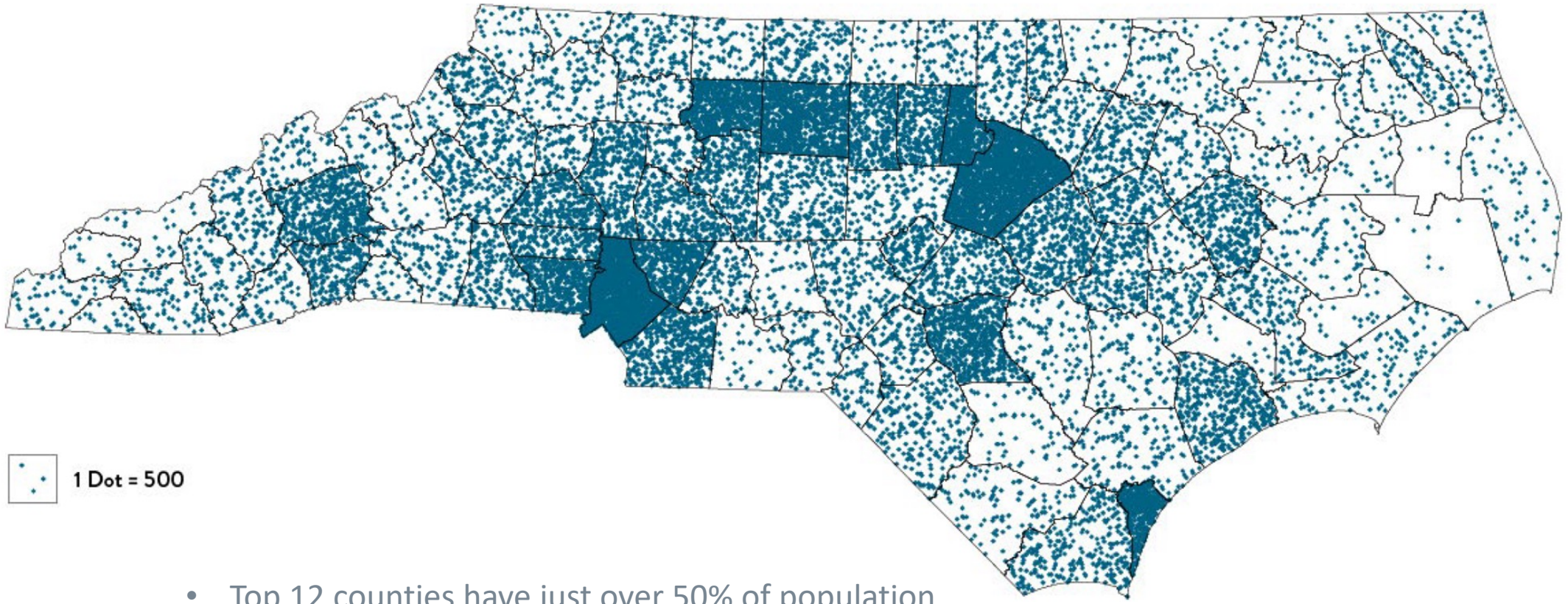
Which factors have largest impact on three economic well-being variables?

- Per capita GDP
- Per capita personal income
- Average annual pay

Using *SAS Visual Statistics*, we found three factors statistically significant for predicting changes in economic well-being variables across all U.S. states:

- Proportion of workers in High-SET (*science, engineering & tech*) **industries**
- Proportion of workers in employed in science & engineering **occupations**
- Proportion of population with post-secondary **educational attainment**

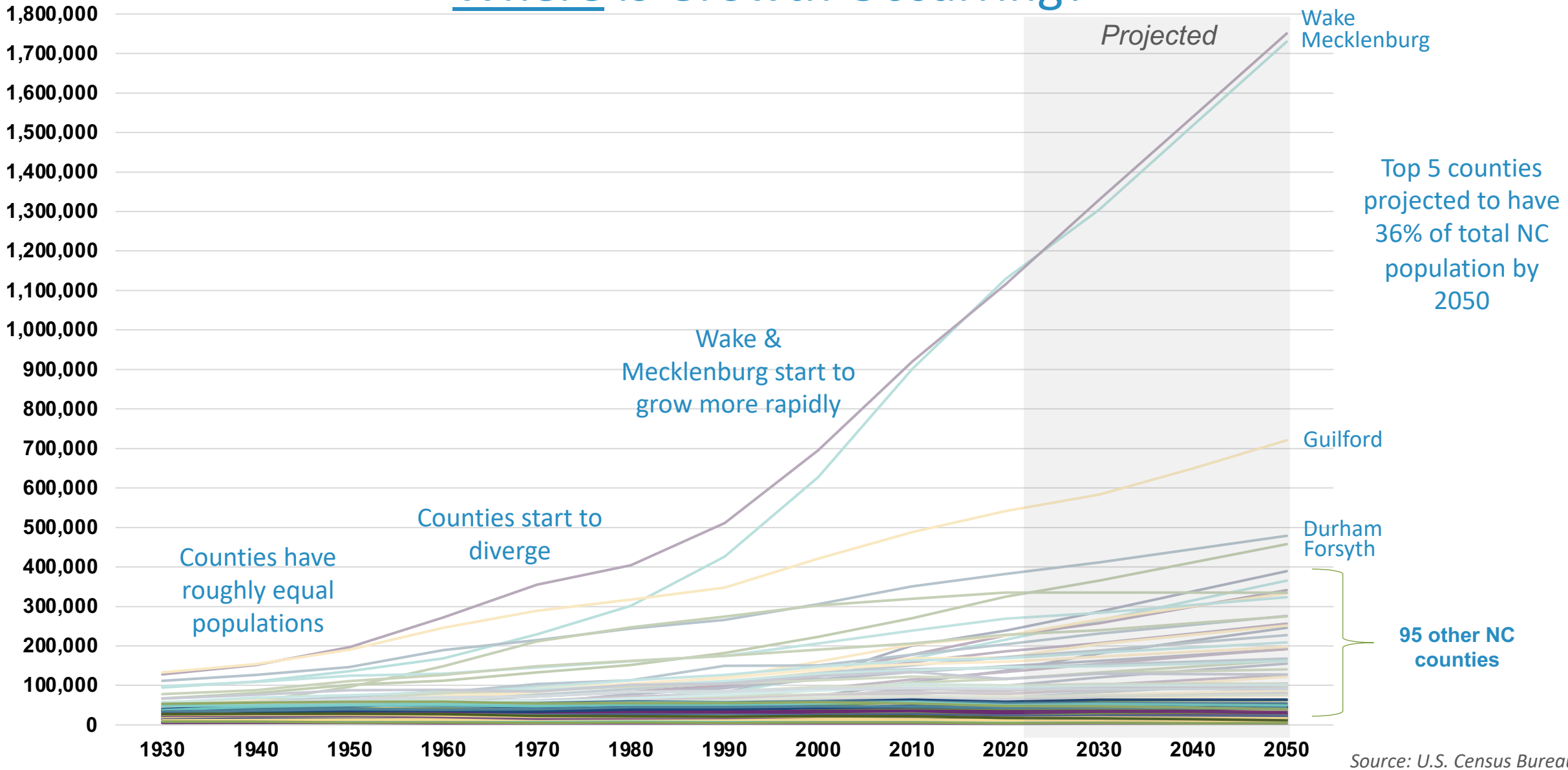
Where do People Live: Population in NC, 2020



- Top 12 counties have just over 50% of population
- Since 2000, those 12 counties have accounted for 72% of population increase
- Since 2000, Wake & Mecklenburg have accounted 38% of population increase

Source: U.S. Census Bureau

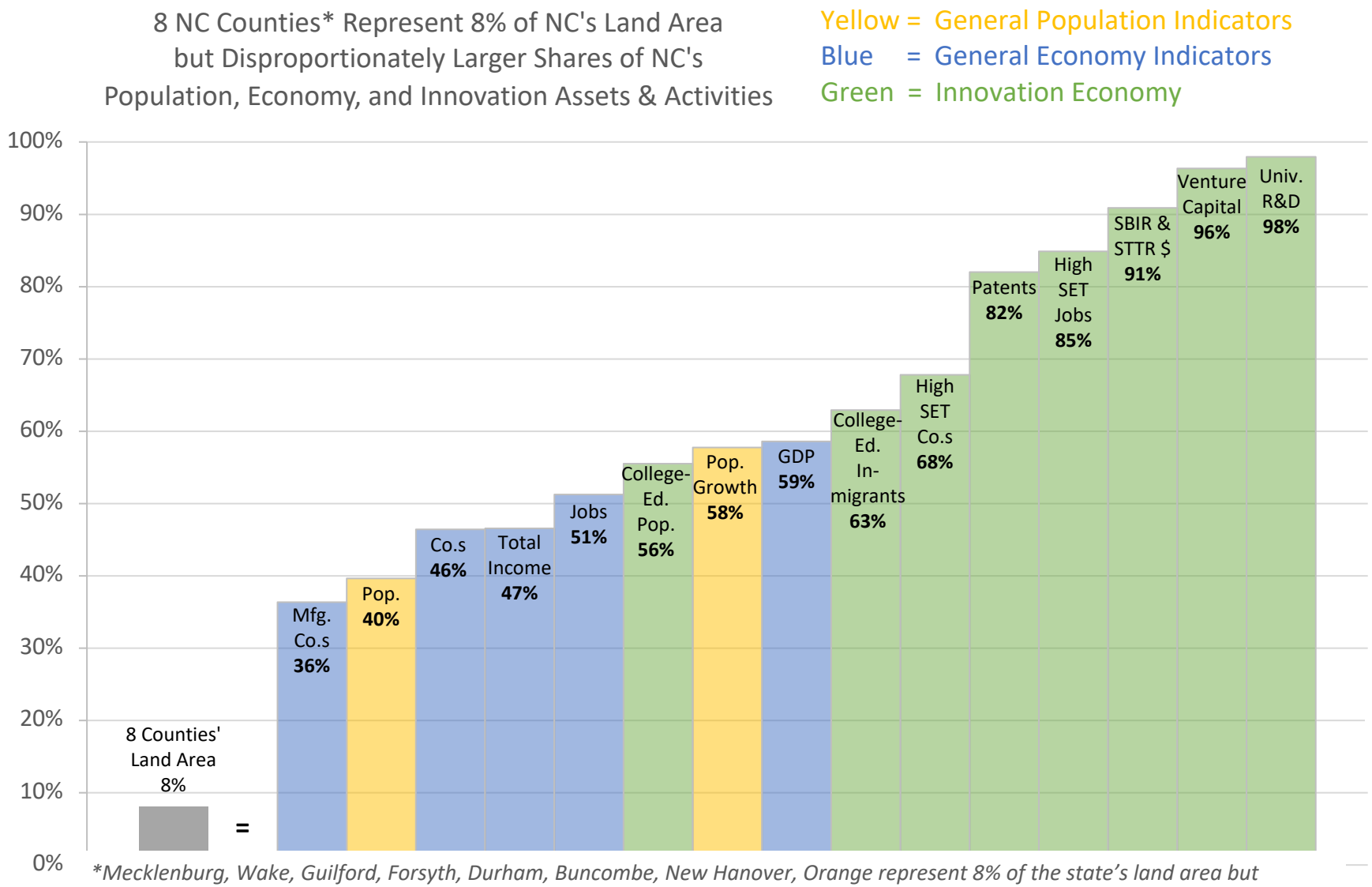
Where is Growth Occurring?



