

Re-imagining American Innovation and Workforce Development:

Bridging the Gap to Unlock America's Stranded Brilliance

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Industrial to Knowledge Age Shift - Icon



Three Key Inflection Points:

1. Post-Civil War: 1865 (Industry 1.0 to 2.0, populism, civil war)

- Emancipation, Reconstruction, Land Grants, HBCUs - STEM focus
- 1870 – 1890: growth to superpower, GDP, patents, black middle class emergence
- 1877 - Reconstruction ends
- 1896 - Plessy v. Ferguson - backlash and long lasting retrenchment (i.e., 1898, 1921, 1923 massacres)



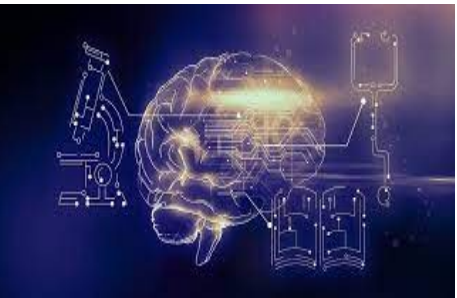
2. World War II: 1945 (Industry 2.0 to 3.0, populism, world war)

- GI Bill – >10 mill. vets post-secondary ed., community colleges, university expansion – STEM focus
- 1950 -1980: ~20 mill. women entered US workforce; huge economic growth, esp. 1948-1973
- 1957: Sputnik; 1958: NDEA – rapid expansion of universities and students; effective but ironic
- Backlash and retrenchment, beginning in 1970s and accelerating after 1980

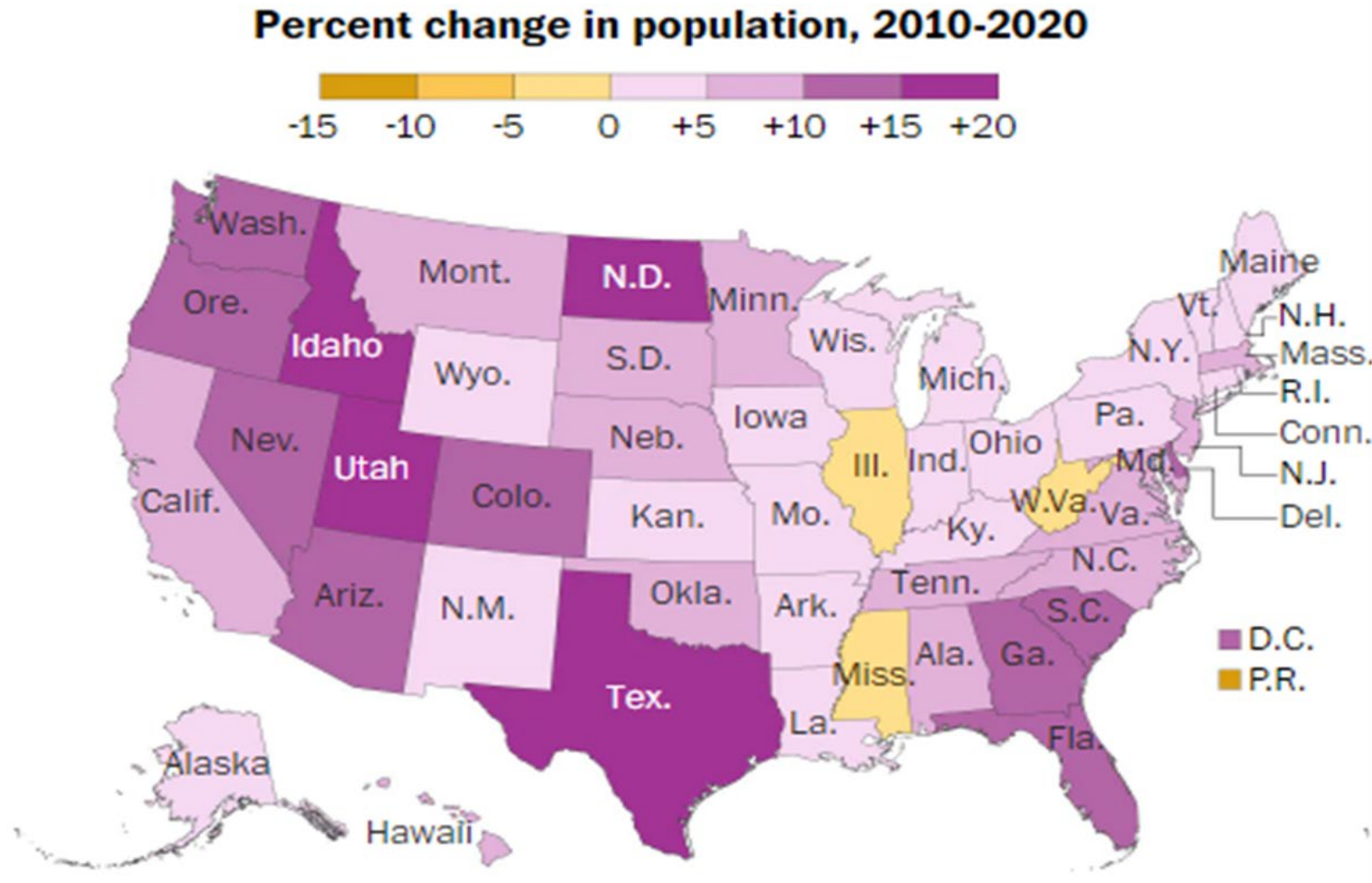


3. Current Period: 2025 (Industry 4.0 to 5.0, populism, hot wars)

- Information Age, globalization, rise of China – STEM focus
- De-industrialization, urbanization, sorting, re-segregation, social fragmentation, populism, vetocracy
- Backlash and retrenchment?



