City Economic Growth: Implications for New Mexico

Prepared for presentation to

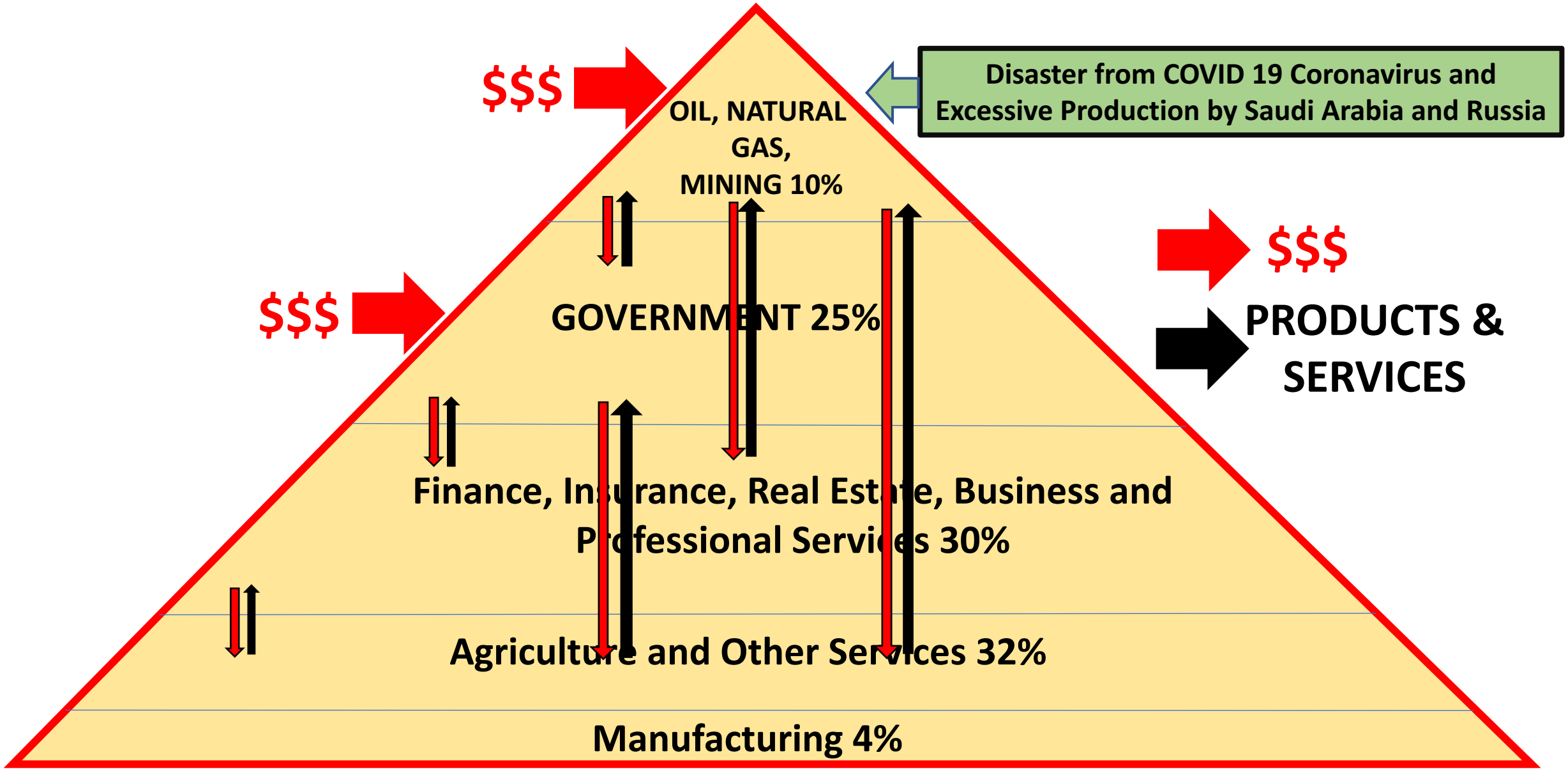
New Mexicans for Science and Reason

Dr. James Gover, IEEE Life Fellow

JGOVER@KETTERING.EDU

ON-LINE WITH ZOOM: April 8, 2020

New Mexico Gross Domestic Product $105 B



Recommended Response 1: State Education Content

- **NM needs a TWO DECADE strategic plan for economic development that is based on data and analysis and is accessible to the public. The goal should be development of a sector that can grow to 10% of state GDP in 10 years.**
- **NM needs a university strategic plan linked to NM's strategic plan for economic development that in 10 years results in 1 university in the WSJ top 50, 3 in the top 100 and all universities in the top 400. All university programs, but particularly STEM-based programs and business, must achieve high ratings.**
- **NM should focus its investments in high-tech education, emphasizing artificial intelligence (AI), data analytics, cybersecurity, Internet of Things (IoT), augmented reality (AR), robotics and machine learning (ML).**
  - **Embed these topics in multiple majors in New Mexico's universities and community colleges and make these major research topics. UNM already offers on-line Masters study in IoT that could be expanded to include other high-tech topics.**
  - **Also introduce these subjects in NM K-12 Schools. Naveen Rao, Intel Vice President says, "Beginning in the elementary grades, school systems must start thinking about their curricula with AI in mind, including development of whole new education tracks."**
  - **A first-of-its kind AI degree program is under development at the Australian National University by Senior Intel Fellow and computer science professor Genevieve Bell. Intel should help UNM, NMSU & NMTech develop similar programs.**

Recommended Response 2: Entrepreneurship

- **Only 3% of US universities, ALMOST ENTIRELY PRIVATE UNIVERSITIES, graduate 90% of today's "unicorn" founders. No unicorns are traceable to NM universities or NM National Labs.**
- **The University of New Mexico, New Mexico State and the New Mexico Institute of Mining and Technology with assistance from NM's government labs and Intel, must join that elite group and embed entrepreneurship coursework throughout their curricula.**
- **NM congressional delegation and NM governor must pressure USAF, DOE, SNL and LANL to spin-out NM-based companies with potential to grow into unicorns, e.g., turn R&D 100 Awards into NM companies.**
- **There must be a community wide effort including government, religious organizations, K-12 schools, colleges and universities and public service organizations in NM to build an entrepreneurial, innovative mind-set and culture.**
- **It is time for NM's community of innovators to provide leadership and expand their voice in NM policy development.**

How To Get Started

- **Governor Chair and Appoint Economic Development Committee of Executives from DOE, New Mexico Universities, National Labs, AFRL, U. S. Army, Intel, Major Cities, Think Tanks, Native Community, Mega Church Leaders, Major Counties and Retired Intellectually Elite to:**
  - **Develop 2 Decade State Economic Vision and Strategy for Reaching that Vision that Includes Developing a Sector Capable of Growing to 10% of State GDP**
  - **Develop Strategic Role for Universities in Implementing State Economic Vision**
  - **Develop Strategic Plan for Getting More State Economic Bang from Federal R&D Dollars Spent in New Mexico**
  - **Develop Plan for Utilizing Public and Private Institutions to Build an Entrepreneurial Culture throughout New Mexico**

Outline

- **Today's NM Economy**
- **Data on City Economic Growth that Lead to Recommendations**
  - **Economic Impact of Disruptive Technology**
  - **Organizations Studying City Economic Growth**
  - **Highlights of City Studies**
  - **Data on Job Creation and Economic Growth of Cities and States by CityLab, Milken, Brookings, ITIF**
- **Your Recommendations for NM**
  - **Respond by email to jgover@kettering.edu**

Today’s NM Economy

New Mexico 'left behind' in wage growth

BY STEPHEN HAMWAY / JOURNAL STAFF WRITER,
Friday, February 28th, 2020 at 11:05pm, *Albuquerque Journal*

- **"Albuquerque dropped precipitously on an annual list (Milken) that ranks the top cities in the nation for job, wage and tech-sector growth….(ACTUALLY STAGNATED WHILE OTHER CITIES ARE GROWING.)**
- **Kevin Klowden, who oversaw the study for the Milken Institute, said Albuquerque's ranking suffered from stagnant wages and relatively slow high-tech industry growth over the past several years. …**

Where Are We Now? Today's New Mexico Economy

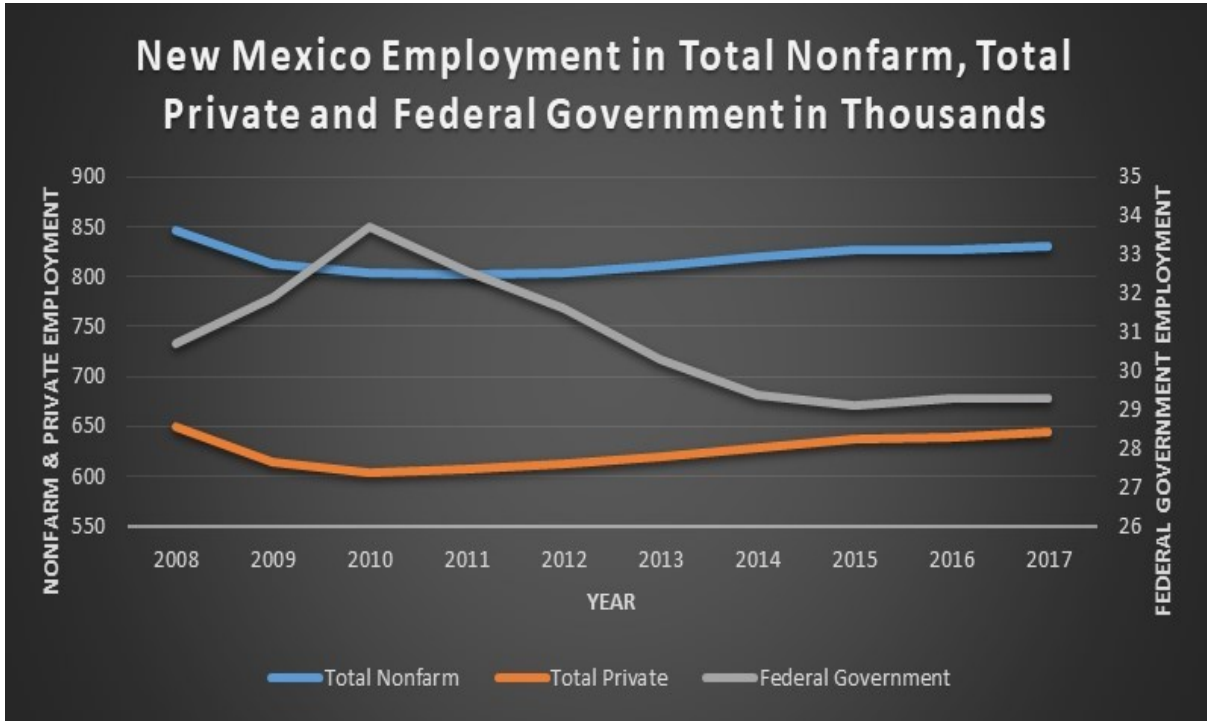
- **Rankings**
  - The national median household income is $58,820. NM's median household income is $46,744.
  - The national poverty rate is 13.4%. New Mexico's is 19.7%; Mississippi's is 19.8%; West Virginia's is 19.1%.
  - Wall Street Journal (WSJ) rankings place UNM between 400th and 500th and NMSU between 500th and 600th among the top 800 US universities. Other NM universities did not make WSJ's top 800 list. UNM ranks a very impressive 28 for tech transfer; NMSU ranks 172.
- **New Mexico GDP**
  - Mining Including Oil and NG Production Are 10% of NM GDP
    - State revenue from oil and gas activity was $3.1 billion in fiscal year 2019, up 41% from $2.2 billion in 2018.
    - Permian Basin shale oil producers need an average of $40-$50 per barrel to break even.
  - Government Employment Including SNL & LANL Are 25% of NM GDP
  - Finance, Insurance, Real Estate, Business and Professional Services Are 30% of NM GDP
  - Today's NM economy is fueled by nuclear weapons and oil and natural gas recovery. Nuclear weapons will be around at some level because of periodic updates; however, oil and gas recovery from shale has major economic and environmental risks including, excess supply by Saudi Arabia and Russia and COVIF-19 reducing demand.
- **What Must NM Develop This Decade to Replace Oil and NG Revenue?** ($1/yr/barrel decrease in oil price costs NM general fund $22M. Oil and gas companies have over $200 billion in debt due in next four years. –WSJ, 3/11/2020)