Source: U.S. Census Bureau

Where are NC's Strengths? Multiple Indicators

Population, Economy & Innovation are Geographically Concentrated



**Mecklenburg, Wake, Guilford, Forsyth, Durham, Buncombe, New Hanover, Orange represent 8% of the state's land area but disproportionately larger shares of state's population, economy, and innovation assets and activities.*

Sources: National Science Foundation, Neo IP Intellectual Property Law Firm and Magic Number, Inc. Software, Pitchbook, SBIR.Gov, NC Department of Commerce, U.S. Bureau of Economic Analysis, U.S. Census Bureau, U.S. Patent & Trademark Office.

What Does All This Data Tell Us?

North Carolina is a tale of two innovation economies:

- One based primarily in a small number of more research-intensive areas, which have large populations that are growing rapidly and that have economic and innovation assets, activities, and outcomes well above the U.S. average

- The other based largely in less developed areas, which have much smaller populations that are stable or shrinking and that have economic outcomes well below the U.S. average

What Can We Do About It?

We must increase (throughout NC):

- Proportion of workers in high SET **industries**
- Proportion of workers in science and engineering **occupations**
- Proportion of population with post-secondary **educational attainment**

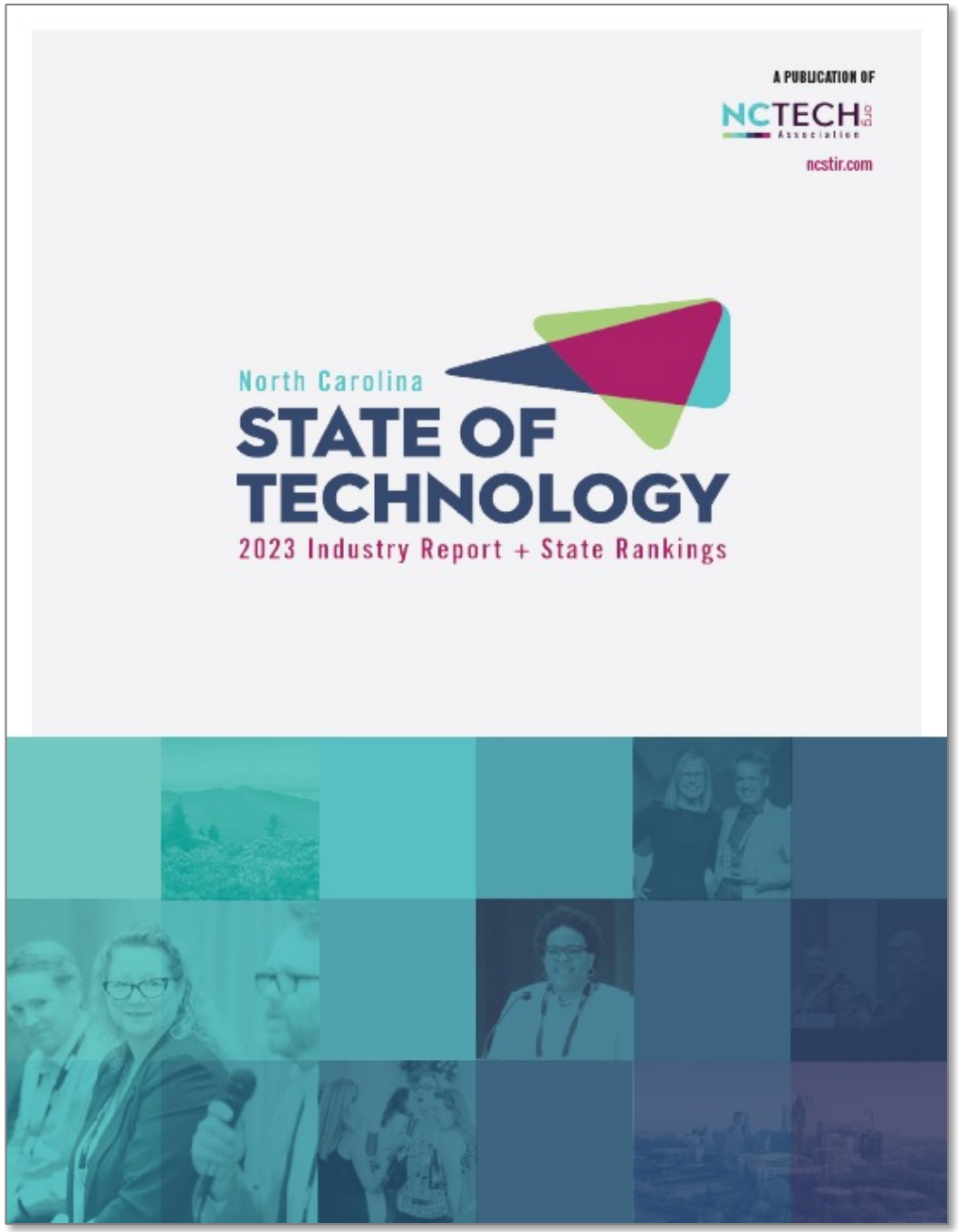
We can do this by:

- **Starting & growing** more innovative companies
- **Assisting** existing innovative companies
- **Recruiting** more innovative companies

- **Raising educational attainment** of all citizens at all levels
- **Emphasizing STEM** skills in education & workforce development
- **Helping struggling communities** to enhance their innovation ecosystems & link to thriving communities

Part 2

North Carolina's Tech Sector



How does the NC TECH Association Measure the Health of NC's Tech Sector?

73 pages total

"Another gripping page-turner!"

~Everyone who has read it

NC Tech Sector Overview

North Carolina Technology Industry Summary Statistics, 2021

Indicator	Technology Industry	State Total	State Total Percentage
Employees	290,823	4,509,160	6.4%
Establishments	25,368	315,071	8.1%
Wages (millions)	$36,714	$303,468	12.1%
Sales (millions)	$105,430	$967,057	10.9%

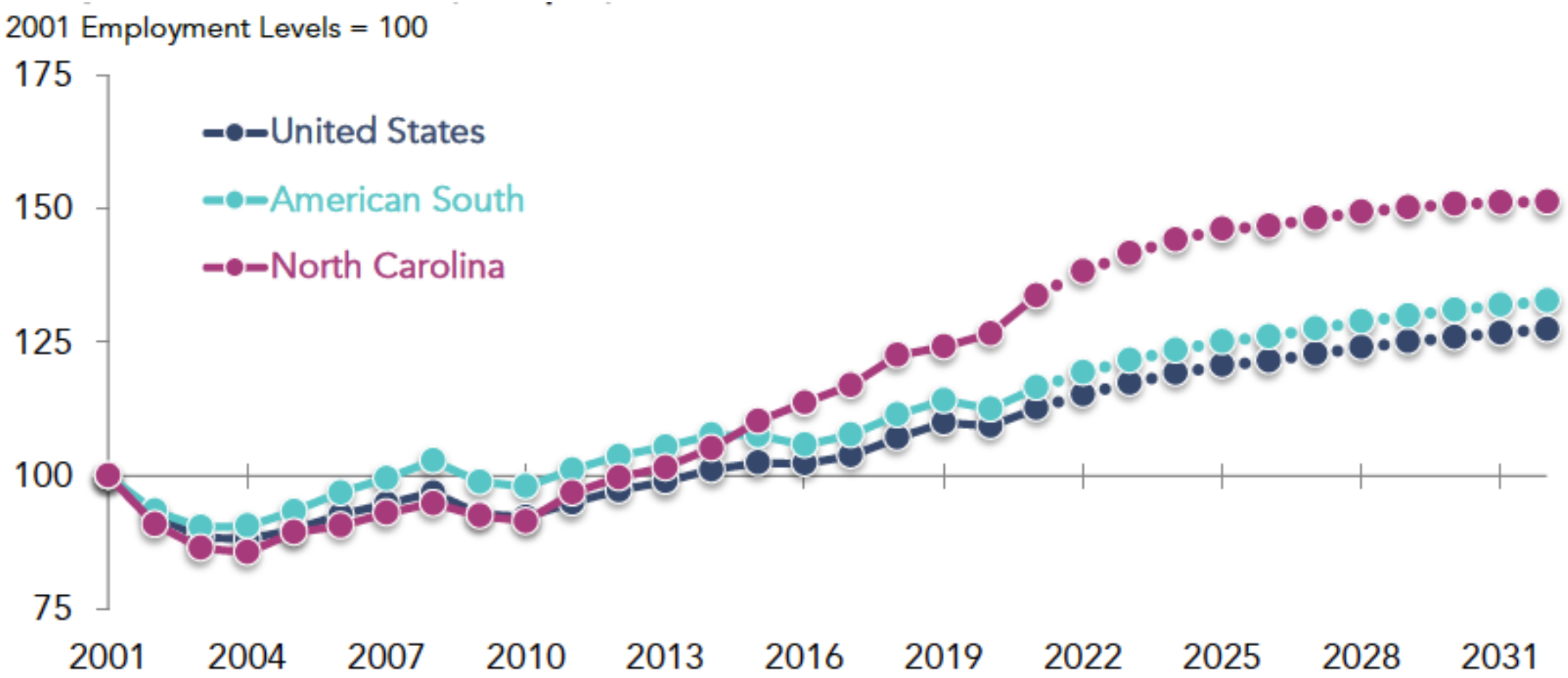
Source: EL calculations based on Lightcast 2022.4