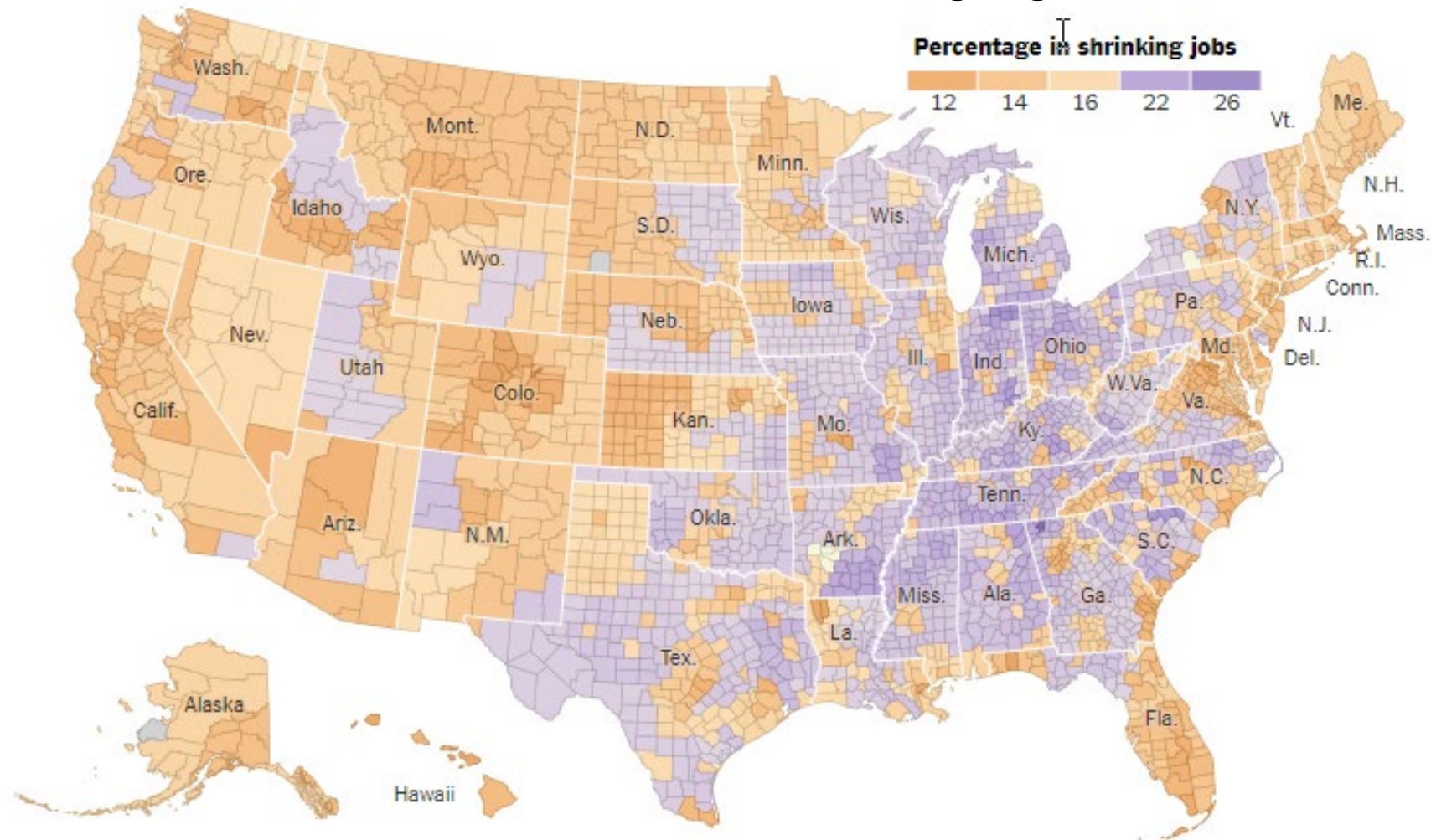
U.S. Population & Geographical Shifts (2010-2020)



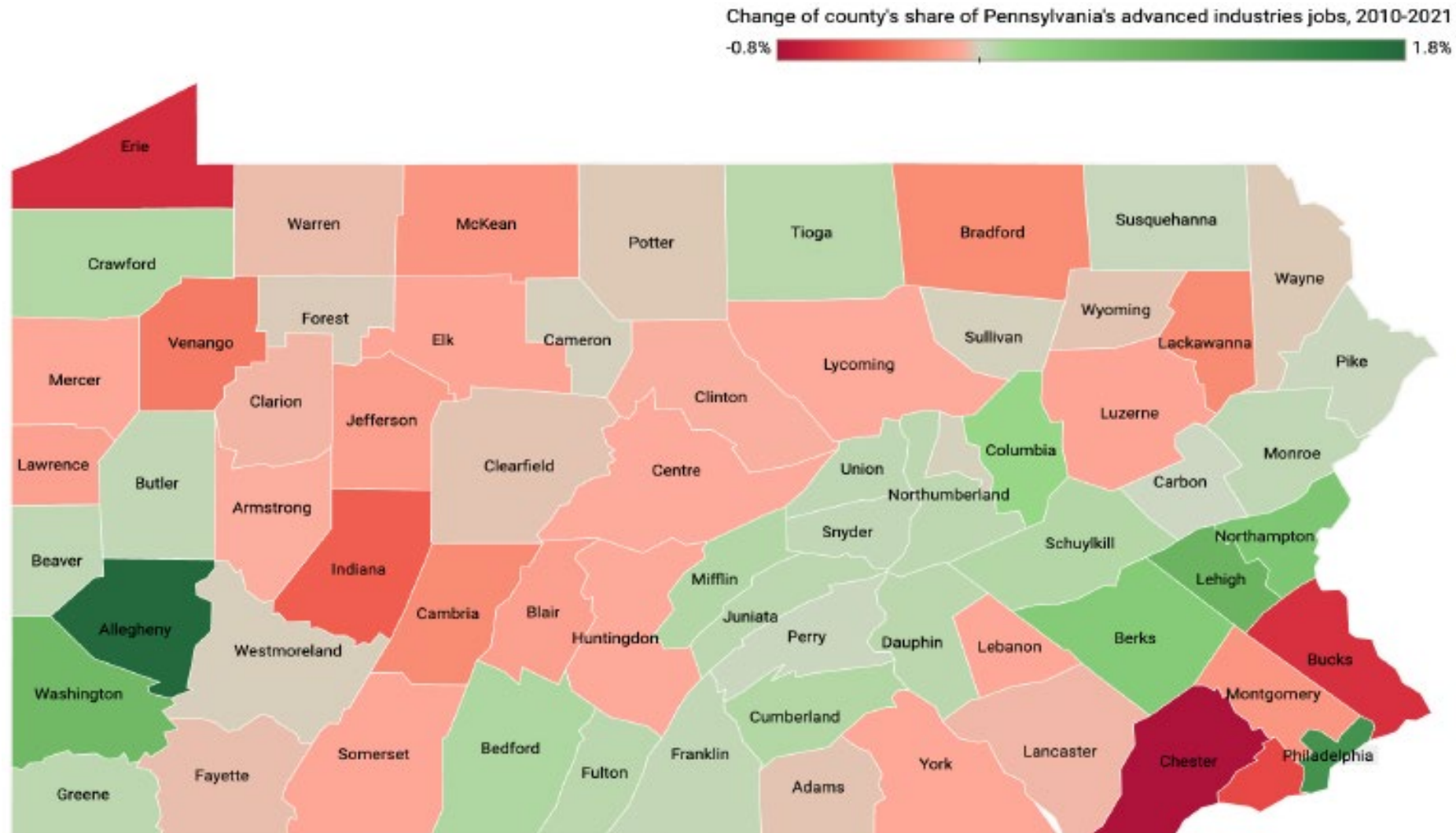
Percentage of Residents in Shrinking Jobs (2017 to 2026)