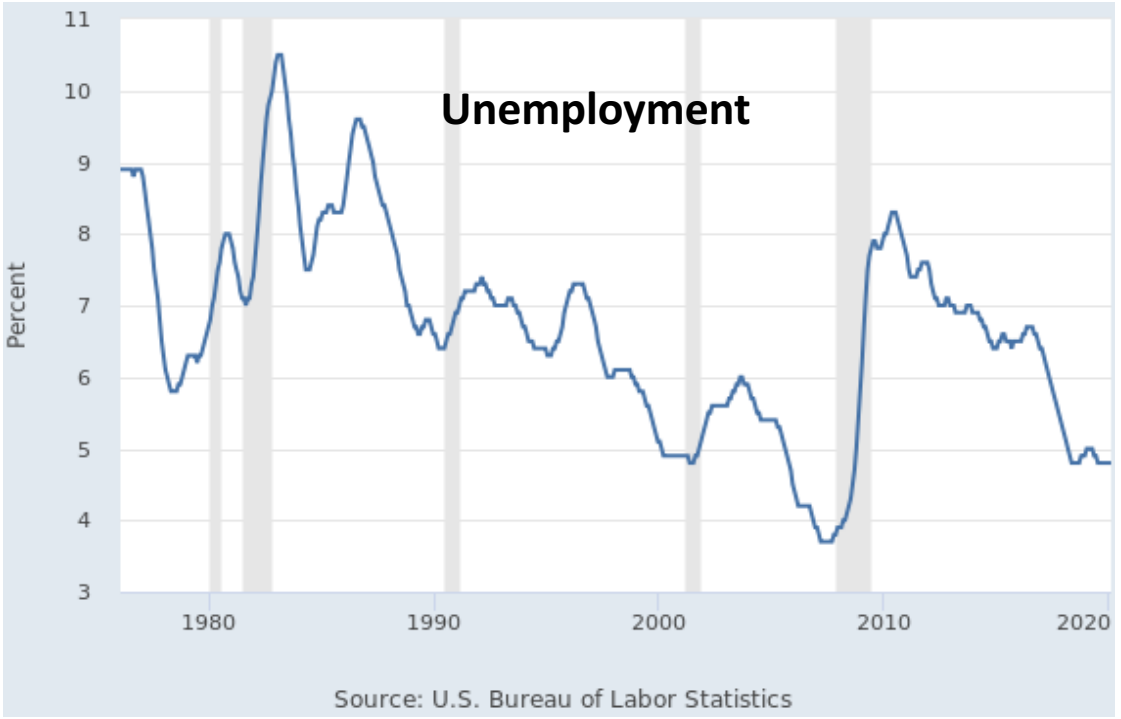
Oil price plunge wallops NM

BY KEVIN ROBINSON-AVILA / JOURNAL STAFF WRITER
Published: Monday, March 9th, 2020 at 10:02pm
Updated: Monday, March 9th, 2020 at 10:09pm

- **The coronavirus and the collapse of price-stabilization agreements among Russia and members of the Organization of Petroleum Exporting Countries are crashing oil prices.**
- **The (NM) state budget … will be the first casualty of the new price war, since each dollar decline per barrel of oil over a year's time translates into about $22 million in lost annual state revenue.**

New Mexico Economic Data





New Mexico Rankings by Forbes

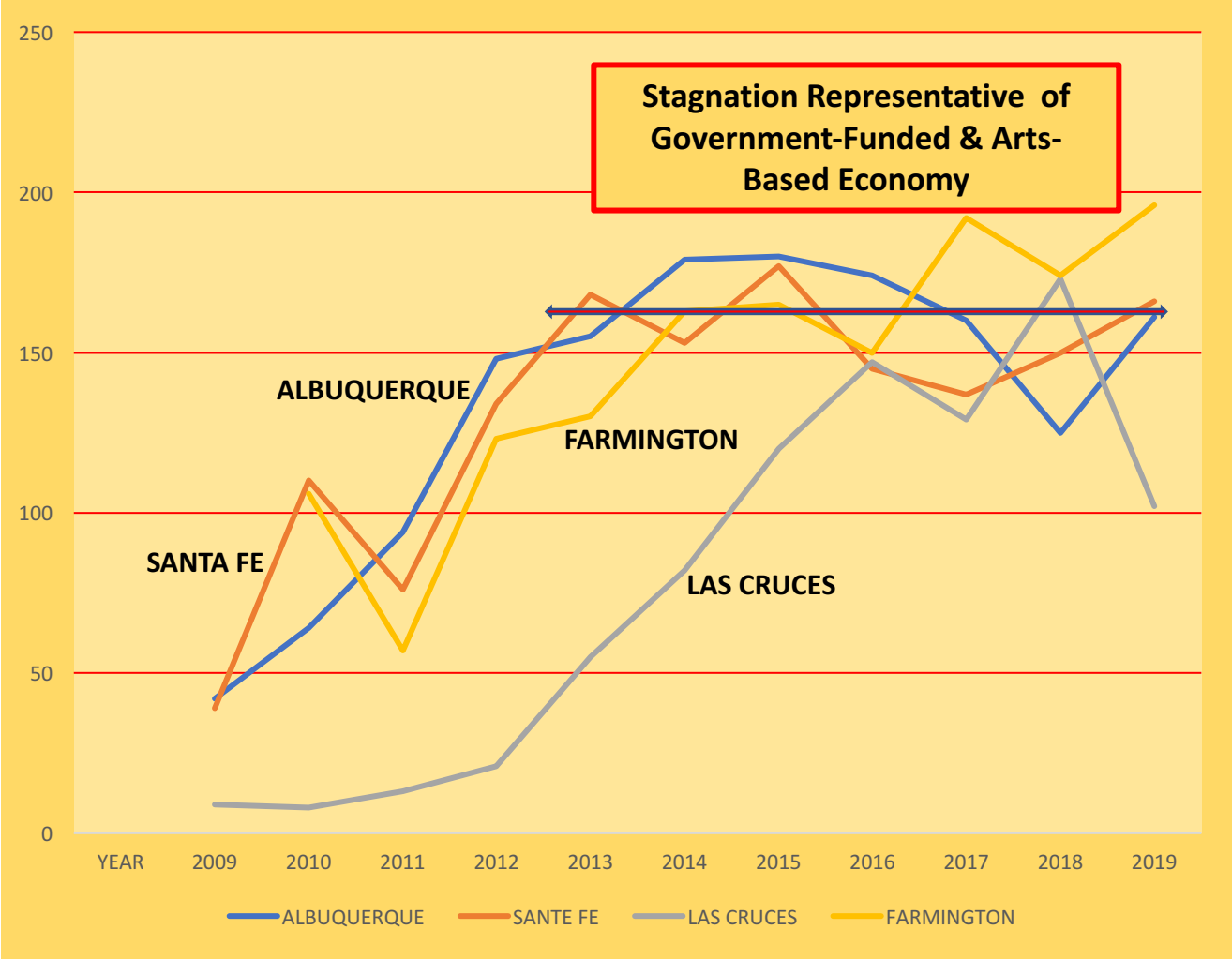
Gross State Product $105 B As of December 2019

- Population: 2,095,400
- Governor: Michelle Lujan Grisham
- Median Household Income: $47,723
- Job Growth (2019): 1.8%
- Cost of Doing Business: 2% above national average
- College Attainment: 27.1%
- Net Migration (2018): -2,100
- Moody's Bond Rating: Aa2

Forbes Lists

- #48 Best States for Business
- #34 in Business Costs
- #46 in Labor Supply
- #46 in Regulatory Environment
- #44 in Economic Climate
- #15 in Growth Prospects
- #49 in Quality of Life

History of New Mexico City Rankings by Milken:
2009-2019 Albuquerque, Santa Fe, Las Cruces & Farmington



YEAR	ALBUQUERQUE	SANTE FE	LAS CRUCES	FARMINGTON
2009	42	39	9	
2010	64	110	8	106
2011	94	76	13	57
2012	148	134	21	123
2013	155	168	55	130
2014	179	153	82	163
2015	180	177	120	165
2016	174	145	147	150
2017	160	137	129	192
2018	125	150	173	174
2019	161	166	102	196

Data taken from Milken annual rankings of cities, 2009-2019.

Comparison of Utah and New Mexico Economies

- **Utah has 3 Cities in 2018 Milken's Top 25 for Large Cities and 2 Cities in Milken's Top 10 for Small Cities. Ratings are based on rates of job creation, salary growth and technology adoption.**
  - **Albuquerque is ranked 161 with an average ranking since 2013 of 162.**
- **BYU Has Spun-Out 5 Unicorns and Milken Ranks BYU #4 for Tech Transfer. 1/6 BYU Students Take Entrepreneurship Course. Milken Ranks University of Utah #1 for Technology Transfer**
  - **UNM ranks a very high #28 for technology transfer + SNL and LANL have major tech transfer programs and science parks. None of their spin-offs have grown into unicorns. Very few public universities, e.g. University of MI and UC Berkeley, have graduated unicorn founders.**
- **Utah's Poverty Rate in 2017 was 9.7 percent. That was sixth lowest nationally. The national poverty rate was 13.4 percent. Only 4.2 percent of Utah households make less than $10,000 a year; only 5.7 percent make $200,000 or more.**
  - **NM's poverty rate is 19.7 percent.**
- **Utah's median household income was $68,358. The national median income was $58,820.**
  - **NM's median household income is $46,744.**
- **Utah has the lowest income inequality in the US.**
  - **NM has the 14TH highest income inequality and NM ranks 6th for inequality growth rate.**

The Salt Lake Tribune, Census: Utah ranks No. 1 for equality of incomes — at least for now, September 12, 2018