North Carolina's Technology Industry by Sub-Categories, 2021

Technology Categories	Employment, 2021	Employment Change, 2019-2021	Employment Change, 2016-2021	Establishments, 2021	Sales, 2021 (millions)	National Location Quotient
Energy Tech	13,444	0.8%	1.8%	576	$10,639	0.47
Environmental Tech	25,976	2.8%	14.2%	1,705	$5,893	1.09
Life Sciences	98,124	9.1%	27.1%	5,814	$32,908	1.09
IT	153,279	8.4%	14.4%	17,273	$55,990	0.95

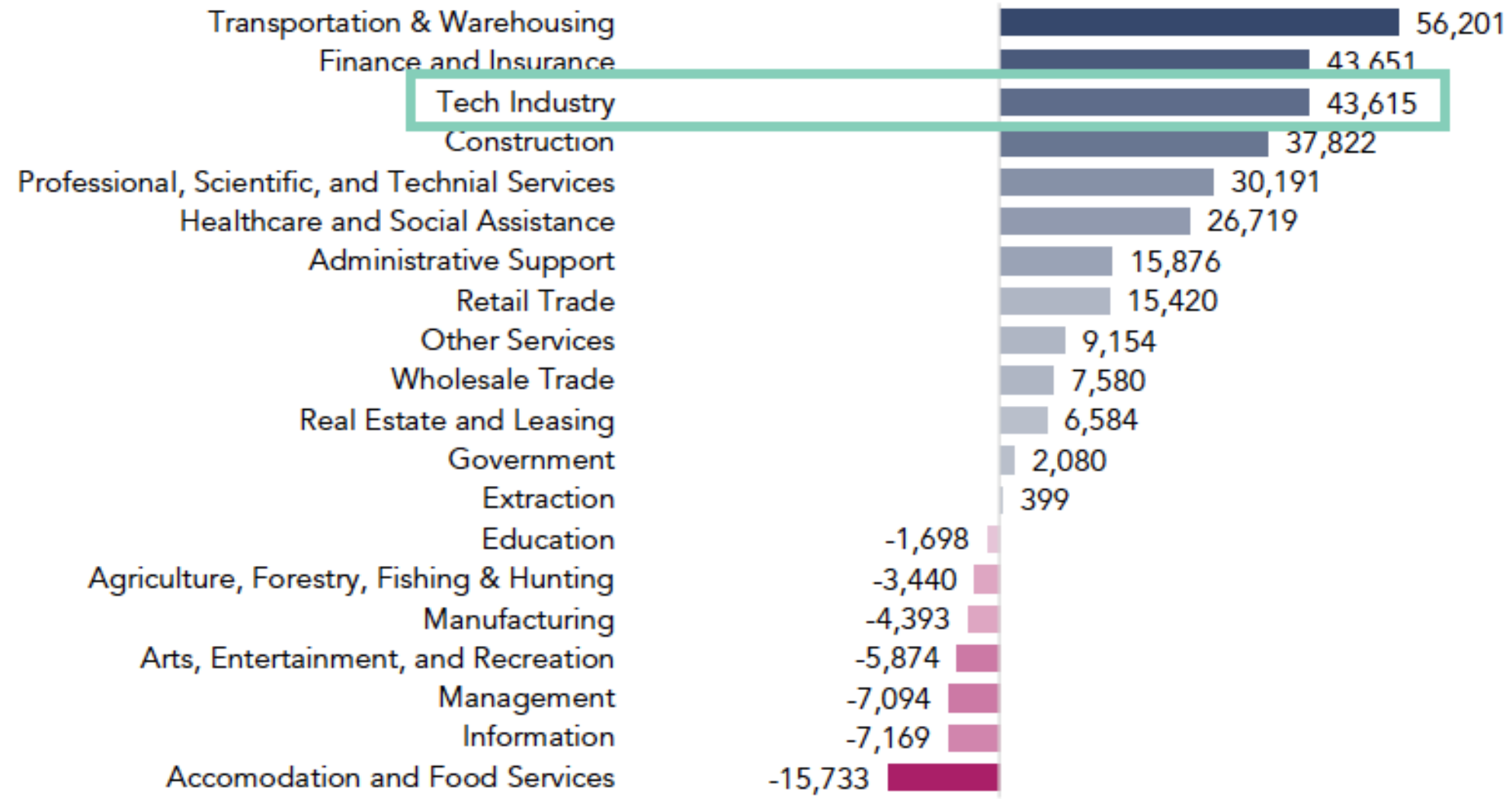
Source: EL calculations based on Lightcast 2022.4

Long Term Tech Industry Employment Trends



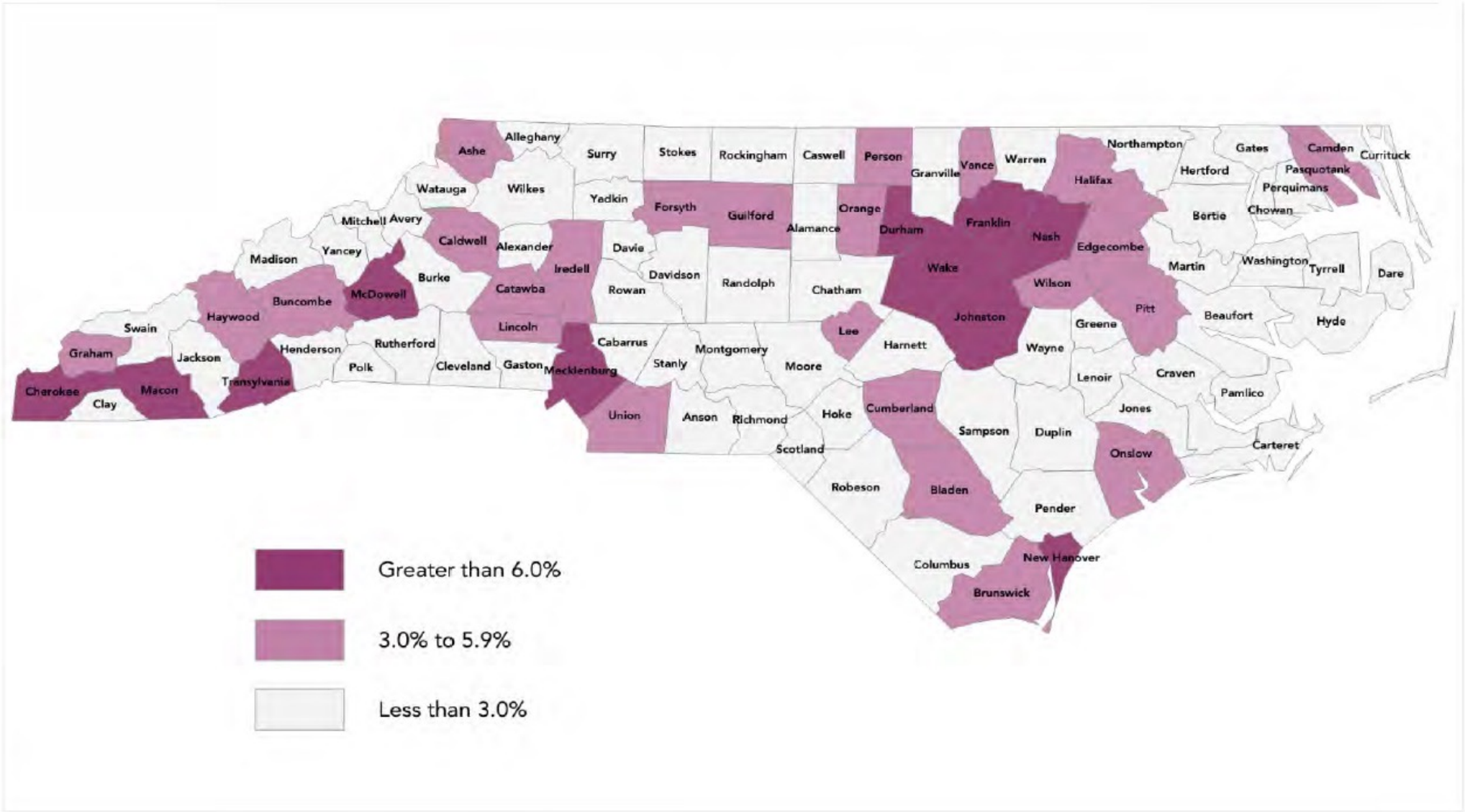
Source: EL calculations based on Lightcast 2022.4