Geography of Innovation

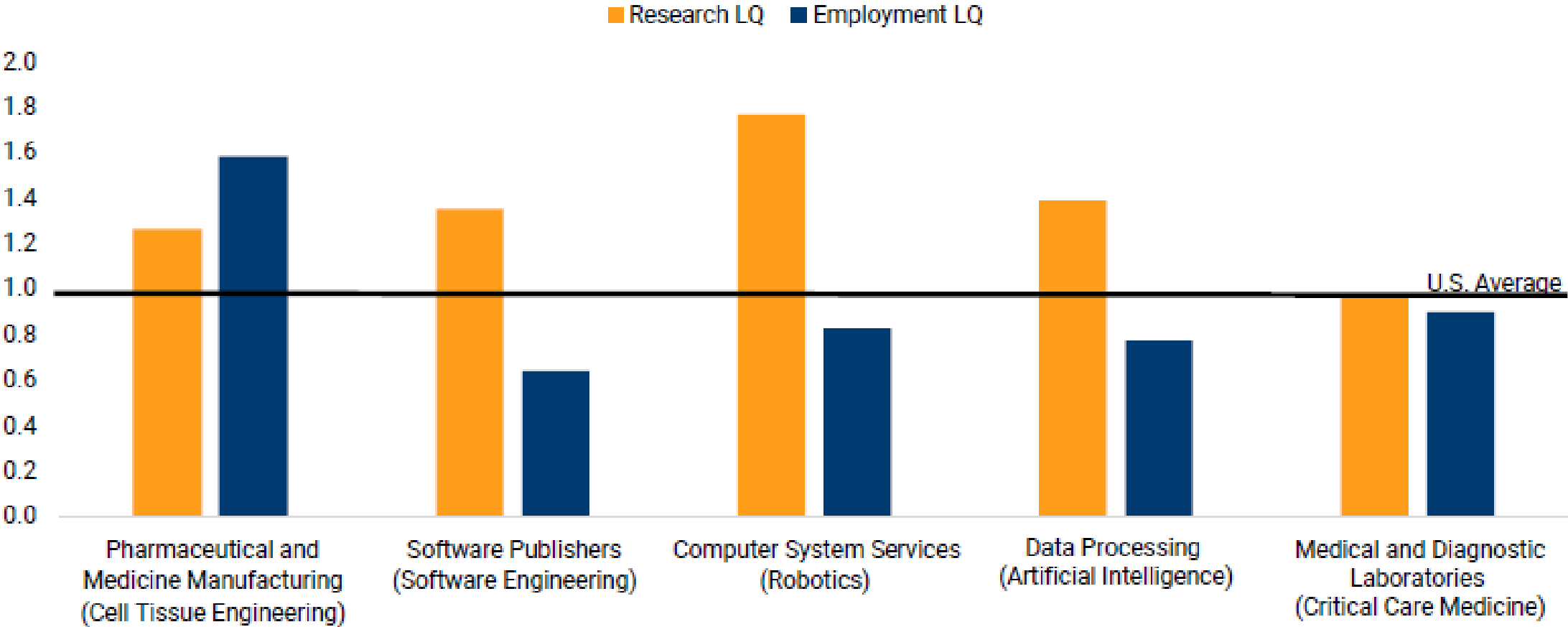
“De-Industrialization to Knowledge Age Shift”



Change in Share of Advanced Industries Jobs (2010-2021)



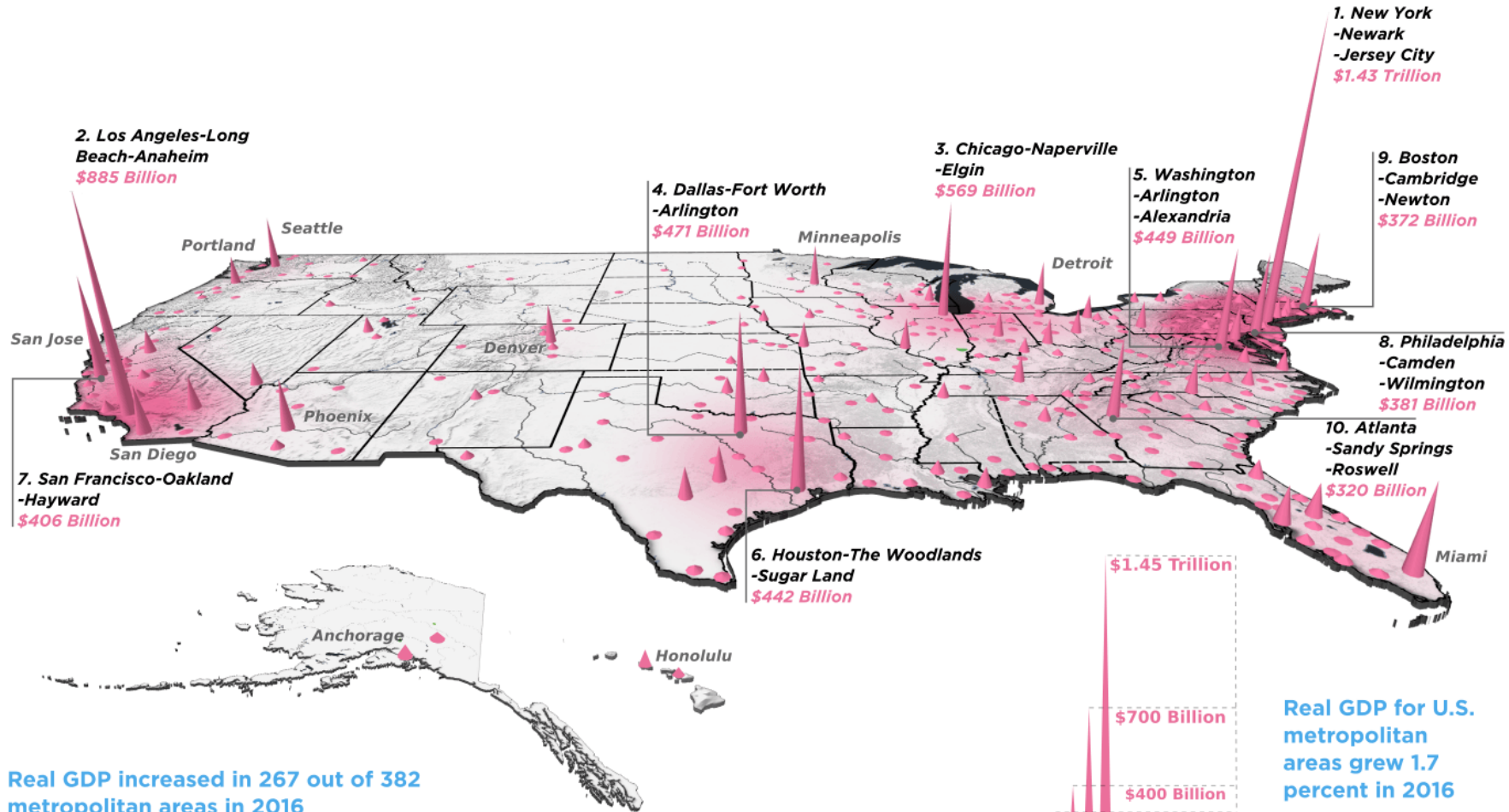
PA's Research Activity vs. Industry Employment (LQ)