Data on City Economic Growth that Lead to Recommendations

Summary of High-Tech's World-Wide Economic Impact

- **Artificial Intelligence (AI) developers and Machine Learning (ML) engineers are earning over $200,000 per year. Between 2015 and 2018 there was 344 percent growth in ML job postings.**
- **AI has the potential to add $13 trillion or 1.2% of global GDP growth per year. World-wide spending on AI reached $35.8 billion in 2019 (2/3 spent in US) and will grow to $79.2 billion in 2022.**
- **In 2018, 1,800 new AI-based start-up companies raised $19 billion in equity funding.**
- **AI-intensive cybersecurity is estimated to be valued $300B by 2025.**
- **Internet of Things (IoT), also AI intensive, could have an annual economic impact up to $11.1 trillion by 2025 across many different settings, including factories, cities, healthcare and retail. UNM offers an on-line MS in IoT.**
- **NM-based Intel has acquired Habana Labs, an Israel-based developer of programmable deep learning accelerators for data centers for $2 billion. This strengthens Intel's AI portfolio and accelerates its efforts in the fast-growing AI chip market, which should reach $25 billion by 2024.**

Number of Times Each Asset Is Mentioned in Milken Ranking of 2018 Top 25 Cities for Job Creation, Wage Growth and Technology Adoption

- **High-Tech Industry Cluster: 13**
- **Favorable Business Climate: 9**
- **University: 9**
- **Educated/Trained Workforce: 9**
- **Entrepreneurship/Start-Ups/Innovation: 7**
- **Diversified Economy: 4**
- **Tourism/Retirees: 3**
- **Manufacturing: 2**
- **Cannabis Growth: 0**
- **Renewable Energy: 0**
- **Movie Making: 0**

Highlights of City/Metro Economic Studies by CityLab, Milken Institute, Brookings, and ITIF

- **"The future of America's economy lies in its high-tech innovation sector." (Brookings/ITIF)**

- **The innovation sector —comprised of 13 of the nation's highest-tech, highest-R&D "advanced" industries— has widened the nation's regional divides. *Fully one-third of the nation's innovation jobs now reside in just 16 counties, and more than half are concentrated in 41 counties.***

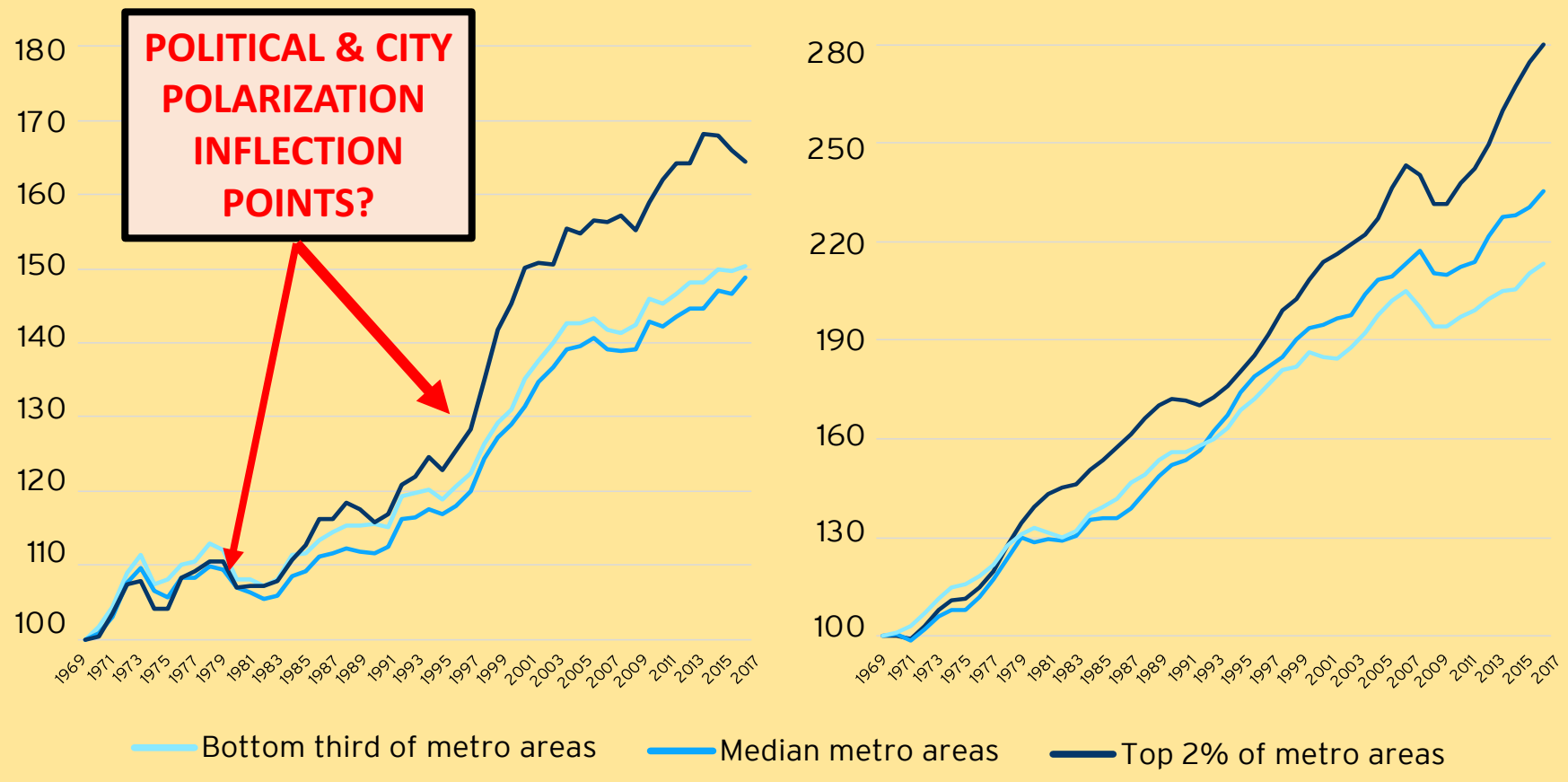
- **Most midsized cities and smaller towns (let alone rural areas) have struggled to make progress in amassing critical innovation industries, with many falling farther behind. For most of them, "innovation" or advanced-industry-sector employment and incomes have declined. Many such places have been left to cope with brain drain, the hollowing out of the labor market, and industrial decline.**

.

- **The innovation sector has generated significant technology gains and wealth but has also helped spawn a growing gap between the nation's dynamic "superstar" metropolitan areas and most everywhere else. This economic gap has major education, social, and political costs and is promoting the populist movement and political polarization.**

Since the 1980s, wage and employment growth convergence among metro areas has broken down

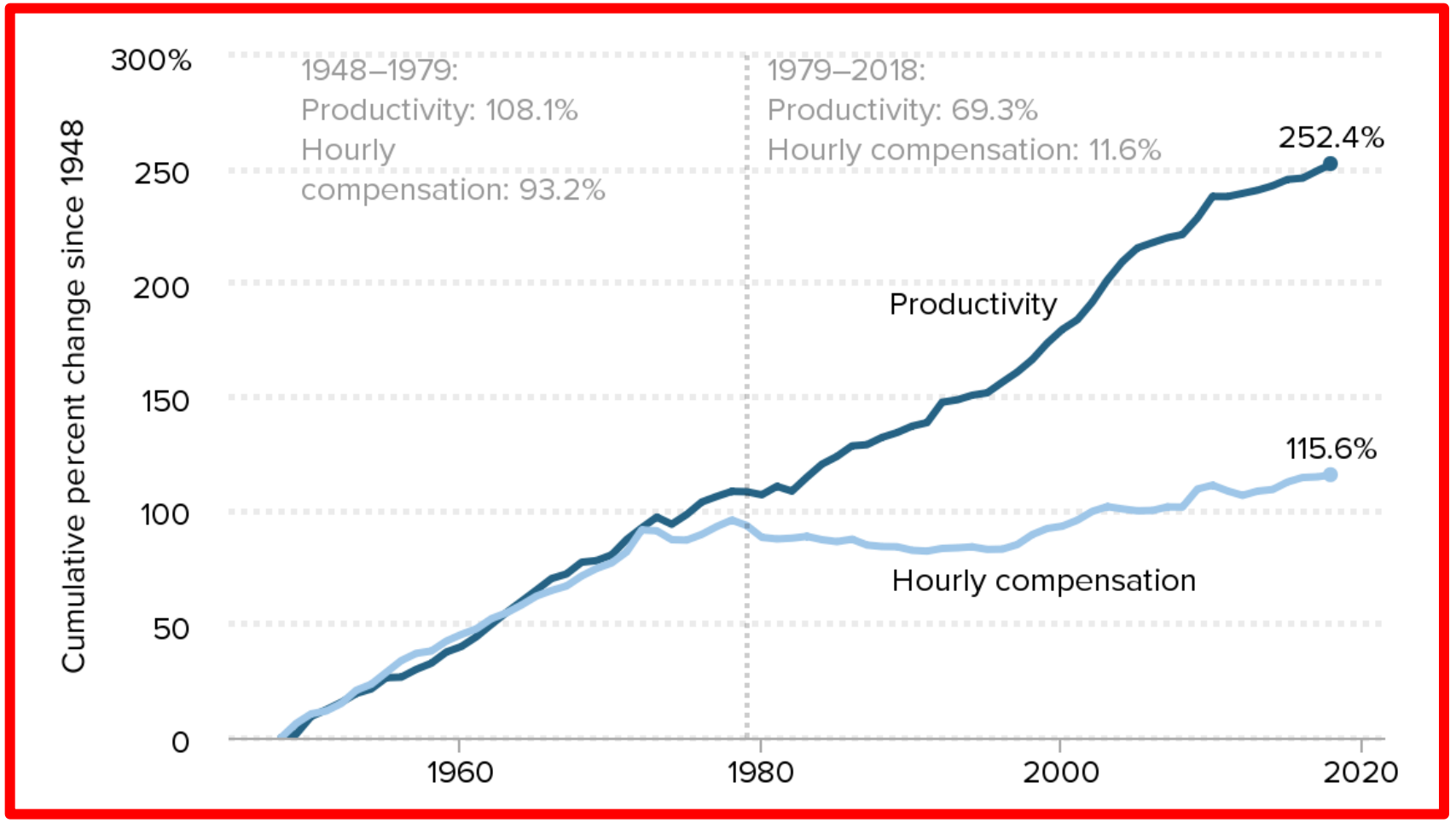
From 1880 to 1980, incomes across states "converged" at a rate of 1.8% a year. In other words, low-income states' economies grew faster than high-income states' economies. Wages in poorer metropolitan areas likewise grew 1.4% faster than those in higher-wage metro areas between 1940 and 1980.



Source: Brookings analysis of BEA data

THE CASE *for* GROWTH CENTERS How to spread tech innovation across America, ROBERT D. ATKINSON, MARK MURO, *and* JACOB WHITON, Brookings and Information Technology & Innovation Foundation, December, 2019.