Net Jobs Change in NC by Industry, 2016-2021



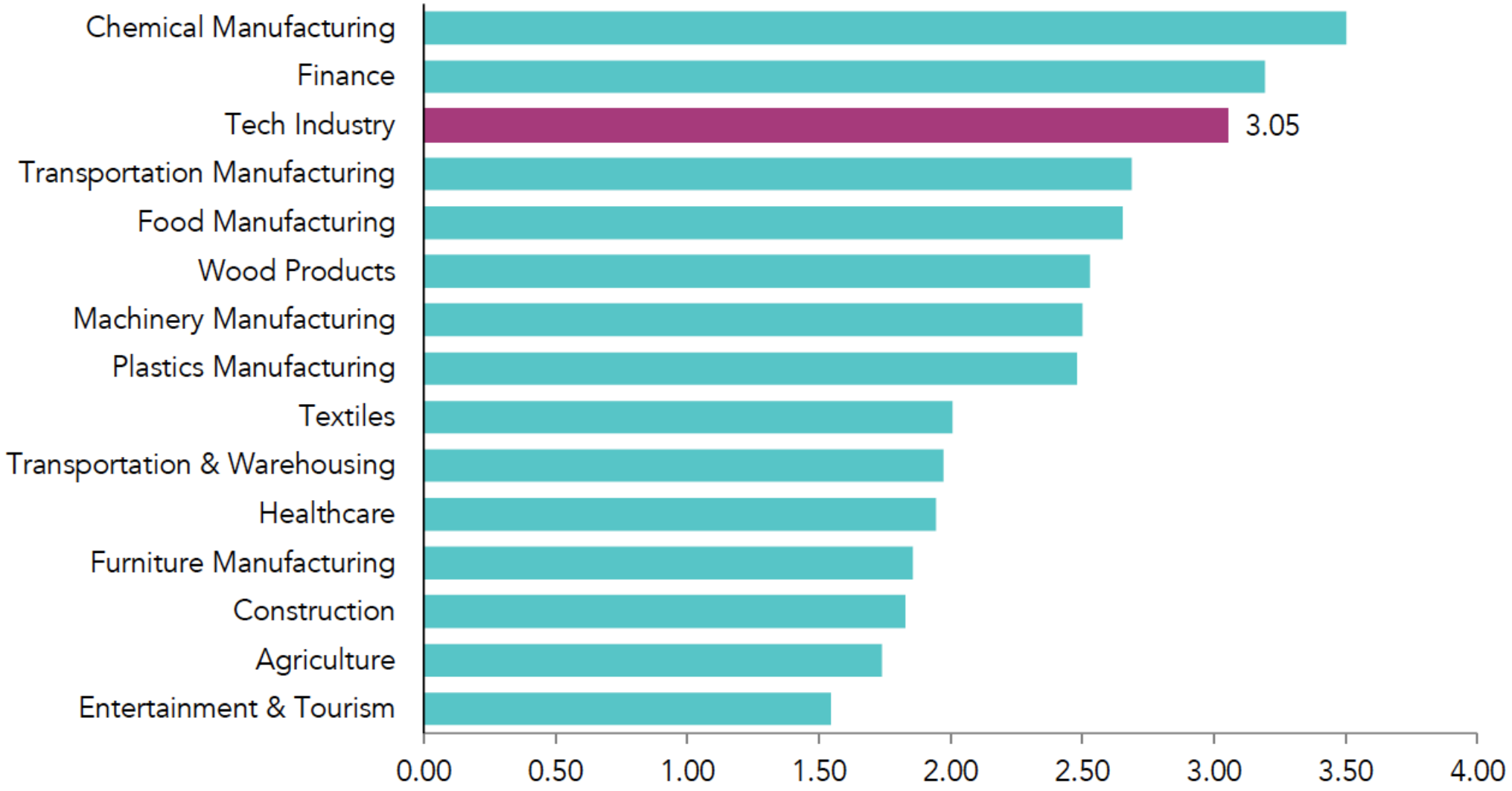
Source: EL estimates based on Lightcast 2022.4

Tech Industry Jobs as a Percentage of Total Jobs, 2021



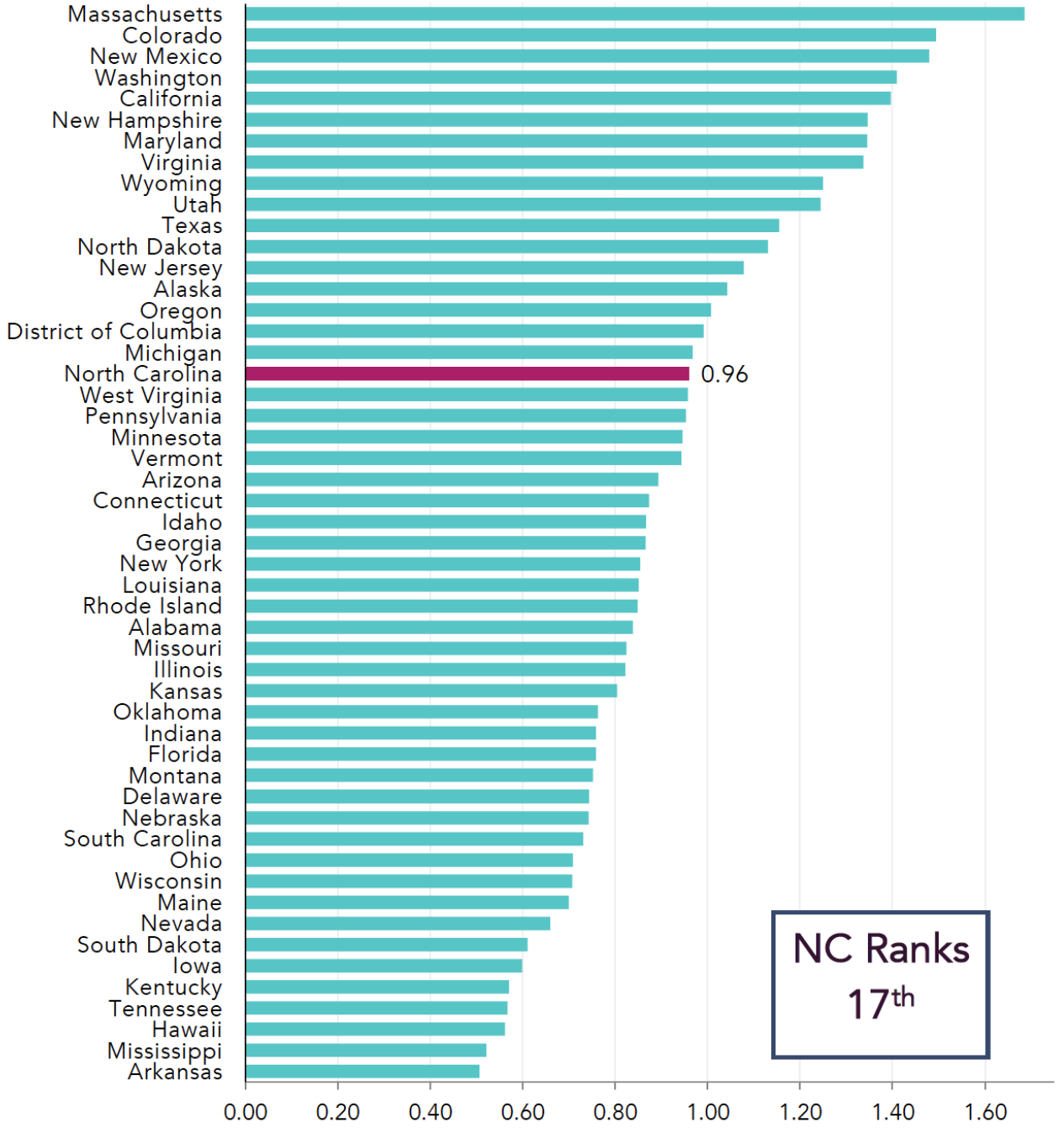
Source: EL calculations based on Lightcast 2022.4

NC Job Multiplier by Selected Industries, 2021



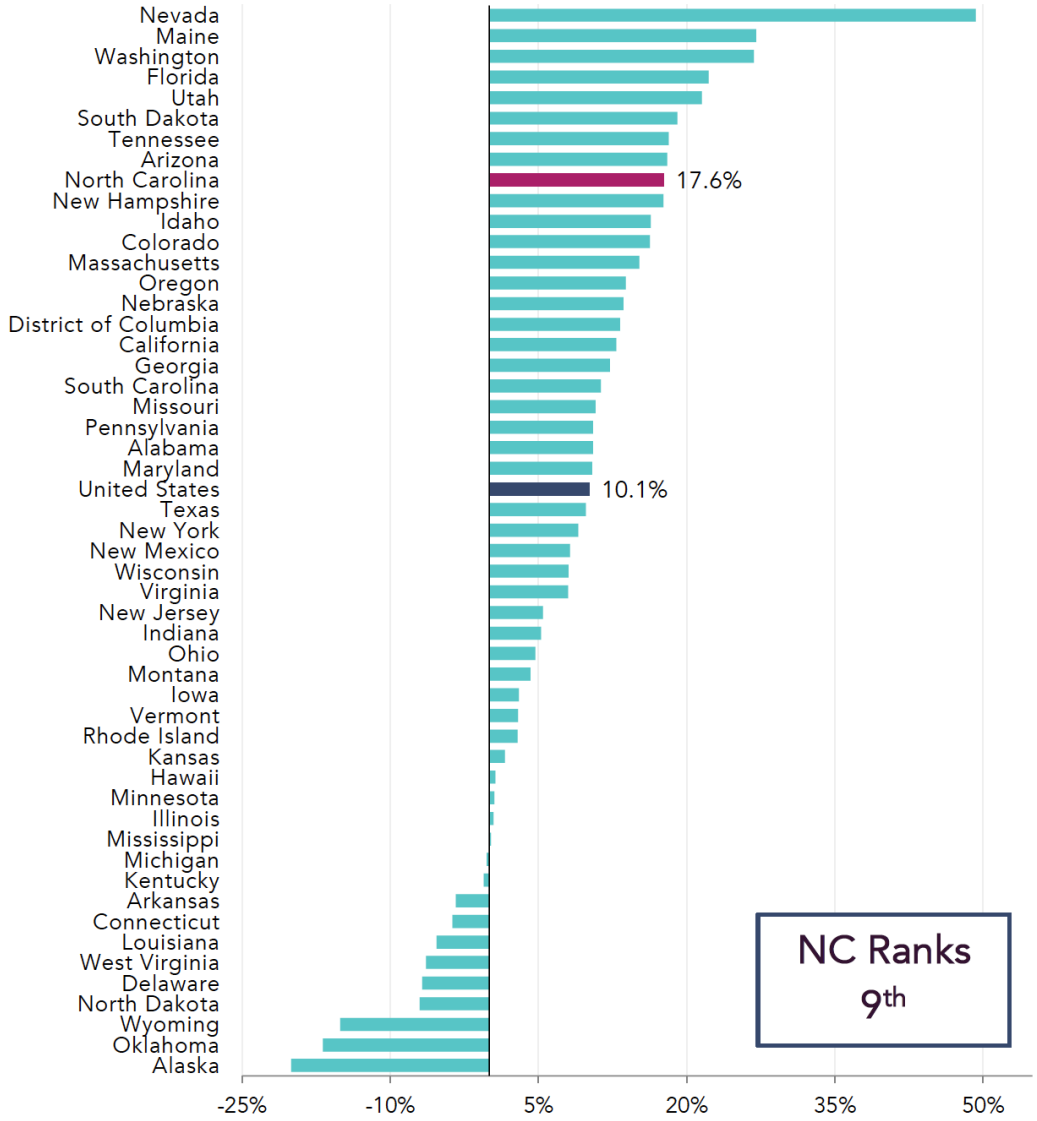
Source: EL estimates based on Lightcast 2022.4