SOURCE: Brookings analysis of data from Lightcast, TEconomy, and World of Science

Growing Geographic Shifts in U.S. Innovation

Knowledge and GDP Concentrated in Select Regions



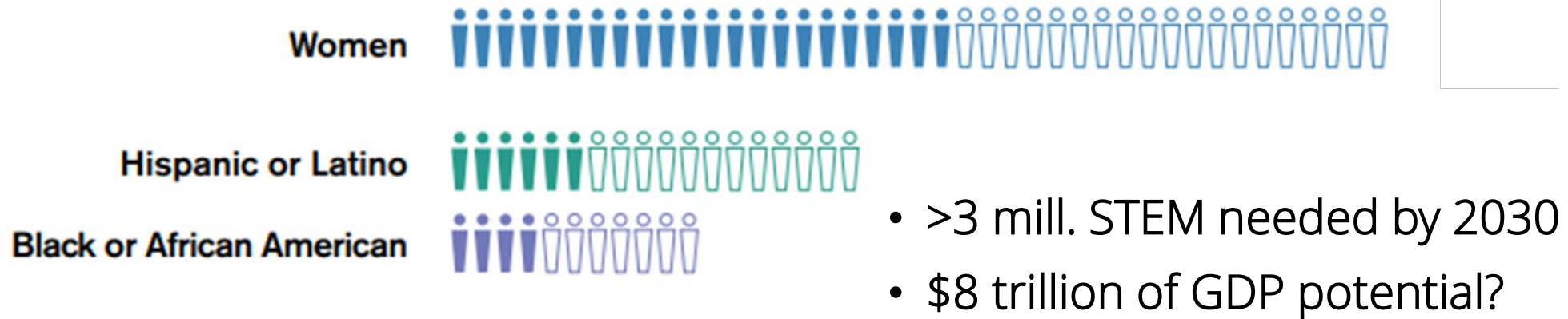
Article & Sources:
<https://howmuch.net/articles/gdp-by-metro-2017>
https://www.bea.gov/newsreleases/regional/gdp_metro/2017/gdp_metro0917.htm

Gross Domestic Product (GDP)
by Metropolitan Areas


howmuch.net


“Missing Millions” – Stranded Brilliance

Must Eliminate “Artificial Scarcity” and “Stranded Brilliance” – Broaden Participation



Legend

 x 100,000 people in 2020 S&E workforce

 x 100,000 additional people needed in 2030 for the S&E workforce to representative of the U.S. population

- *We must make visible the invisible*

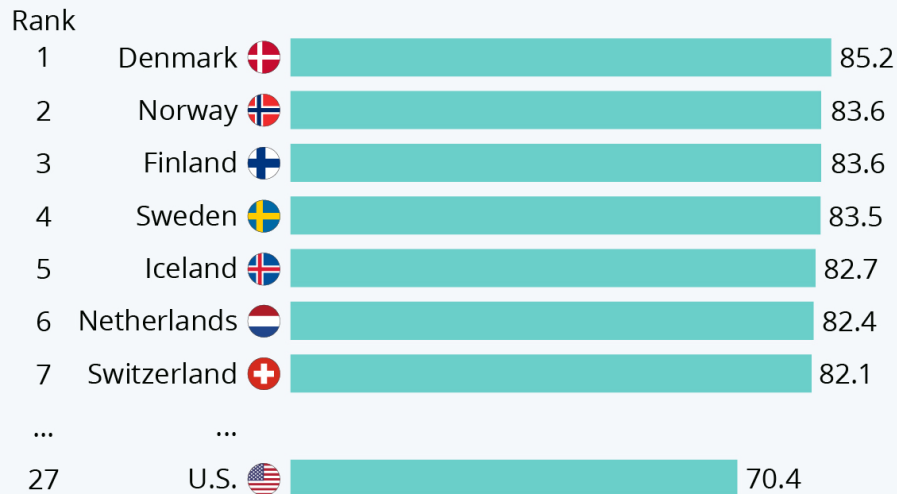
*Note: new US chip fab plants alone forecast shortage of 67,000 STEM by 2030

Our Human Potential Scorecard - SMI

The Immense Cost of "Stranded Brilliance"

The Countries with the Highest Social Mobility

Social mobility index scores of a given country



Index ranks 82 countries on their citizens' ability to achieve their potential despite their socioeconomic background