The gap between productivity and a typical worker's compensation has increased dramatically since 1979



Economic Policy Institute, August 16, 2019

Factors determining job location decisions & Talent Needed 2018–2022, by US industry

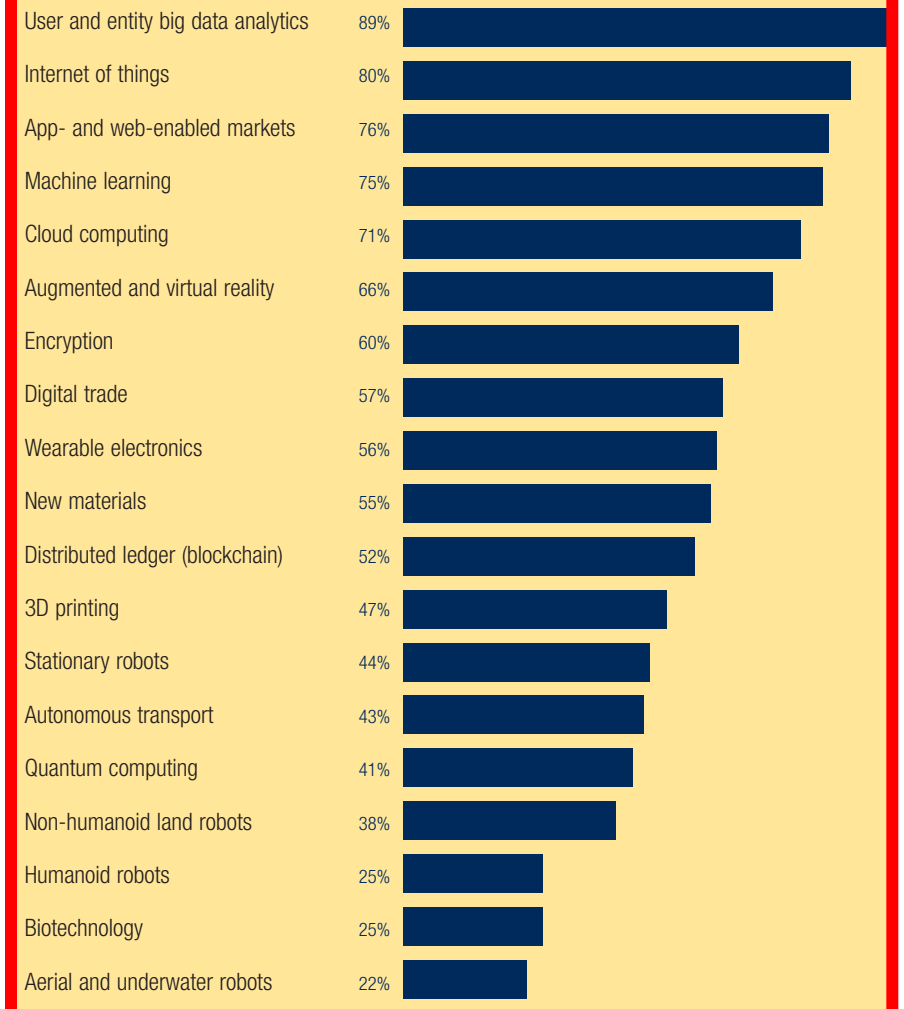
Factors determining job location decisions

Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Labour cost
Aviation, Travel & Tourism	Talent availability	Organization HQ	Ease of importing talent
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Production cost
Consumer	Talent availability	Labour cost	Quality of the supply chain
Energy Utilities & Technologies	Labour cost	Talent availability	Production cost
Financial Services & Investors	Talent availability	Organization HQ	Labour cost
Global Health & Healthcare	Talent availability	Labour cost	Production cost
Information & Communication Technologies	Talent availability	Labour cost	Organization HQ
Infrastructure	Talent availability	Labour cost	Production cost
Oil & Gas	Talent availability	Labour cost	Production cost
Professional Services	Talent availability	Labour cost	Strong local ed. provision

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

World Economic Forum, 2018 Jobs Report

Technology adoption *(share of companies surveyed)*



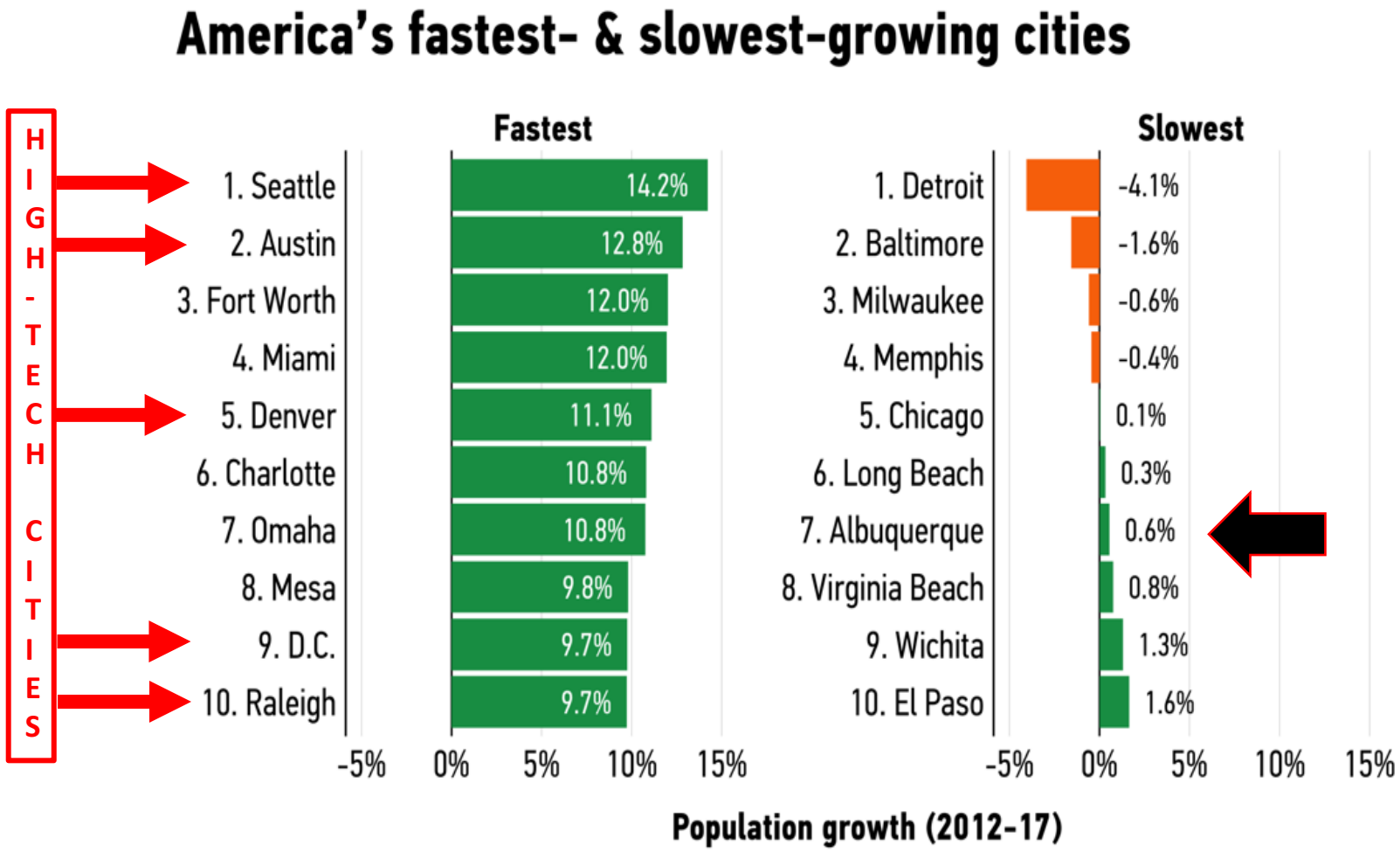
Why Is It So Difficult to Know a City's Competitiveness Trajectory?

- **It Is Politically Expedient for Mayors, Economic Development Officials, Government Labs and Governors to Claim Success Regardless of Facts.**
- **Expertise Is not Respected – See: How America Lost Faith in Expertise And Why That's a Giant Problem By Tom Nichols, March/April 2017 Foreign Affairs.**
- **City and State Economic Development Strategies Are Tactical, Unfocused, Opaque, Unsteady and Are Politically Driven, not Research or Data-Based.**
- **Many Want to Believe Their Community Is The Best – Pollyanna Syndrome with Cheerleading Replacing Leadership.**
- **Local Newspapers' Business Model Has Been Disrupted by the Internet and Social Media**
  - **Reduced emphasis on watchdog role**
  - **Cannot afford time, if capable, for synthesis of think tank and university studies**
  - **Few readers are interested in complex economic or high-tech matters**
  - **Easiest path: align with a particular political point-of-view, blame someone and pander to the Pollyanna readers by offering them the journalism equivalent of "sound-bites" and Dick and Jane stories. For something different try The Economist for periodical and BBC for news.**
- **Sorting Fact From Fiction Makes the Priority List of Very Few.**

Organizations Studying City Economic Growth

- **CityLab**
  - **Richard Florida is a co-founder and editor at large of CityLab and a senior editor at *The Atlantic.* He is a university professor in the University of Toronto's School of Cities and Rotman School of Management, and a distinguished fellow at New York University's Schack Institute of Real Estate and visiting fellow at Florida International University.**
- **Milken Institute**
  - **The Milken Institute is a nonprofit, nonpartisan think tank. Its Center for Regional Economics promotes prosperity and sustainable growth by advancing regional competitiveness and job creation. Milken issues an annual report on city economic growth.**
- **Brookings Institution**
  - **The Brookings Institution is the highest rated think tank in the world. It conducts research and education in the social sciences, primarily in economics, metropolitan policy, governance, foreign policy, global economy, and economic development. Mark Muro, Senior Fellow and Policy Director of Brookings Metropolitan Policy Program, focuses on regional technology ecosystems and economic development and has published extensively on digital trends, automation, advanced industries, and regional development issues.**
- **Information Technology and Innovation Foundation**
  - **The Information Technology and Innovation Foundation (ITIF) is a U.S. nonprofit public policy think tank based out of Washington, D.C. The organization focuses on public policies that spur technology innovation. Robert D. Atkinson is president of ITIF. Much of his work is at the intersection of technological innovation and public policy.**