Tech Industry Location Quotients, 2021



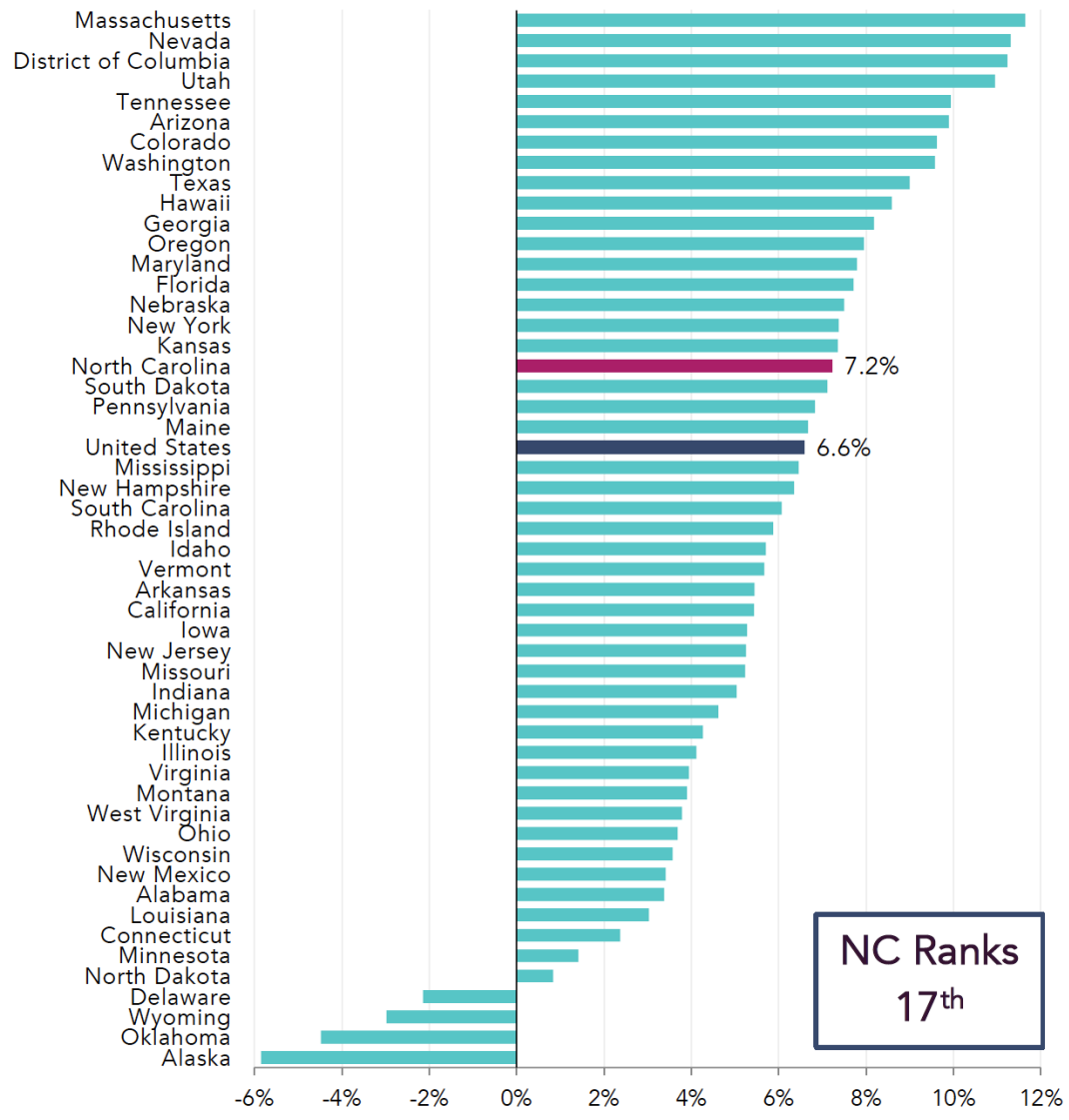
Source: EL estimates based on Lightcast 2022.4

Tech Industry Employment Growth, 2016-2021



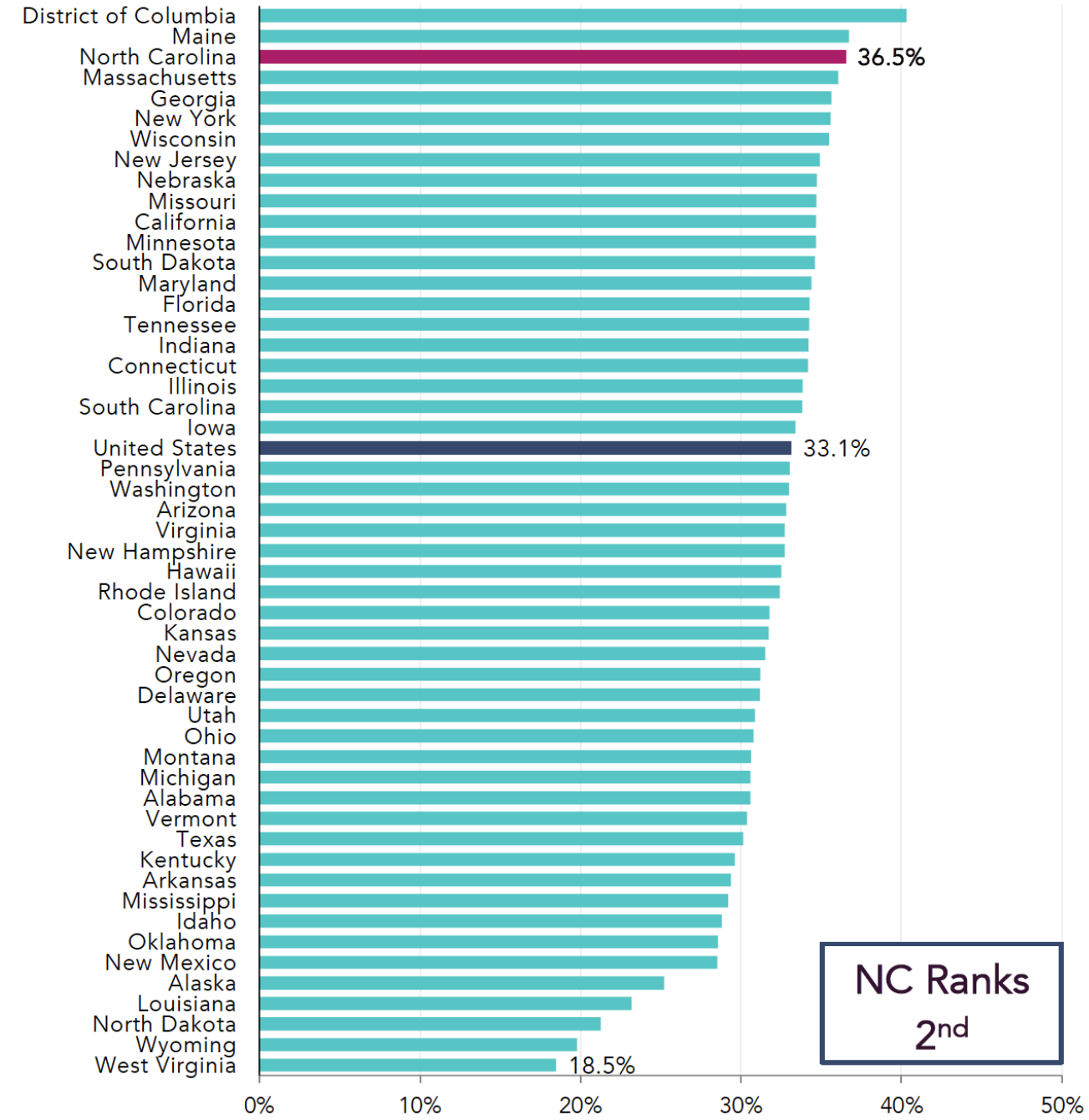
Source: EL estimates based on Lightcast 2022.4