Source: World Economic Forum

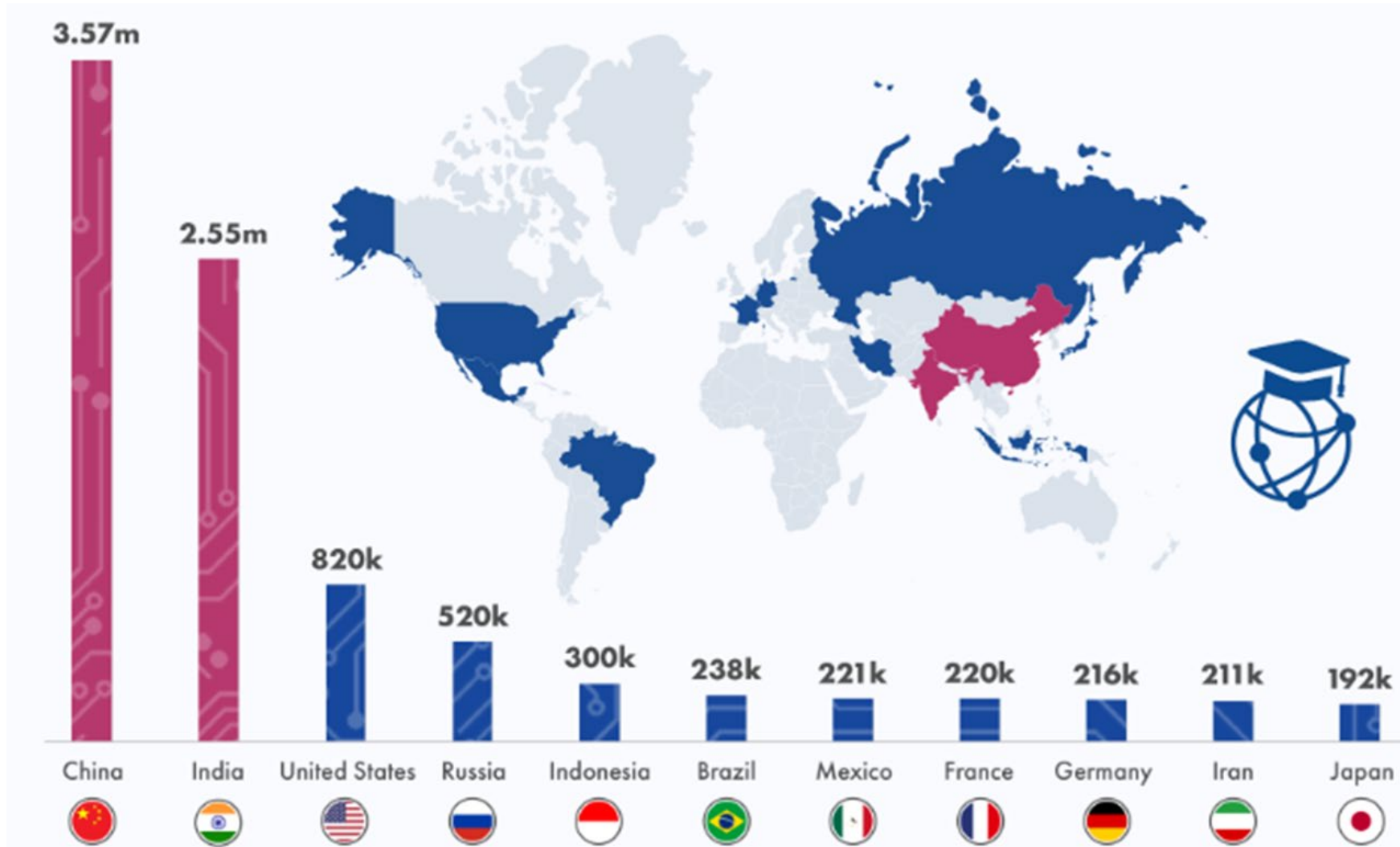


statista

- Why American affluence? Top-tier, vast IHE system, especially STEM/S&E, and our diverse human capital
- Studies show college still key for upward social mobility
- U.S. invented STEM, but lead slipping – why?
- Others doing better with SMI, life expectancy, especially *Scandinavia*? Why?
- *If we continue higher ed. and S&E divestments, we'll be 2nd rate country in 20 yrs.*
- Must invest more, not less – our future is at stake

Global Competition for STEM Talent

Number of STEM Graduates (2020)

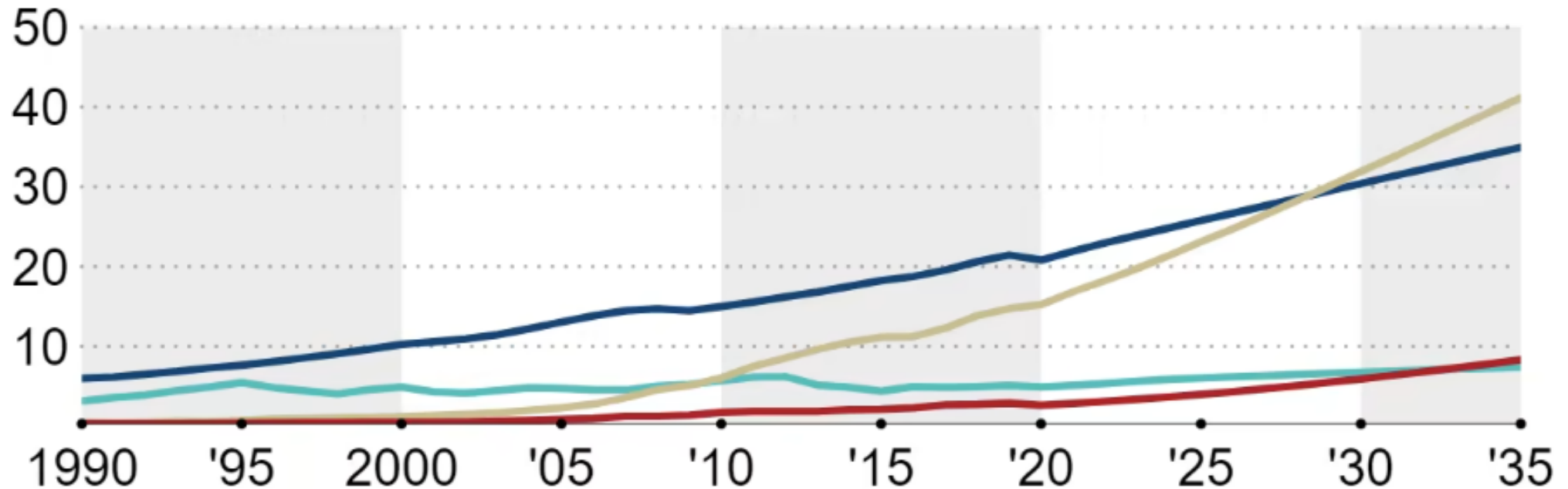


Global Power Shift - Forecast of Nominal GDP

Innovation & GDP also means National Security

(Baseline forecast, in trillions of dollars)

■ U.S. ■ Japan ■ China ■ India



Source: Japan Center for Economic Research

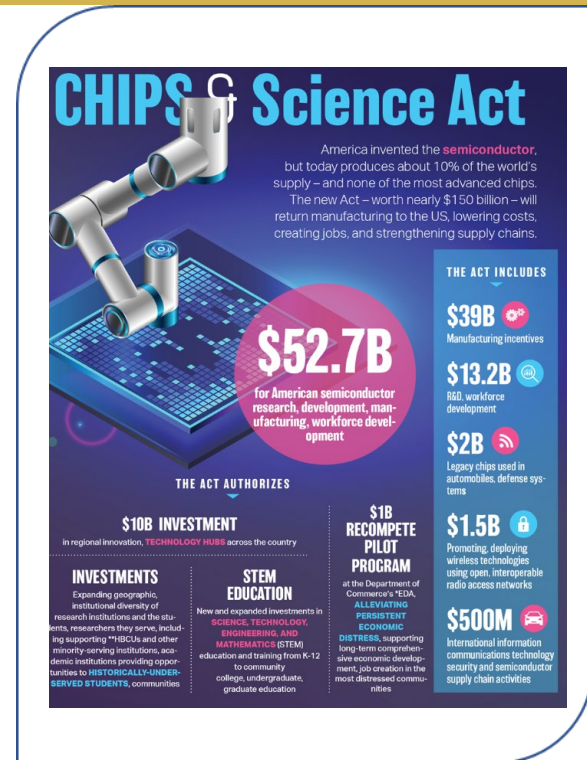
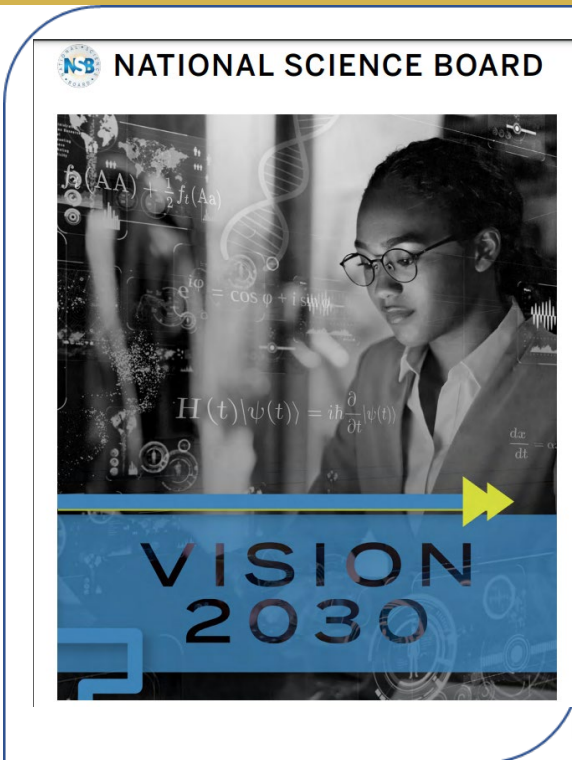
Others Using the “American Playbook” ...