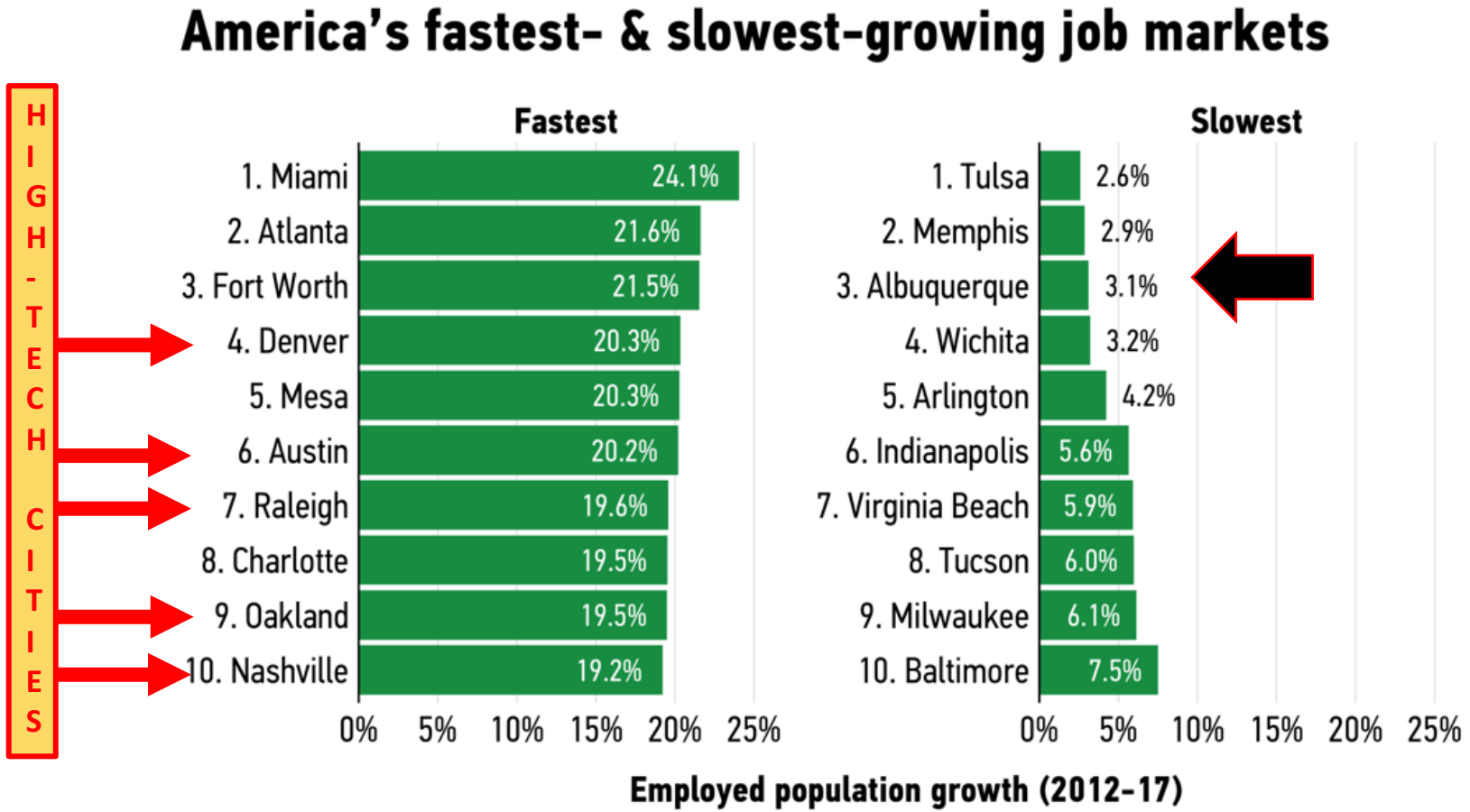
CityLab Ranking of Cities Based on % Population Growth



Source: U.S. Census (David H. Montgomery/CityLab)

The Fastest-Growing U.S. Cities Aren't What You Think, RICHARD FLORIDA , CityLab, AUGUST 21, 2019

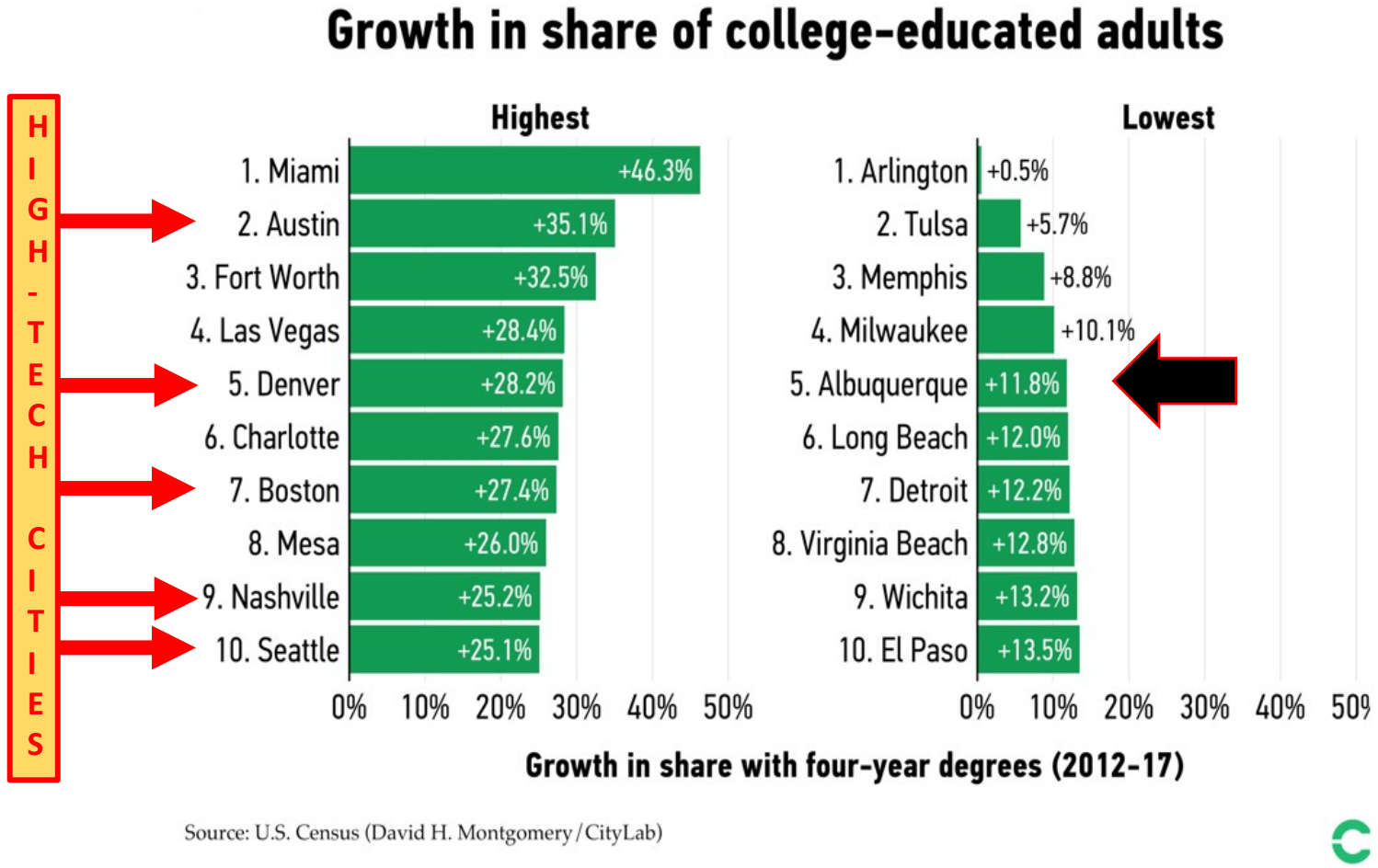
CityLab Ranking Based on % Job Growth



Source: U.S. Census (David H. Montgomery / CityLab)

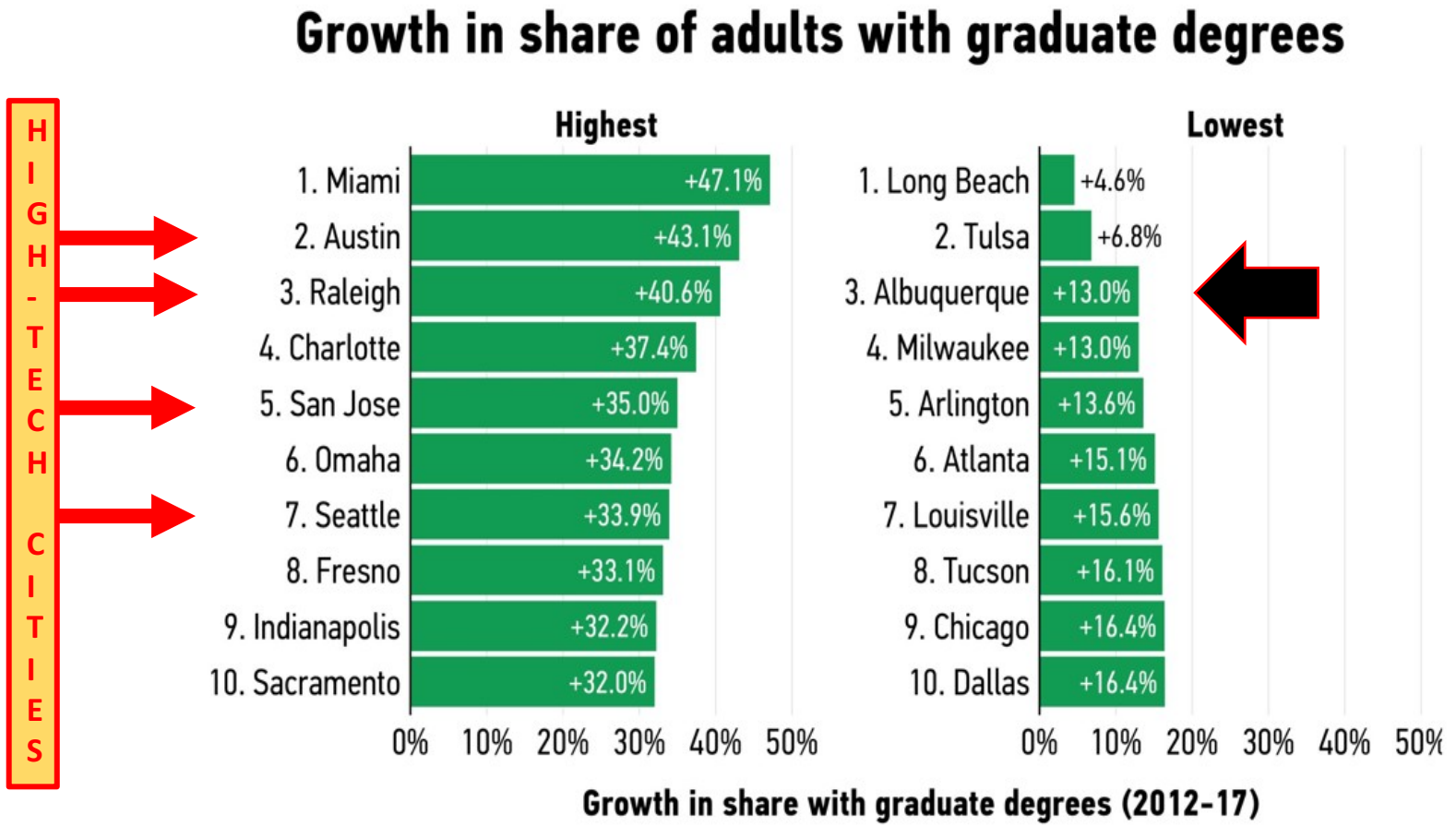
The Fastest-Growing U.S. Cities Aren't What You Think, RICHARD FLORIDA AUGUST 21, 2019

CityLab Rankings by % Growth of College Educated Adults



Where Do College Grads Live? The Top and Bottom U.S. Cities, RICHARD FLORIDA AUGUST 23, 2019