Tech Industry Expected Employment Growth, 2022-2027



Source: EL estimates based on Lightcast 2022.4

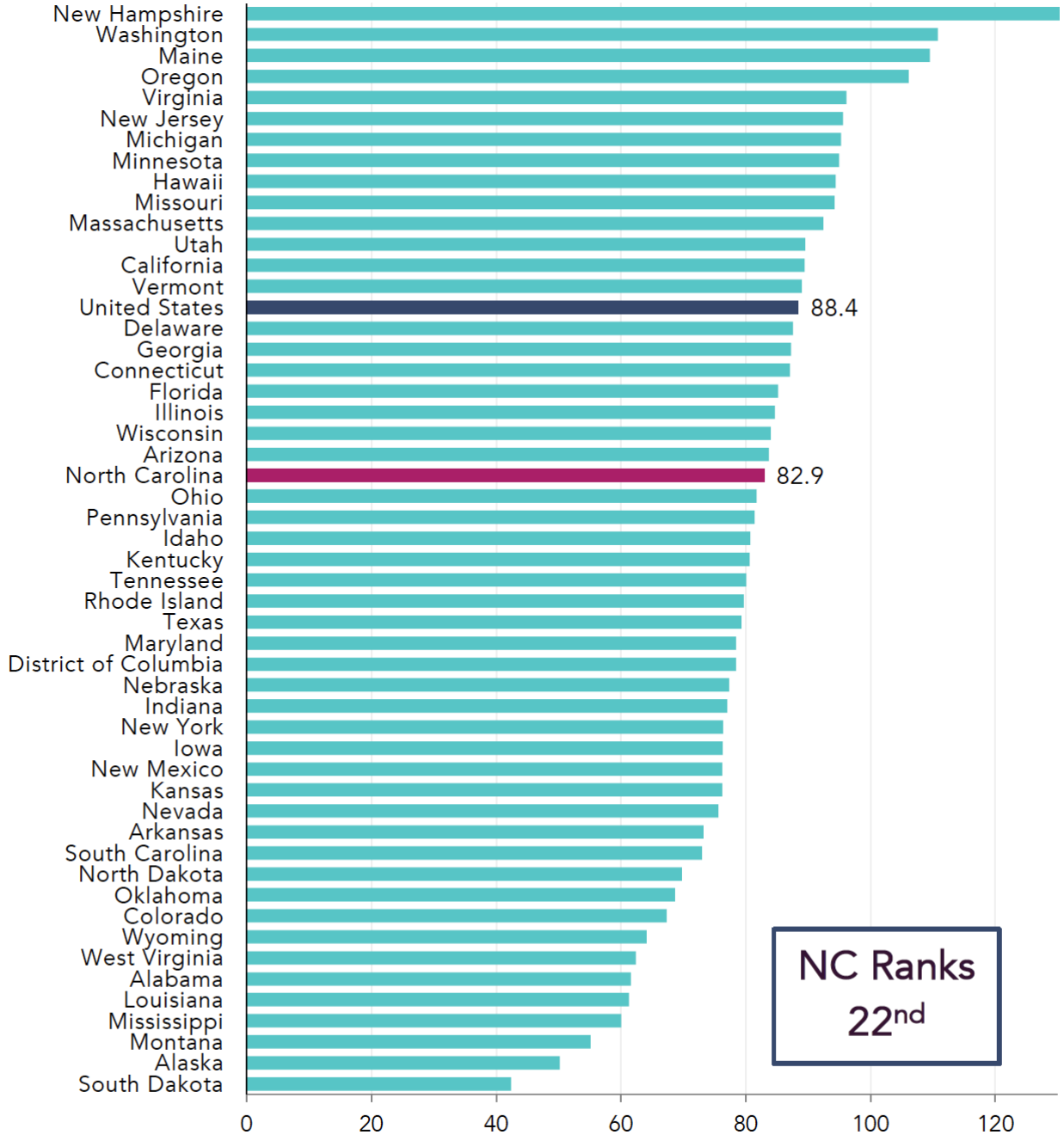
Percentage of Women in the Tech Industry Workforce, 2021



Source: EL estimates based on Lightcast 2022.4

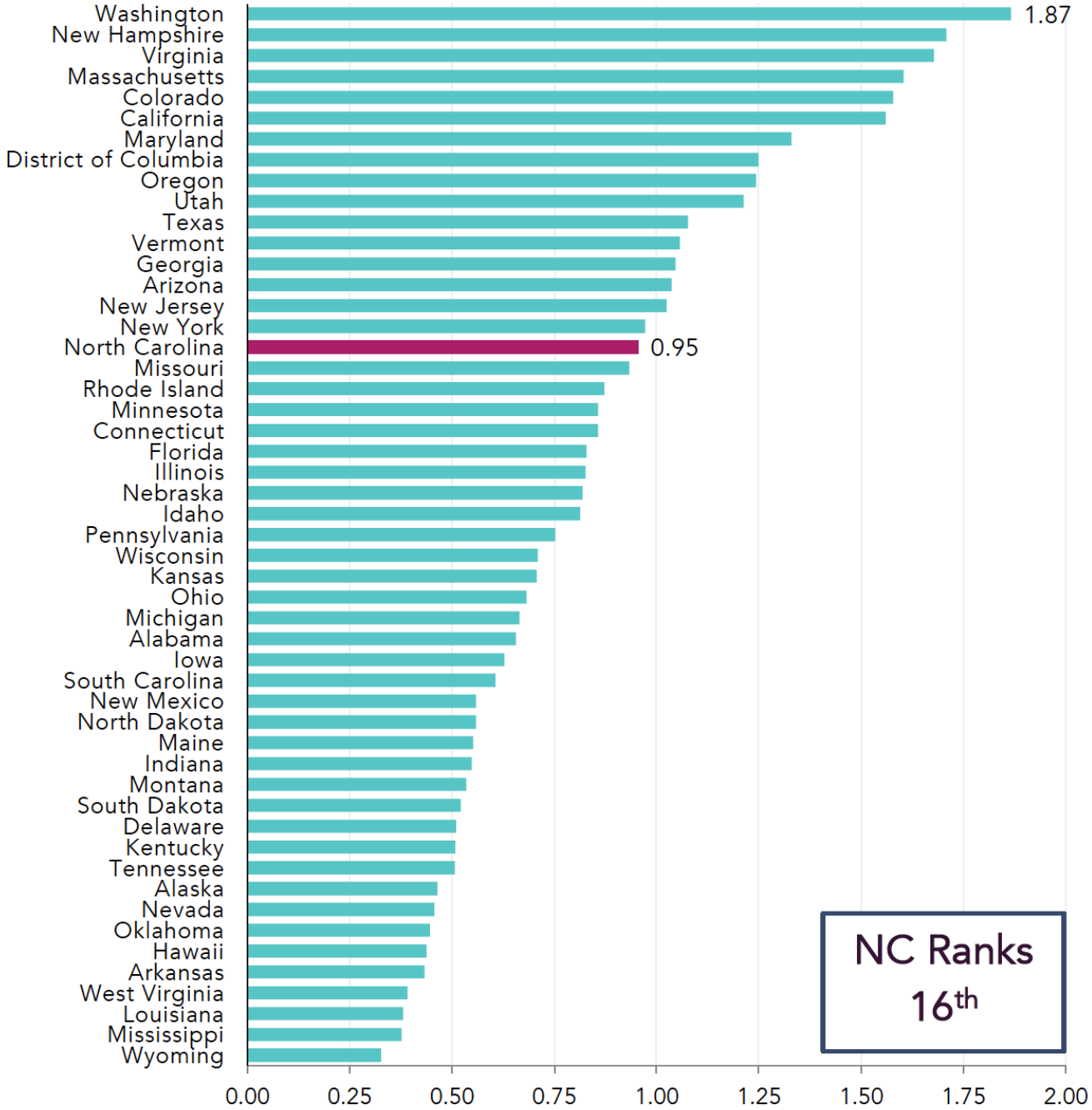
Tech Industry Diversity Index, 2021

The tech industry diversity index is calculated by dividing the percentage of tech industry workers who identify as people of color or in the Hispanic community by the ratio present in the overall population. Therefore, if a state has a tech industry diversity index lower than 100, this indicates that the tech industry is less diverse compared to the state's overall population. A value of 100 would mean the tech industry is representative of the state's overall population.



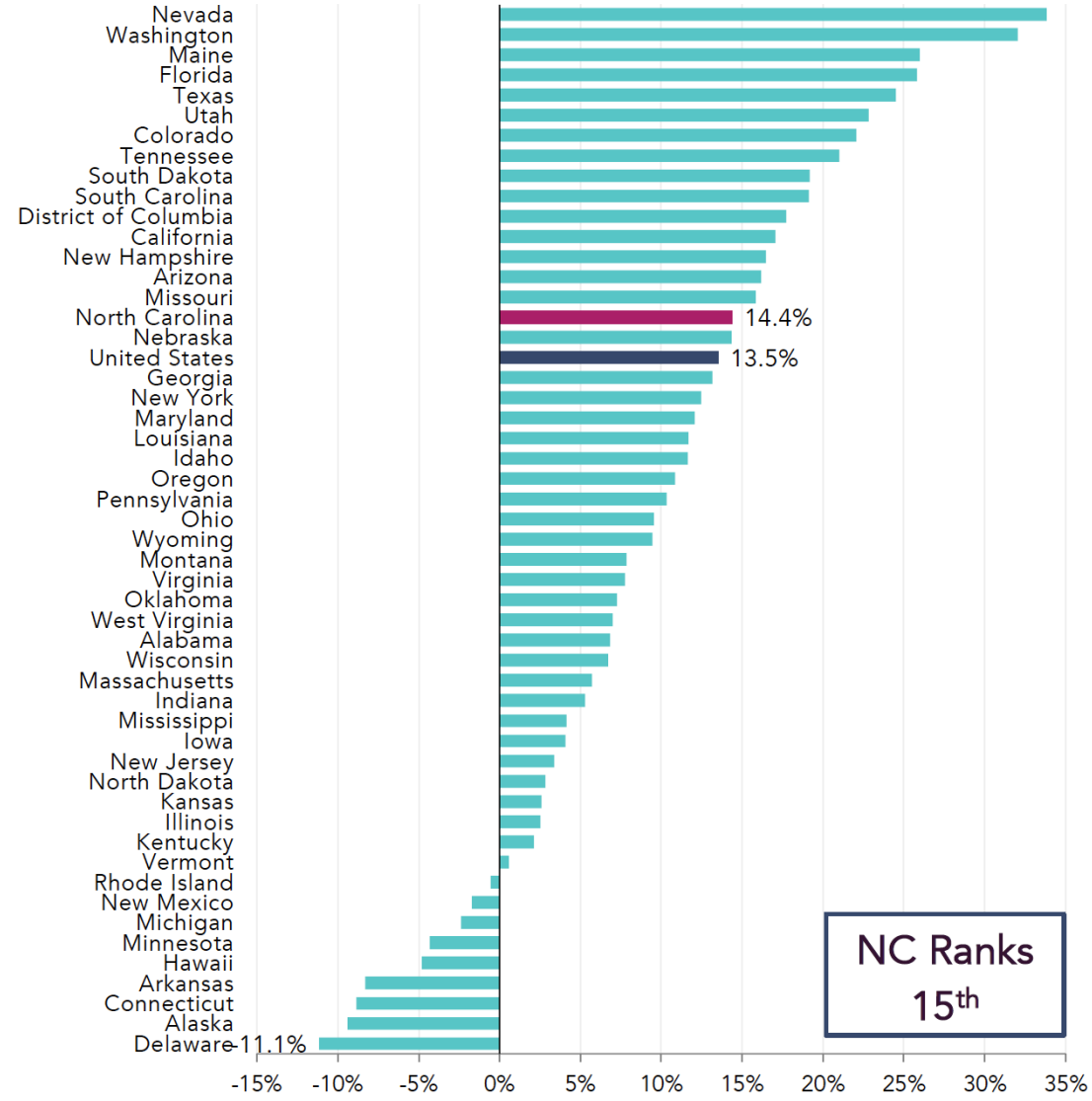
Source: EL estimates based on Lightcast 2022.4 and US Census Bureau (2022)