“China’s Mars rover has amassed reams of novel geological data” – *Nature*, Nov. 2021



Recent Government Responses



NSF – Innovation, Partnerships, Broader Participation:

- Technology Innovation Partnership Directorate
- NSF ENGINES, NSF GRANTED, STEM EDU
- Geography of Innovation (EPSCoR expansion)

Economic Development Agency:

- Regional Tech Hubs (place)

OSTP Focus on STEM Innovation

- The Time is Now (inclusion)

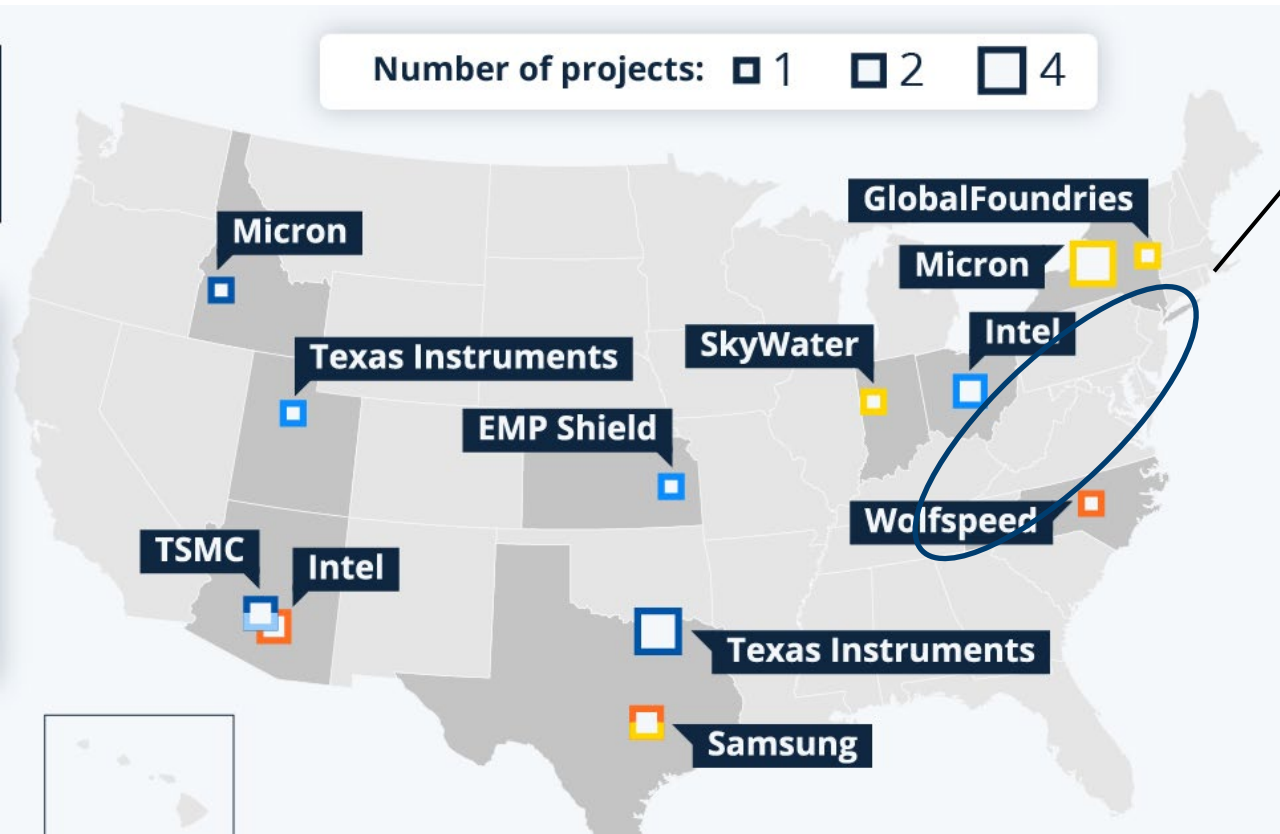
Chips & Science Act '22:

- \$250 B in 10 yrs authorized
- \$52 B appropriated
- Infrastructure & workforce

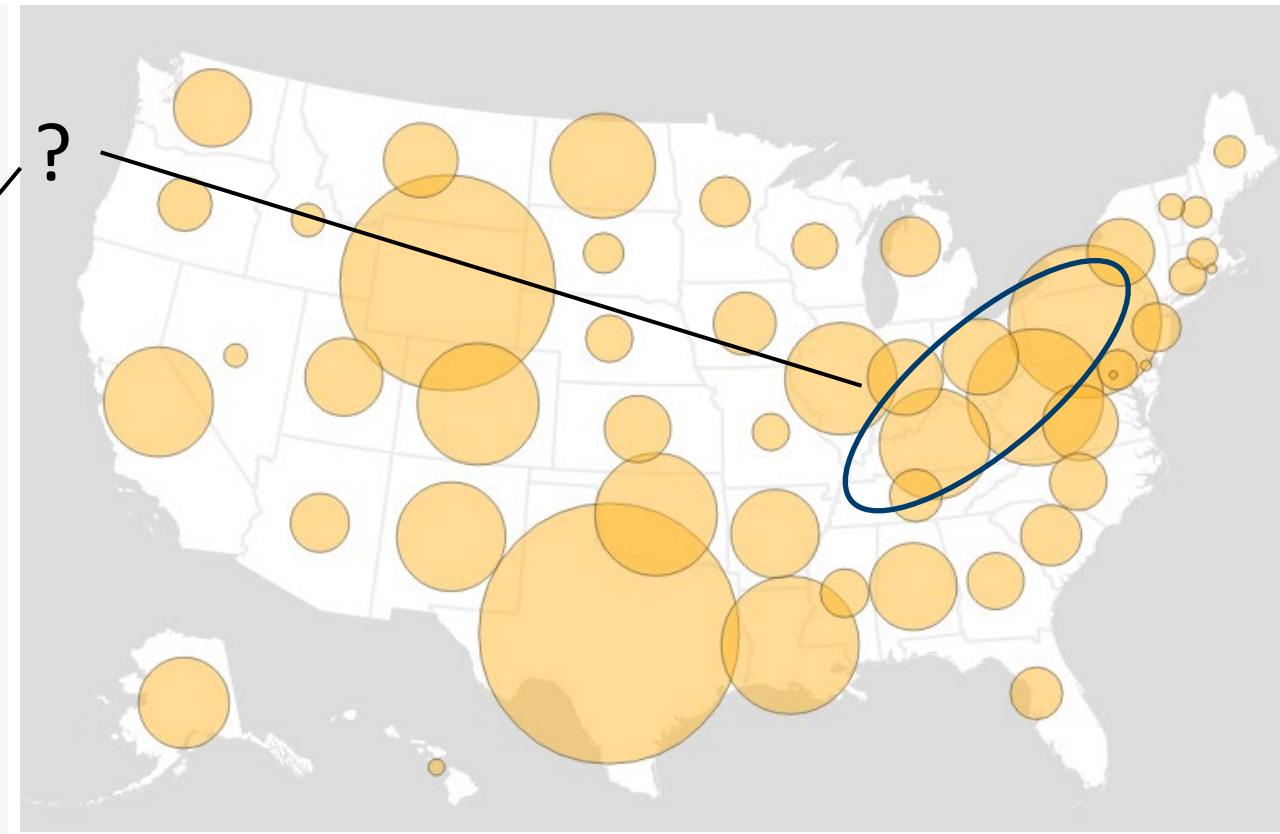
Energy Sources for New Chip Fab Plants?