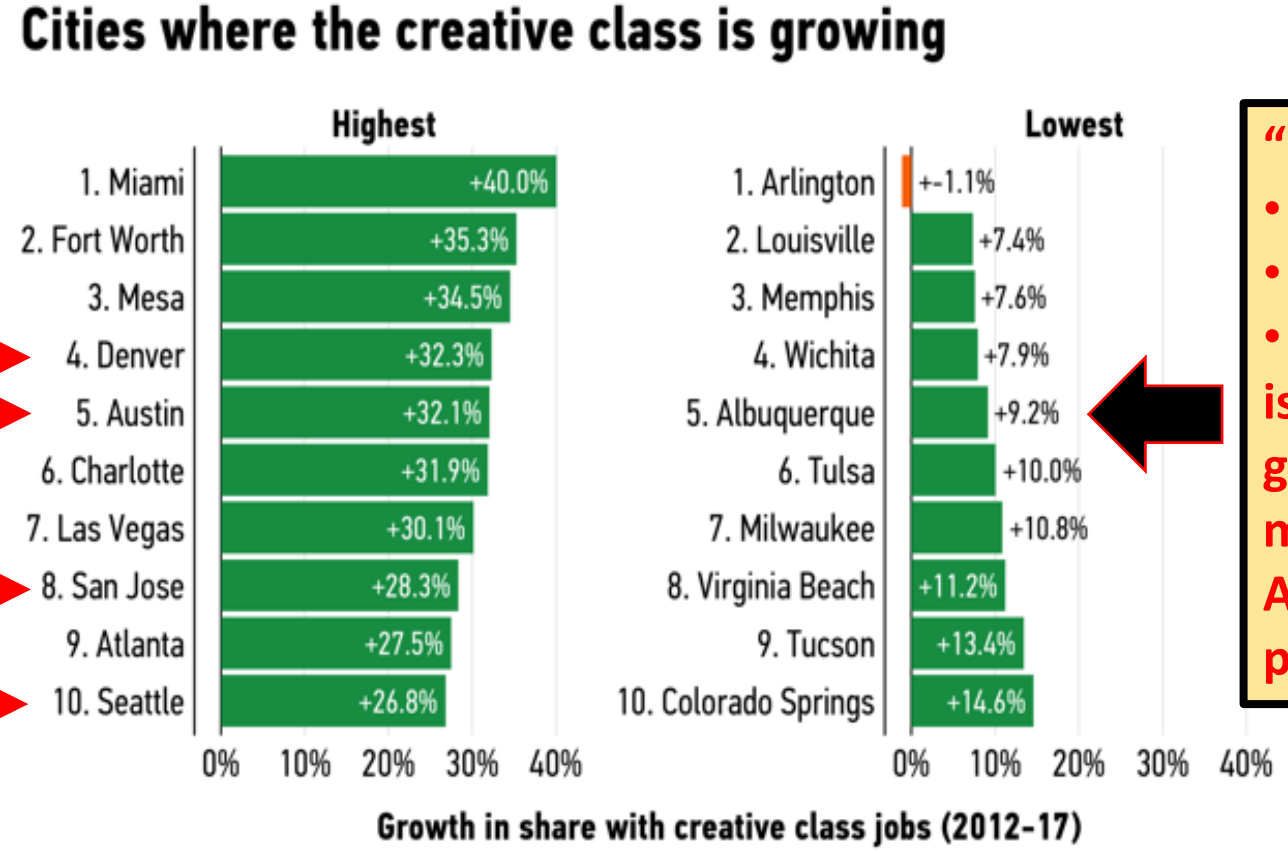
CityLab Ranking by % Growth of Adults with Graduate Degrees



Where Do College Grads Live? The Top and Bottom U.S. Cities, RICHARD FLORIDA AUGUST 23, 2019

CityLab Ranking by Growth % of Creative Class

HIGH-TECH CITIES



Source: U.S. Census (David H. Montgomery/CityLab)

"The creative class - composed of:

- **knowledge workers,**
- **techies, and**
- **cultural creatives**

is a key force in the economic growth of U.S. cities. More than 55 million workers are members of America's creative class, or above 35 percent of the workforce. "

The Changing Geography of America's Creative Class, RICHARD FLORIDA AUGUST 27, 2019

State Rankings by Gini Coefficient (largest to smallest)

1. New York
2. Connecticut
3. Louisiana
4. California
5. Florida
6. Massachusetts
7. Georgia
8. Texas
9. Mississippi
10. Illinois
11. Tennessee
12. New Jersey
13. Alabama
14. **New Mexico**
15. North Carolina
16. Kentucky
17. Rhode Island
18. Arkansas
19. South Carolina
20. Arizona
21. Pennsylvania
22. Virginia
23. Oklahoma
24. Michigan
25. Ohio
26. Missouri
27. West Virginia
28. Oregon
29. Colorado
30 Montana
31. North Dakota
32. Washington
33. Kansas
34. Nevada
35. Maine
36. Maryland
37. Indiana
38. Minnesota
39. Delaware
40. Idaho
41. South Dakota
42. Wisconsin
43. Vermont
44. Iowa
45. Nebraska
46. Hawaii
47. New Hampshire
48. Wyoming
49. **Utah**
50. Alaska

ZIPPA, PUBLISHED MON, MAR 12 2018, 4:15 PM EDT CNBC HTTPS://WWW.CNBC.COM/2018/03/12/US-STATES-WITH-THE-HIGHEST-LEVELS-OF-INCOME-INEQUALITY.HTML

States With Fastest Growing Gini Coefficient - Income Inequality Growth 2010-2016

1. Montana
2. California
3. Maine
4. Rhode Island
5. Idaho
6. TIE: New Mexico
6. TIE: Georgia
8. Iowa
9. Indiana
10. Michigan

ZIPPA, PUBLISHED MON, MAR 12 2018, 4:15 PM EDT CNBC
HTTPS://WWW.CNBC.COM/2018/03/12/US-STATES-WITH-THE-HIGHEST-LEVELS-OF-INCOME-INEQUALITY.HTML

Milken Institute City Algorithm for 2018 Rankings

Component	Weight
Job growth (I=2012)	0.143
Job growth (I=2016)	0.143
Wage and salary growth (I=2011)	0.143
Wage and salary growth (I=2015)	0.143
Short-term job growth (Aug 17-Aug 18)	0.143
High-tech GDP growth (I=2012)	0.071
High-tech GDP growth (I=2016)	0.071
High-tech GDP location quotient (2017)	0.071
Number of high-tech industries with GDP LQ>1 (2017)	0.071

JOB GROWTH: 43%
WAGE & SALARY GROWTH: 28.5%
HIGH-TECH GROWTH: 28.5%

Note: I refers to the beginning year of the index. Weights do not add up to 1, due to rounding.

Source: Milken Institute.

High-tech location quotients (LQs) measure the industry's concentration in a particular metro relative to the national average

JESSICA JACKSON, JOE LEE, MICHAEL C.Y. LIN, AND MINOLI RATNATUNGA, BEST-PERFORMING CITIES 2018: WHERE AMERICA'S JOBS ARE CREATED AND SUSTAINED, Milken Institute, January, 2019.

Milken 2018 Large Metro Rankings for Job, Salary @ High Tech Growth

1. Provo-Orem, UT
2. San Jose-Sunnyvale-Santa Clara, CA
3. Austin-Round Rock, TX
4. San Francisco-Redwood City-South San Francisco, CA
5. Dallas-Plano-Irving, TX
6. Raleigh, NC
7. Orlando-Kissimmee-Sanford, FL
8. Seattle-Bellevue-Everett, WA
9. Fort Collins, CO
10. Salt Lake City, UT
11. Reno, NV (Large Growth from Battery Factory)
12. Boise City, ID
13. Charlotte-Concord-Gastonia, NC-SC
14. Oakland-Hayward-Berkeley, CA
15. Riverside-San Bernardino-Ontario, CA
16. Charleston-North Charleston, SC
17. Atlanta-Sandy Springs-Roswell, GA
18. Santa Rosa, CA
19. Olympia-Tumwater, WA
20. Phoenix-Mesa-Scottsdale, AZ
21. Ogden-Clearfield, UT
22. North Port-Sarasota-Bradenton, FL
23. Las Vegas-Henderson-Paradise, NV
24. Denver-Aurora-Lakewood, CO
25. Nashville-Davidson-Murfreesboro-Franklin, TN

125. Albuquerque, NM

JESSICA JACKSON, JOE LEE, MICHAEL C.Y. LIN, AND MINOLI RATNATUNGA, BEST-PERFORMING CITIES 2018: WHERE AMERICA'S JOBS ARE CREATED AND SUSTAINED, Milken Institute, January, 2019.

Milken Description of Top 2018 Cities' Assets

1. **PROVO-OREM, UT**
   - Dynamic economy consistently creating jobs, including a vibrant high-tech sector.
   - Brigham Young University attracts and educates students, supporting the local economy and a highly-skilled local workforce.

2. **SAN JOSE-SUNNYVALE-SANTA CLARA, CA**
   - Large and diversified high-tech industry cluster continues to generate new opportunities through innovation and investment.
   - Entrepreneurial culture and mobile workforce disseminate new knowledge through the cluster more quickly than in more restrictive environments.

3. **AUSTIN-ROUND ROCK, TX**
   - Competitive business climate combined with an established high-tech hub supports employment and wage growth.
   - The University of Texas at Austin attracts and trains a highly-skilled and entrepreneurial workforce.

4. **SAN FRANCISCO-REDWOOD CITY-SOUTH SAN FRANCISCO, CA**
   - Dynamic high-tech sector is creating new technologies and industries, sustaining the economic expansion.
   - Educated and mobile workforce is attractive to employers seeking to hire skilled and experienced employees.

5. **DALLAS-PLANO-IRVING, TX**
   - A competitive business climate supports broad-based economic growth.
   - High-profile corporate headquarters create demand for professional services.

JESSICA JACKSON, JOE LEE, MICHAEL C.Y. LIN, AND MINOLI RATNATUNGA, BEST-PERFORMING CITIES 2018: WHERE AMERICA'S JOBS ARE CREATED AND SUSTAINED, Milken Institute, January, 2019.

Milken Description of Top Cities' Assets

6. RALEIGH, NC

- Proximity to research triangle (UNC, Duke, & NC State) spurs innovation and draws in talent and new tech companies.
- Most new jobs are high-skill and high-wage, increasing activity throughout the metro's economy.

7. ORLANDO-KISSIMMEE-SANFORD, FL

- The University of Central Florida produces an educated labor force and R&D.
- An increase in high-tech industry activity is bolstering the metro's knowledge-based economy.

8. SEATTLE-BELLEVUE-EVERETT, WA

- The University of Washington is a high-quality research university drawing in significant R&D funding.
- Tech giants continue to propel employment of high-wage, high-skill jobs.

9. FORT COLLINS, CO

- Colorado State University attracts young talent to feed the high-tech sector.
- Healthy startup scene spurs innovation.

10. SALT LAKE CITY, UT

- The University of Utah contributes to both the talent pool and research for the high-tech sector.
- Low business costs and cost of living draw in tech companies.

JESSICA JACKSON, JOE LEE, MICHAEL C.Y. LIN, AND MINOLI RATNATUNGA, BEST-PERFORMING CITIES 2018: WHERE AMERICA'S JOBS ARE CREATED AND SUSTAINED, Milken Institute, January, 2019.

Milken Description of Top Cities' Assets

11. RENO, NV

- Manufacturing jobs are expected to keep growing and bolster employment and wages.
- The arrival of Tesla's Gigafactory 1 in the Reno area has the region's economy moving.

12. BOISE CITY, ID

- Low business costs draw in tech startups.
- Affordable cost of living facilitates in-migration.

13. CHARLOTTE-CONCORD-GASTONIA, NC-SC

- Low business and living costs make it easier for startup companies to come into the metro.
- The existing financial cluster bolsters the new financial technology industry.