IT Industry Location Quotient, 2021



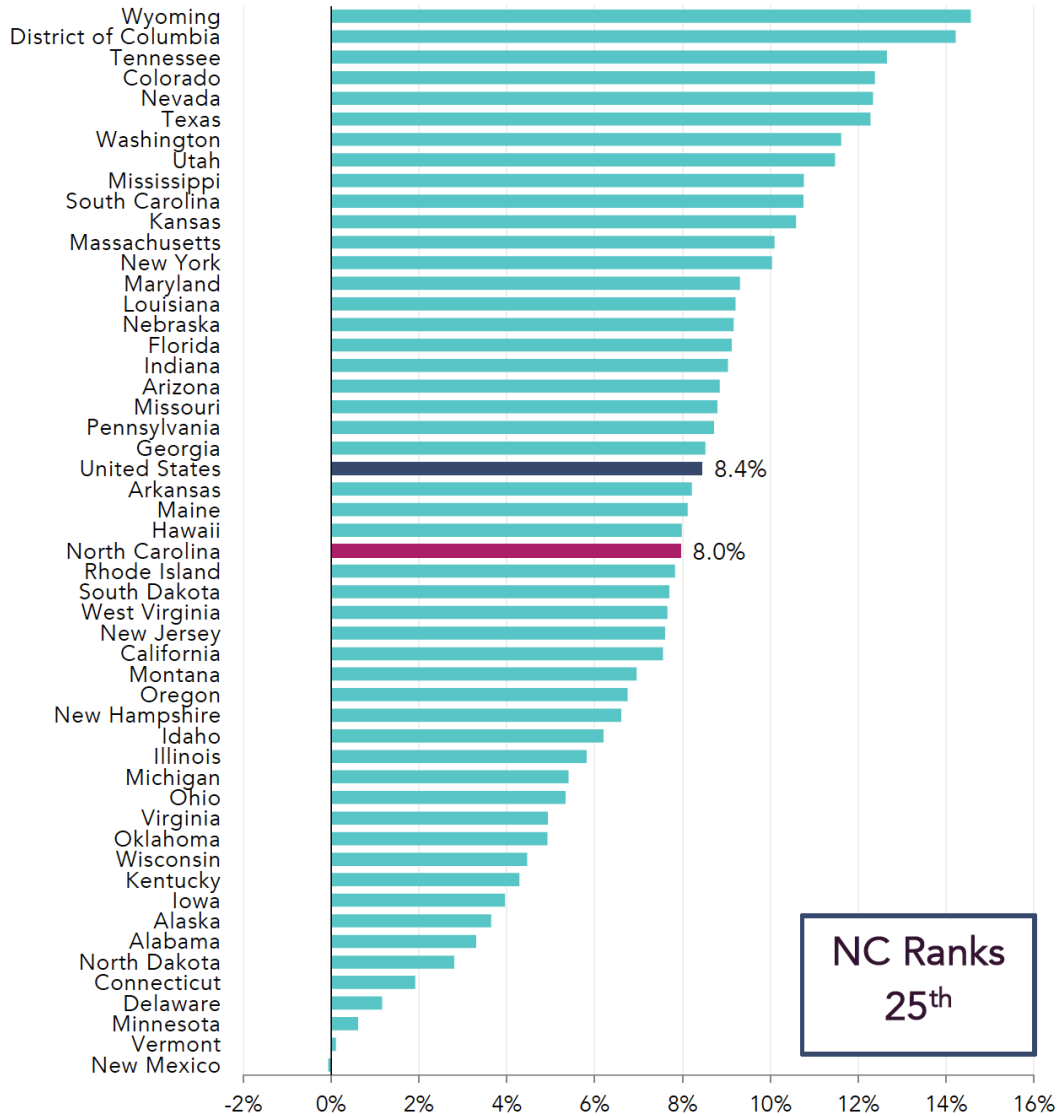
Source: EL estimates based on Lightcast 2022.4

IT Industry Employment Growth, 2016-2021



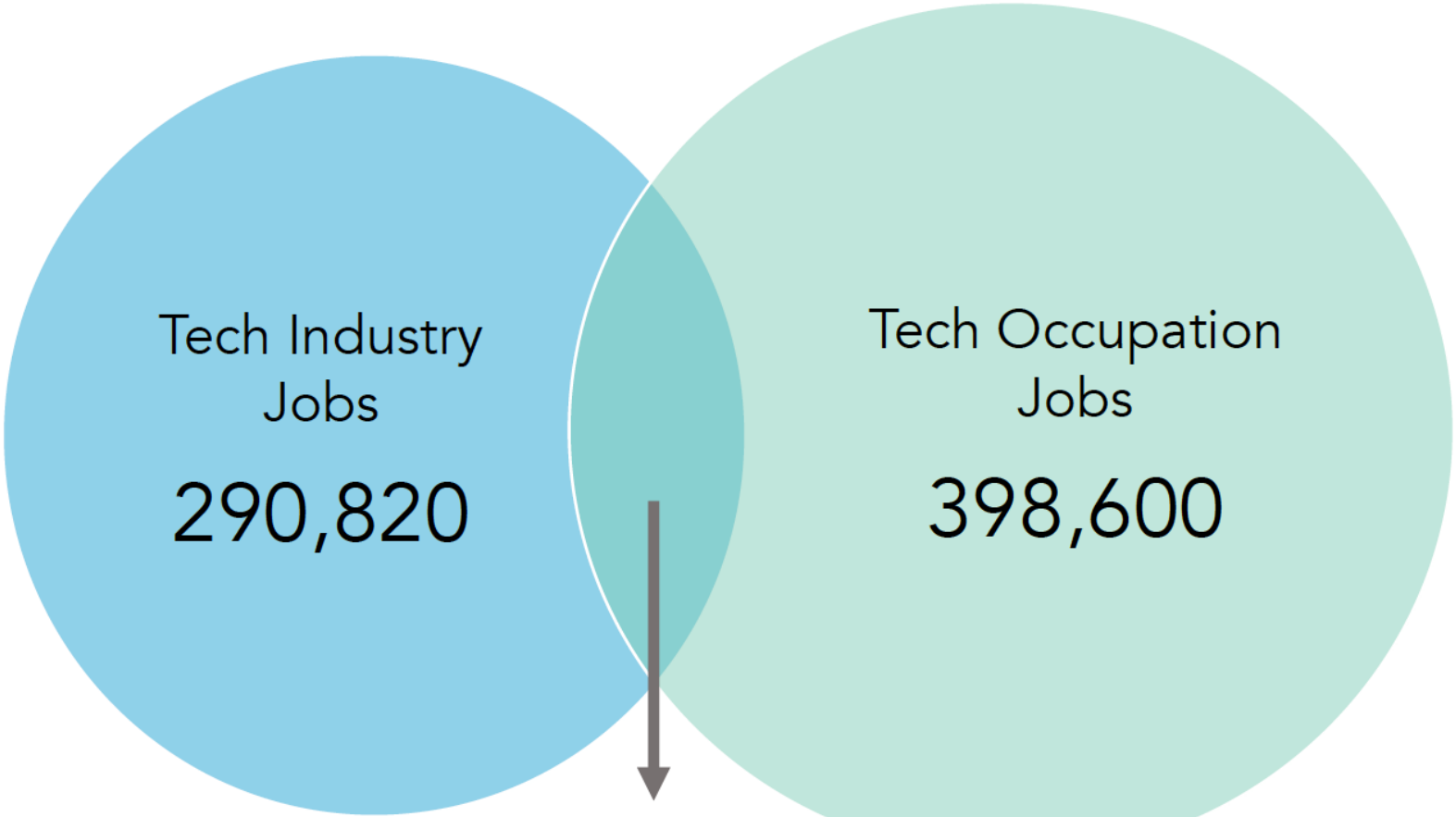
Source: EL estimates based on Lightcast 2022.4