We Need Chips & Science Investments in Appalachian Region

New Chip Fab Plants - (Chips Act '22)



U.S. Energy Production



Building the Energy Innovation Future WE Deserve

We All Have Critical Roles to Play

- Accelerate human capital development at speed and scale
- Leverage US innovation advantages – multifaceted diversity, higher ed
- Build more personalized, accelerated, and lifelong learning platforms
- Facilitate strategic partnerships and networks
- Double-down on place-based investments - NSF, DOE, EDA, Chips, etc.
- Invest in regional economic development for Appalachian-based energy and derivative products
- Build and staff Advanced Industries, esp. in energy-rich regions

Two Relevant Case Histories ...

Geography of Stranded Brilliance

America's De-industrialized Heartland – Johnstown, PA

Energy-rich region but lacks investment in growth opportunities

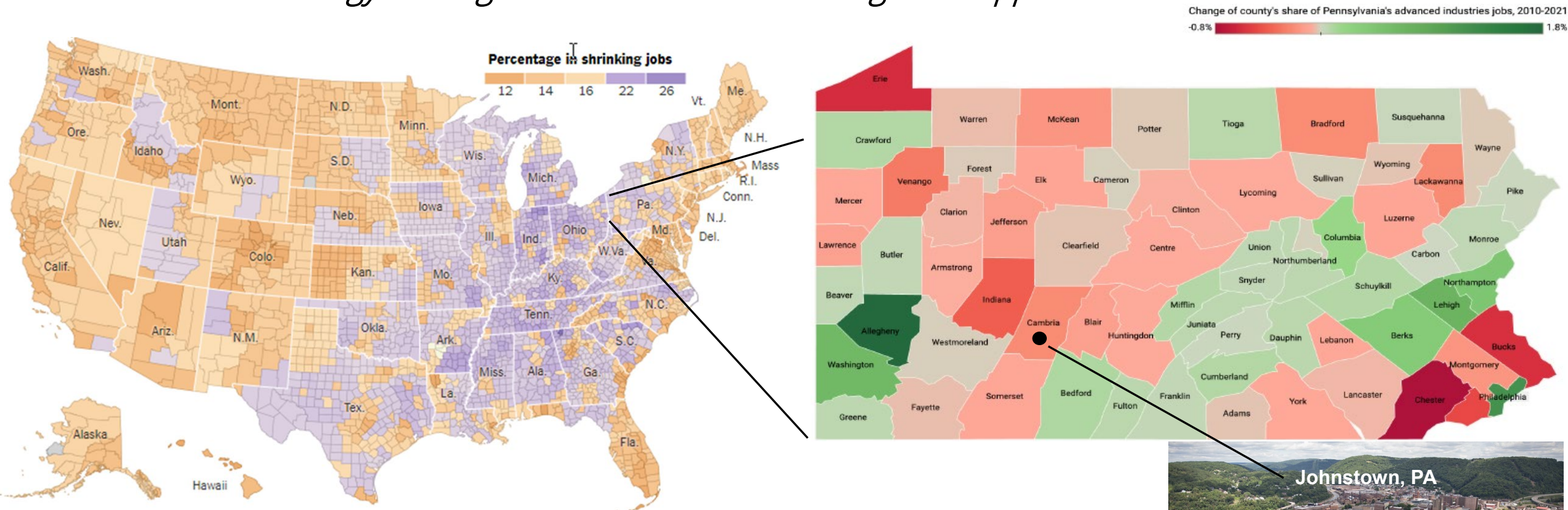


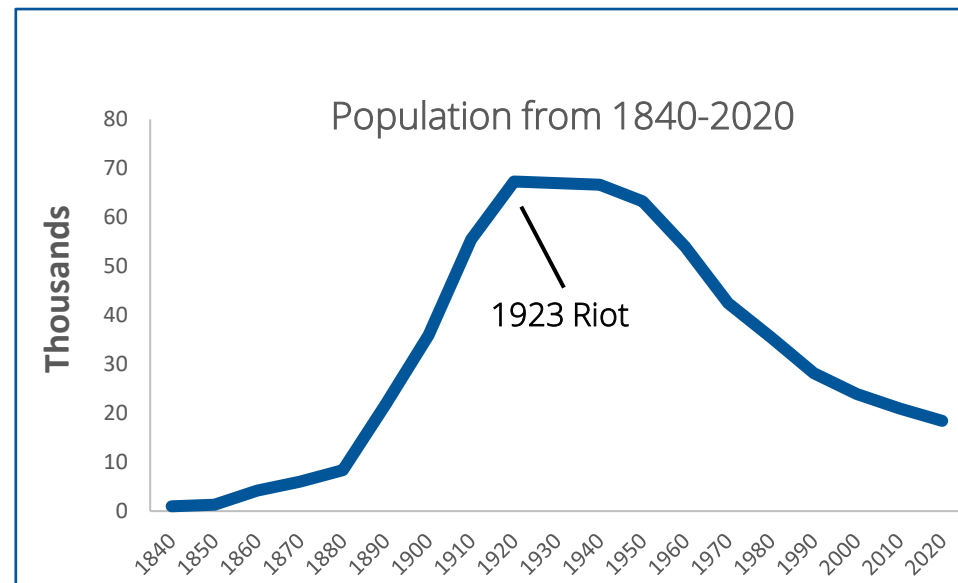
Fig. adapted from NY Times <https://www.nytimes.com/2017/10/24/business/economy/future-jobs.html>

Johnstown, PA – Prototype Project

Building Living-Learning Communities – Bridges to Our Future



- Epicenter of US industrial Age, top steel producer by 1860
- 1923 Race Riot w/peak pop. of 66,000; steady decline since
- Peak steel production 1940's, 3rd fastest shrinking city (2017)
- Significant urban and rural challenges (~2 hrs. to maj. city)
- Median HH income \$33.5k, 33% poverty, 14% college deg.