14. OAKLAND-HAYWARD-BERKELEY, CA

- Slightly lower costs of living and of business draw Bay Area expansion to the metro.
- Location of UC Berkeley fosters innovation and provides high-skill labor.

15. RIVERSIDE-SAN BERNARDINO-ONTARIO, CA

- The logistics hub is drawing investment from large employers like Amazon.
- Proximity to large markets like Los Angeles and San Diego aids its major industries.

JESSICA JACKSON, JOE LEE, MICHAEL C.Y. LIN, AND MINOLI RATNATUNGA, BEST-PERFORMING CITIES 2018: WHERE AMERICA'S JOBS ARE CREATED AND SUSTAINED, Milken Institute, January, 2019.

Milken Description of Top Cities' Assets

16. CHARLESTON-NORTH CHARLESTON, SC

- Economic diversity makes it less vulnerable to external shocks.
- Population and income growth will support the region's future economic growth.

17. ATLANTA-SANDY SPRINGS-ROSWELL, GA

- Economic diversity helps maintain its economic health.
- High-educated population supplies high-skill employees to the local workforce

18. SANTA ROSA, CA

- World-class beverage industry helps to support local economy.
- The rise of organic and artisanal food industry adds new fuel to the local economy.

19. OLYMPIA-TUMWATER, WA

- The government sector serves as a stable employment source for the region.
- Recent population growth helps support its education and health services, retail trade, and construction sectors.

20. PHOENIX-MESA-SCOTTSDALE, AZ

- Diversified industries help to strengthen the region's economy.
- A favorable business environment attracts companies to set up their offices.

JESSICA JACKSON, JOE LEE, MICHAEL C.Y. LIN, AND MINOLI RATNATUNGA, BEST-PERFORMING CITIES 2018: WHERE AMERICA'S JOBS ARE CREATED AND SUSTAINED, Milken Institute, January, 2019.

Milken Description of Top Large Cities' Assets

21. OGDEN-CLEARFIELD, UT

- Low business costs attract manufacturers to the region.
- A growing high-tech GDP provides the region with a stronger economic base.

22. NORTH PORT-SARASOTA-BRADENTON, FL

- Nice weather and scenic views make the region attractive to tourists and retirees.
- Continuing population growth will support construction activities.

23. LAS VEGAS-HENDERSON-PARADISE, NV

- World-renowned tourist-related sectors drive the region's growth.
- Zero personal income taxes and low business costs help lure people and businesses

24. DENVER-AURORA-LAKEWOOD, CO

- High-quality talent has attracted many companies to the metro.
- A thriving tech sector serves as a strong pillar of the regional economy.

25. NASHVILLE-DAVIDSON-MURFREESBORO-FRANKLIN, TN

- Low business costs give the metro a competitive edge over other larger metros.
- Technologies at Vanderbilt University has further fueled the development of health tech in the region.

JESSICA JACKSON, JOE LEE, MICHAEL C.Y. LIN, AND MINOLI RATNATUNGA, BEST-PERFORMING CITIES 2018: WHERE AMERICA'S JOBS ARE CREATED AND SUSTAINED, Milken Institute, January, 2019.

Milken 2018 Small Metro Rankings for Job, Salary @ High Tech Growth

1. Bend-Redmond, OR
2. St. George, UT
3. Gainesville, GA
4. Elkhart-Goshen, IN
5. Coeurd' Alene, ID
6. San Rafael, CA
7. Medford, OR
8. Athens-Clarke, Co., GA
9. Albany, OR
10. Logan, UT
11. Daphne-Fairhope-Foley, AL
12. Prescott, AZ
13. Sebastian-Vero Beach, FL
14. Hilton Head Island-Bluffton-Beaufort, SC
15. Charlottesville, VA
16. Wenatchee, WA
17. Bellingham, WA
18. Mankato-North Mankato, MN
19. Auburn-Opelika, AL
20. The Villages, FL
21. Sioux Falls, SD
22. College Station-Bryan, TX
23. Grants Pass, OR
24. Idaho Falls, ID
25. Yuba City, CA
95. Amarillo, Texas
150. Santa Fe, NM
173. Las Cruces, NM
174. Farmington, NM

JESSICA JACKSON, JOE LEE, MICHAEL C.Y. LIN, AND MINOLI RATNATUNGA, BEST-PERFORMING CITIES 2018: WHERE AMERICA'S JOBS ARE CREATED AND SUSTAINED, Milken Institute, January, 2019.

Milken 2019 Large Metro Rankings for Job, Salary @ High Tech Percent Growth

1. San Francisco-Redwood City-South San Francisco
2. Provo-Orem, UT
3. Austin-Round Rock, TX
4. Reno, NV (+ 7)
5. Orlando-Kissimmee-Sanford, FL
6. San Jose-Sunnyvale-Santa Clara, CA (- 5)
7. Boise, ID (+ 5)
8. Seattle-Bellevue-Everett, WA
9. Dallas-Plano-Irving, TX
10. Palm Bay-Melbourne-Titusville, FL
11. Raleigh, NC (- 5)
12. Phoenix-Mesa-Scottsdale, AZ (+13)
13. Charleston-North Charleston, SC
14. Nashville-Davidson-Murfreesboro-Franklin, TN
15. Spartanburg, SC
16. Charlotte-Concord-Gastonia, NC-SC
17. Oakland-Hayward-Berkeley, CA
18. Denver-Aurora-Lakewood, CO
19. Olympia-Tumwater, WA
20. Greeley, CO
21. Fort Collins, CO
22. Ogden-Clearfield, UT
23. Cape Coral-Fort Myers, FL
24. Portland-Vancouver-Hillsboro, OR-WA

25T. Riverside-San Bernardino-Ontario, CA

25T. Salt Lake City, UT (-15)

161. Albuquerque, NM

California-4 (SF, SJ, Oakland, Riverside)
Utah-3 (Provo, Odgen, SLC)
Colorado-3 (Denver, Greeley, Ft. Collins)
Florida-3 (Orlando, Palm Bay, Cape Coral)
North Carolina-2 (Raleigh, Charlotte)
South Carolina-2 (Charleston, Spartanburg)
Washington – 2 (Seattle, Olympia)

Texas-2 (Austin, Dallas)
Nevada-1 (Reno)
Idaho-1 (Boise)
Arizona-1 (Phoenix)
Tennessee-1 (Nashville)
Oregon-1 (Portland)

HIGHLIGHTS

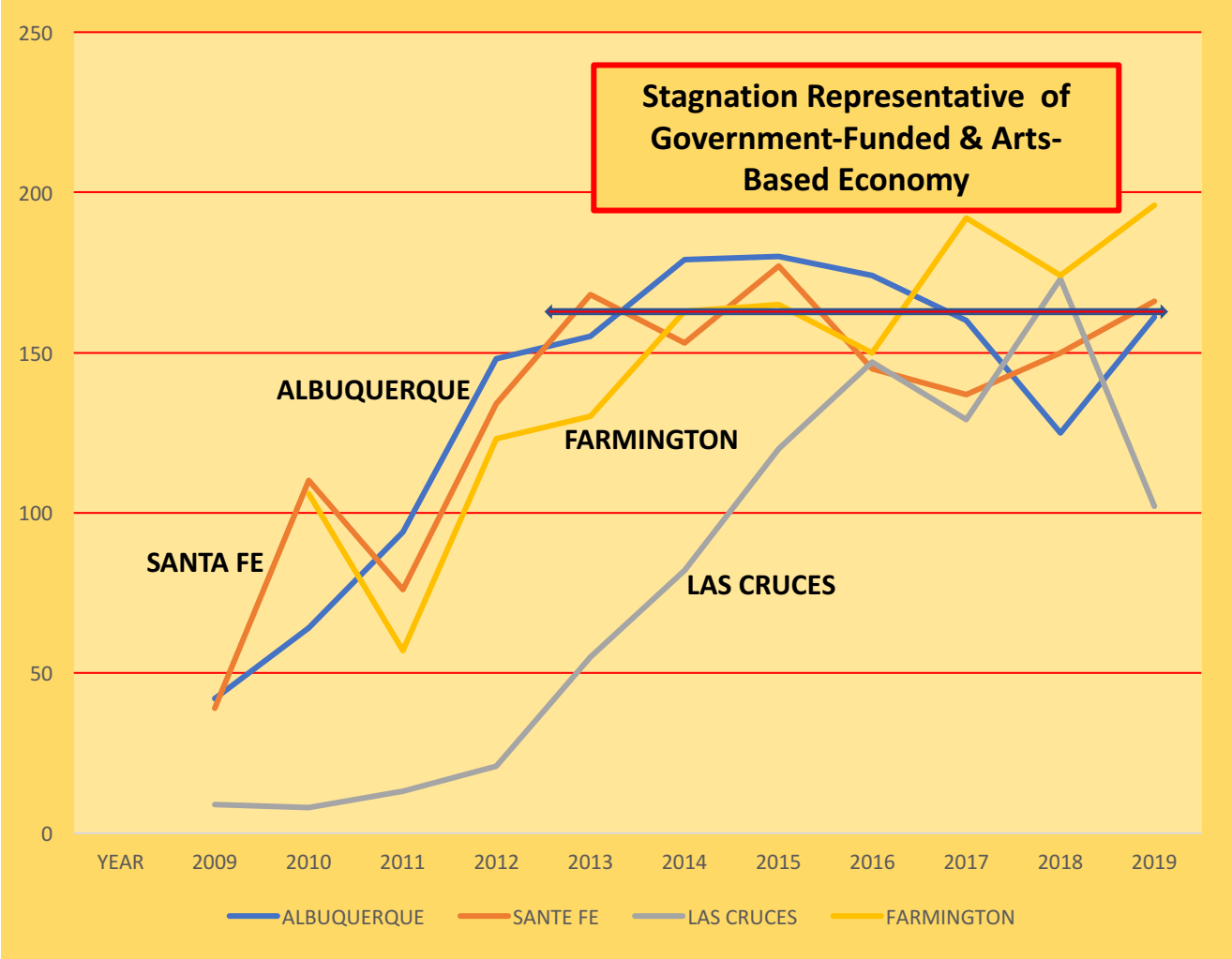
San Francisco metro's skilled workforce, abundant venture capital (VC), and innovation and entrepreneurial culture support regional high value-added industries, including the expanding tech and biotech industries.

Twenty-one top-performing Large metros return from Milken's 2018 Index. A substantial number are metros with dynamic tech sectors. Others, like Reno, NV, continue to develop a diverse industrial base while experiencing rapid growth in the advanced manufacturing and technology sectors.

Overall, metros with strong tech industries remain the superstars of regional economies. One key factor in the success of these tech powerhouses is their ability to engage in new technologies.

Michael C.Y. Lin, PhD, Joe Lee, and Perry Wong, Milken Institute, BEST-PERFORMING CITIES 2020 Where America's Jobs Are Created and Sustained, Feb. 25, 2020.

History of New Mexico City Rankings by Milken:
2009-2019 Albuquerque, Santa Fe, Las Cruces & Farmington



YEAR	ALBUQUERQUE	SANTE FE	LAS CRUCES	FARMINGTON
2009	42	39	9	
2010	64	110	8	106
2011	94	76	13	57
2012	148	134	21	123
2013	155	168	55	130
2014	179	153	82	163
2015	180	177	120	165
2016	174	145	147	150
2017	160	137	129	192
2018	125	150	173	174
2019	161	166	102	196

Data taken from Milken annual rankings of cities, 2009-2019.