IT Industry Expected Employment Growth, 2022-2027



Source: EL estimates based on Lightcast 2022.4

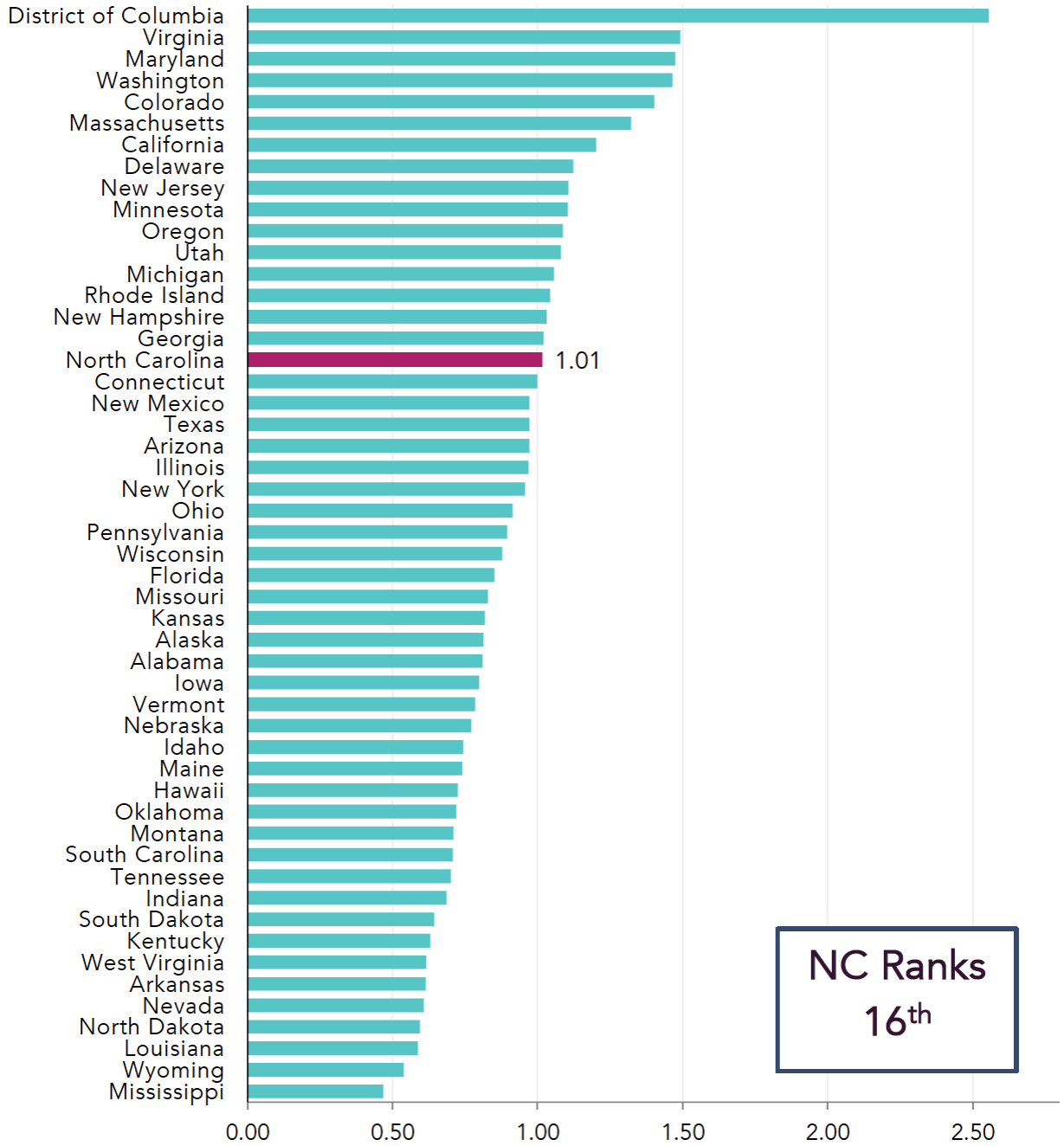
Staffing Patterns of Tech Industries and Tech Occupations, 2021



32% of tech occupation jobs are employed in tech industries.

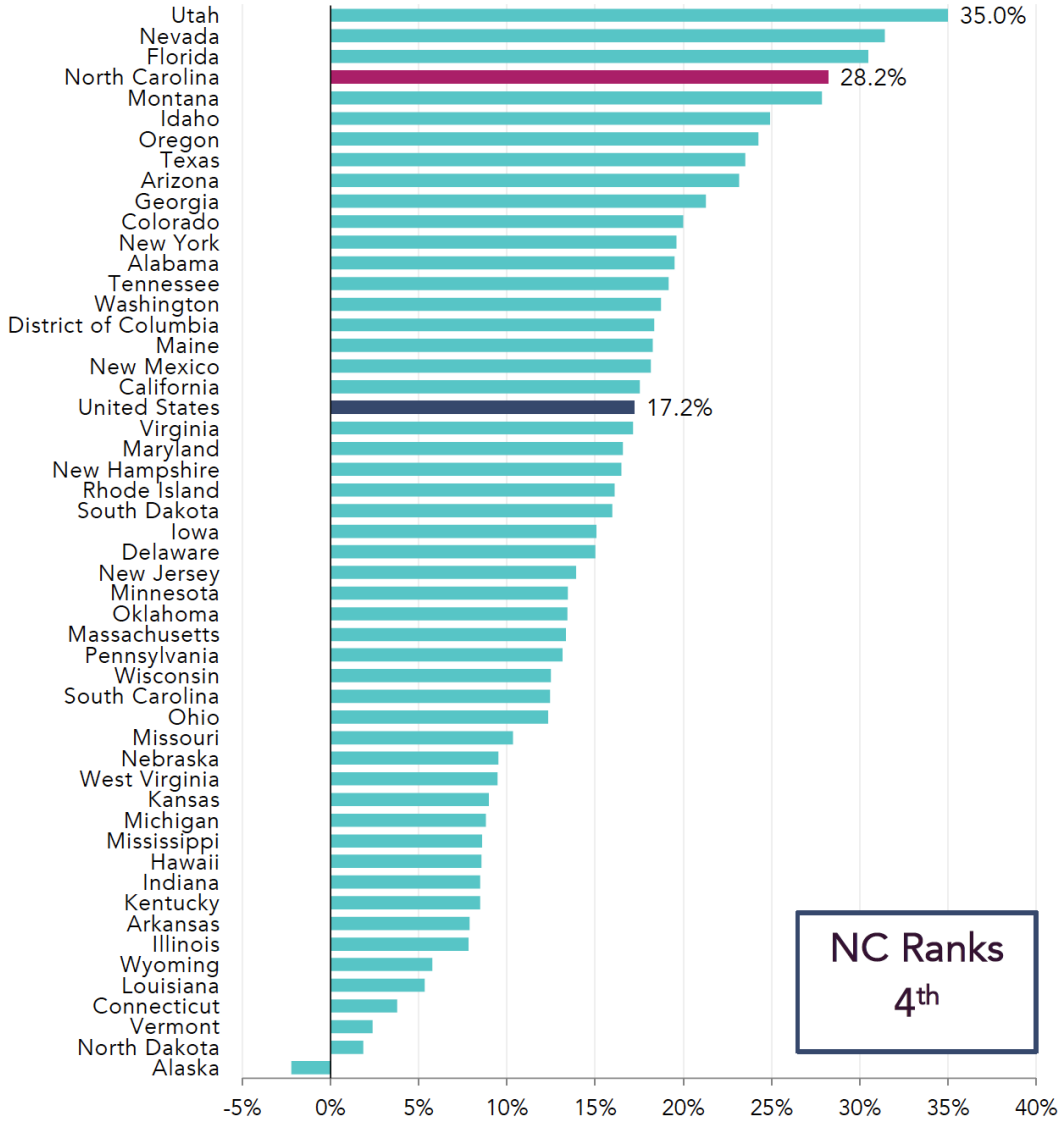
Source: EL estimates based on Lightcast 2022.4

Tech Occupations Location Quotient, 2021



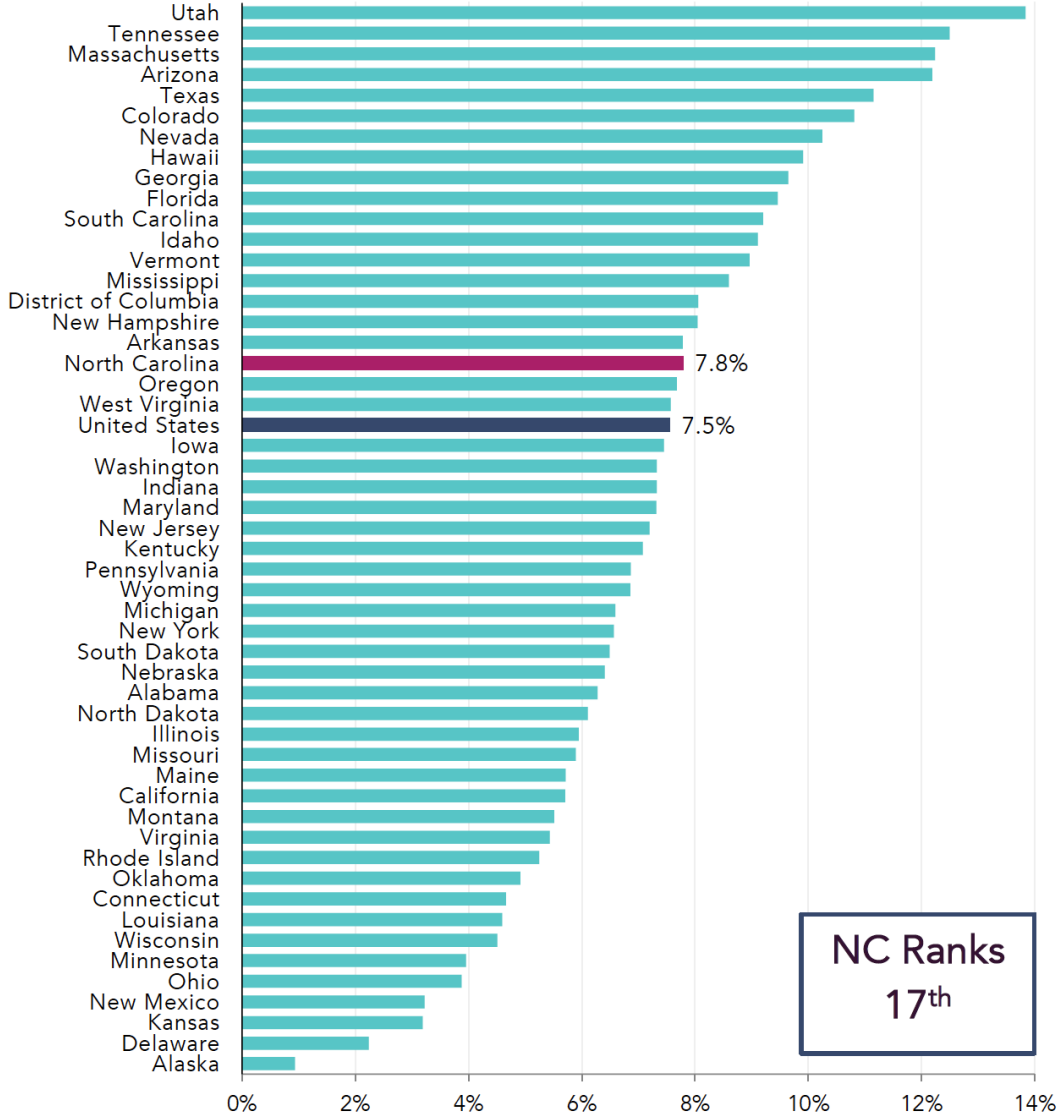
Source: EL estimates based on Lightcast 2022.4

Tech Occupations Growth, 2016-2021



Source: EL estimates based on Lightcast 2022.4

Expected Tech Occupations Growth, 2022-2027



Source: EL estimates based on Lightcast 2022.4

Thoughts, observations, or questions?