Milken Institute: STATE TECHNOLOGY AND SCIENCE INDEX

The State Technology and Science Index (STSI) uses 107 individual indicators sorted into five composites:

A. research and development (R&D) inputs,
B. risk capital and entrepreneurial infrastructure,
C. human capital investment,
D. technology and science workforce, and
E. technology concentration and dynamism.

1. Massachusetts
2. Colorado (1NL)
3. Maryland (DOE, NIH, NSA)
4. California (4NL)
5. Utah
6. Washington (1NL)
7. Delaware
8. Minnesota
9. New Hampshire
10. Oregon (1NL)
11. North Carolina
12. Virginia (1NL)
13. Pennsylvania (1NL)
14. Connecticut
15. Illinois (2NL)
16. New York (1NL)
17. Arizona
18. Michigan
19. Rhode Island
20. Texas (1NL)
21. New Jersey (1NL)
22. Georgia
23. Vermont
24. New Mexico (2NL)
25. Wisconsin
26. Idaho (1NL)
27. Ohio
28. Montana
29. Indiana
30. Missouri
31. Kansas
32. Alabama
33. Florida
34. Nebraska
35. Hawaii
36. Iowa (1NL)
37. South Carolina (1NL)
38. North Dakota
39. Tennessee (1NL)
40. Maine
41. Alaska
42. Wyoming
43. South Dakota
44. Nevada
45. Louisiana
46. Kentucky
47. Oklahoma
48. Arkansas
49. West Virginia (1NL)
50. Mississippi

Milken Institute: STATE TECHNOLOGY AND SCIENCE INDEX: Sustaining America's Innovation Economy, 2018

Brookings – ITIF Analysis: Report Recommendations

- **Neither market forces nor bottom-up economic development efforts have closed the city gap, nor are they likely to. Instead, these deeply seated dynamics appear ready to exacerbate the current divides.**

- **The nation needs a massive federal effort to transform a short list of "heartland" metro areas with compelling strengths into self-sustaining "growth centers" that will benefit entire regions.**

- **The most promising eight to 10 potential growth centers (all not geographically located near existing successful tech hubs) would receive substantial (federal) financial and regulatory support for 10 years to get "over the hump" and become self-sustaining new innovation centers.**

- **As Grandmother used to say, "You can't make a silk purse out of a sow's ear!"**

THE CASE *for* GROWTH CENTERS How to spread tech innovation across America, ROBERT D. ATKINSON, MARK MURO, *and* JACOB WHITON, Brookings and Information Technology & Innovation Foundation, December, 2019.

Brookings Innovation Industries

"Innovation industries" encompass America's 13 highest-tech, highest-R&D industries. Selected from among the 50 advanced industries, the 13 innovation industries represent a cohort whose R&D expenditures exceed $20,000 per worker and have a STEM-worker share of 45%.

1. **Basic chemical manufacturing**
2. **Pesticide, fertilizer, and agricultural chemical manufacturing**
3. **Pharmaceutical and medicine manufacturing**
4. **Computer and peripheral equipment manufacturing**
5. **Communications equipment manufacturing**
6. **Semiconductor and other electronic components manufacturing**
7. **Navigational, measuring, electromedical, and control instruments manufacturing**
8. **Aerospace product and parts manufacturing**
9. **Software publishers**
10. **Satellite telecommunications**
11. **Data processing, hosting, and related services**
12. **Other information services**
13. **Scientific research and development services**

THE CASE *for* GROWTH CENTERS How to spread tech innovation across America, ROBERT D. ATKINSON, MARK MURO, *and* JACOB WHITON, Brookings and Information Technology & Innovation Foundation, December, 2019.

Brookings Superstar Metro Areas

1. New York-Newark-Jersey City, NY-NJ-PA
2. San Jose-Sunnyvale-Santa Clara, CA
3. Los Angeles-Long Beach-Anaheim, CA
4. Seattle-Tacoma-Bellevue, WA
5. Boston-Cambridge-Newton, MA-NH
6. San Francisco-Oakland-Hayward, CA
7. Dallas-Fort Worth-Arlington, TX
8. Washington-Arlington-Alexandria, DC-VA-MD-WV
9. San Diego-Carlsbad, CA
10. Chicago-Naperville-Elgin, IL-IN-WI
11. Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
12. Phoenix-Mesa-Scottsdale, AZ
13. Minneapolis-St. Paul-Bloomington, MN-WI
14. Houston-The Woodlands-Sugar Land, TX
15. Portland-Vancouver-Hillsboro, OR-WA
16. Atlanta-Sandy Springs-Roswell, GA
17. Austin-Round Rock, TX
18. St. Louis, MO-IL
19. Denver-Aurora-Lakewood, CO
20. Miami-Fort Lauderdale-West Palm Beach, FL

Red Cities Are on Milken Top 25 List for Percentage Growth

"Superstar metro areas" are the 20 metropolitan areas with the largest numbers of jobs in innovation industries. These mostly coastal, high-tech places represent about 5% of the nation's metropolitan areas.

THE CASE *for* GROWTH CENTERS How to spread tech innovation across America, ROBERT D. ATKINSON, MARK MURO, *and* JACOB WHITON, Brookings and Information Technology & Innovation Foundation, December, 2019.

Brookings-ITIF Warns Problem Cannot Be Solved by Local Initiative Alone – I Disagree! See Utah

"Few specific and substantial ideas for countering the winner-take-most dynamics of the innovation sector have been forthcoming. To the extent any are offered, they mostly resemble lectures on self-help, based on the opinion that if local leaders were just a bit more creative, they could overcome the powerful forces of cumulative causation on their own."

THE CASE *for* GROWTH CENTERS How to spread tech innovation across America, ROBERT D. ATKINSON, MARK MURO, *and* JACOB WHITON, Brookings and Information Technology & Innovation Foundation, December, 2019.

Brookings/ITIF Potential Growth Centers

Name	Population, 2018	University STEM R&D per capita, 2017	Patents per 100,000, 2015	BA share, 2017	STEM doctoral degrees per 100,000, 2017	Innovation sector job share, 2018	Eligibility Index
Madison, WI	660,422	$1,688.51	71.1	45.9%	80.8	5.9%	1.63
Minneapolis-St. Paul-Bloomington, MN-WI	3,629,190	$245.30	97.1	41.7%	11.3	3.2%	0.68
Albany-Schenectady-Troy, NY	883,169	$268.58	124.0	37.2%	19.5	4.3%	0.66
Lexington-Fayette, KY	516,697	$717.60	36.1	37.5%	29.3	1.8%	0.58
Rochester, NY	1,071,082	$370.93	113.0	34.1%	15.0	2.6%	0.53
Provo-Orem, UT	633,768	$59.56	67.9	41.3%	7.9	6.4%	0.47
Portland-Vancouver-Hillsboro, OR-WA	2,478,810	$14.90	90.8	40.3%	1.8	4.9%	0.47
Tucson, AZ	1,039,073	$593.64	63.5	33.6%	21.3	5.4%	0.45
Pittsburgh, PA	2,324,743	$539.74	38.1	35.1%	22.0	2.2%	0.40
Salt Lake City, UT	1,222,540	$264.64	55.2	35.5%	16.8	3.7%	0.34
Columbus, OH	2,106,541	$386.41	21.9	35.9%	20.1	1.7%	0.30
Chicago-Naperville-Elgin, IL-IN-WI	9,498,716	$166.67	40.9	37.7%	7.4	1.9%	0.29
Nashville-Davidson--Murfreesboro--Franklin, TN	1,930,961	$367.01	12.0	36.0%	11.2	1.0%	0.22
Akron, OH	704,845	$95.09	52.9	32.2%	24.0	1.7%	0.19
St. Louis, MO-IL	2,805,465	$286.57	27.7	34.6%	9.2	2.9%	0.19
Boise City, ID	730,426	$45.46	107.0	30.1%	2.0	3.8%	0.18
Milwaukee-Waukesha-West Allis, WI	1,576,113	$45.53	43.7	35.8%	6.2	2.1%	0.18
Cincinnati, OH-KY-IN	2,190,209	$195.99	48.6	33.2%	5.9	2.5%	0.16

Milken Top 25 City

THE CASE *for* GROWTH CENTERS How to spread tech innovation across America, ROBERT D. ATKINSON, MARK MURO, *and* JACOB WHITON, Brookings and Information Technology & Innovation Foundation, December, 2019.

Brookings/ITIF Potential Growth Centers

Name	Population, 2018	University STEM R&D per capita, 2017	Patents per 100,000, 2015	BA share, 2017	STEM doctoral degrees per 100,000, 2017	Innovation sector job share, 2018	Eligibility Index
Buffalo-Cheektowaga-Niagara Falls, NY	1,130,152	$342.04	22.4	32.5%	16.9	2.7%	0.15
Kansas City, MO-KS	2,143,651	$10.72	39.1	36.5%	0.0	1.9%	0.14
Des Moines-West Des Moines, IA	655,409	$0.00	35.0	36.6%	0.0	1.3%	0.13
Indianapolis-Carmel-Anderson, IN	2,048,703	$25.55	37.0	35.6%	3.7	2.8%	0.13
Detroit-Warren-Dearborn, MI	4,326,442	$53.90	76.7	31.1%	3.4	1.7%	0.12
Albuquerque, NM	915,927	$259.20	32.4	32.1%	11.6	5.0%	0.12
Palm Bay-Melbourne-Titusville, FL	596,849	$30.67	79.5	30.0%	7.3	8.6%	0.10
Syracuse, NY	650,502	$164.65	33.0	31.8%	15.8	3.0%	0.09
Cleveland-Elyria, OH	2,057,009	$234.98	44.7	30.8%	7.8	1.7%	0.09
Greenville-Anderson-Mauldin, SC	906,626	$161.63	54.9	28.6%	19.0	1.8%	0.07
Omaha-Council Bluffs, NE-IA	942,198	$11.41	19.5	36.3%	0.9	1.7%	0.07
Fayetteville-Springdale-Rogers, AR-MO	549,128	$252.46	15.5	31.8%	16.2	0.6%	0.06
Knoxville, TN	883,309	$307.77	25.3	28.8%	23.6	2.4%	0.05
Dayton, OH	806,548	$276.43	32.5	29.8%	13.3	3.4%	0.05
Charlotte-Concord-Gastonia, NC-SC	2,569,213	$9.58	18.6	35.5%	2.7	1.7%	0.05
Birmingham-Hoover, AL	1,151,801	$481.57	9.8	30.5%	8.0	0.6%	0.05
Columbia, SC	832,666	$218.31	11.6	31.9%	15.0	1.5%	0.04
All U.S. metros	281,128,123	$215.75	48.1	34.0%	10.6	2.8%	

Milken Top 25 City

Note: Eligibility Index calculated using a weighted average of normalized eligibility criteria variables for each metro.
Source: Brookings and ITIF analysis of Census PEP, NSF, USPTO, Emsi, and ACS data

THE CASE *for* GROWTH CENTERS How to spread tech innovation across America, ROBERT D. ATKINSON, MARK MURO, *and* JACOB WHITON, Brookings and Information Technology & Innovation Foundation, December, 2019.