Johnstown, PA – Prototype Project

Building Living-Learning Communities – Bridges to Our Future

Flood City Youth Fitness Academy

- 21st Cent. CLC – STEM focus
- 400 k-12 kids, parents (Sec 8)
- K-12 Wraparound services
- Coding, robotics, tutoring
- Family programs, job training
- Trusted community anchor



- 50-year regional industry exp.
- Economic & workforce dev.
- Training, start-ups, loans
- Strong DOD connection
- Vibrant political connector
- Anchor & hub for industry jobs



- Local housing authority
- > 900 Units, mainly Sect. 8
- Most FCYFA kids w/in JHA
- Strong political connector
- Recent BB plan approval
- Anchor for family housing

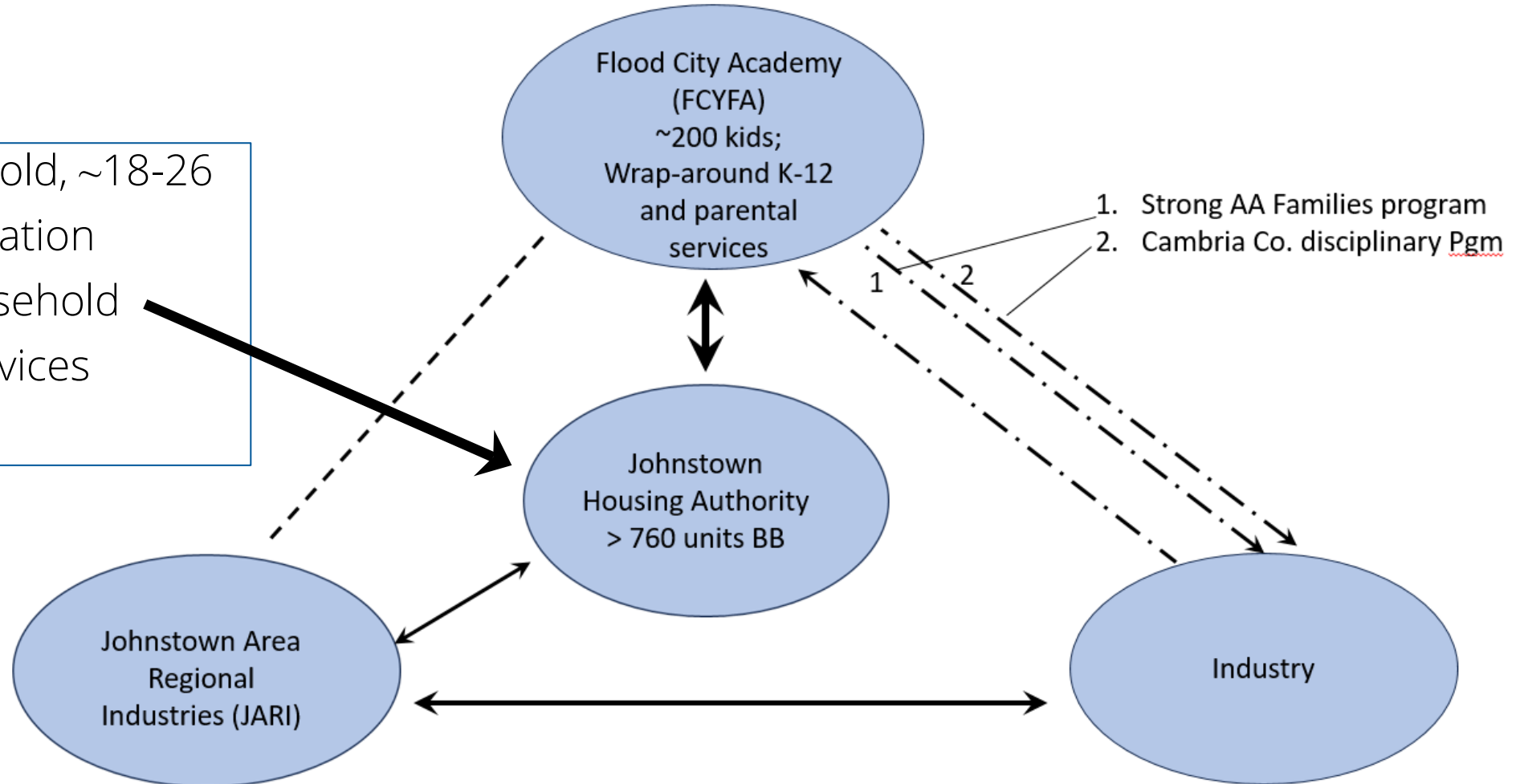


Johnstown, PA – Prototype Project

Building Living-Learning Communities – Bridges to Our Future

“Learning is not an event; rather, it’s a lifestyle.”

- Heads of household, ~18-26
- Job training/education
- Learning for household
- Wrap-around services
- Broadband



Johnstown, PA – Prototype Project

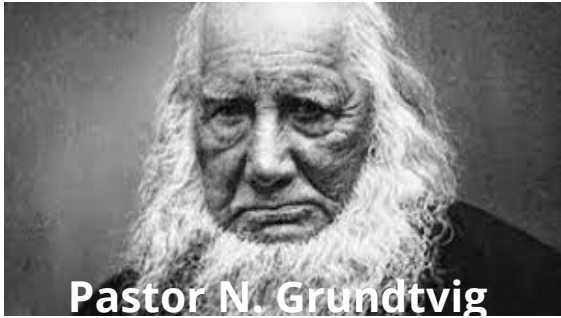
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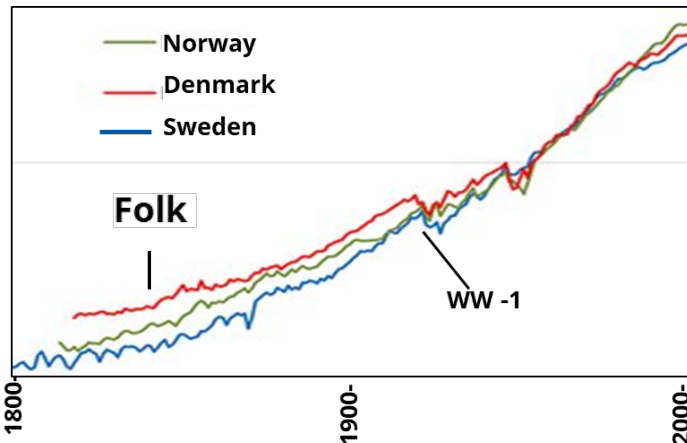
The Power of Learning Networks

Lessons from Scandinavia on Capturing Stranded Brilliance – Full Circle

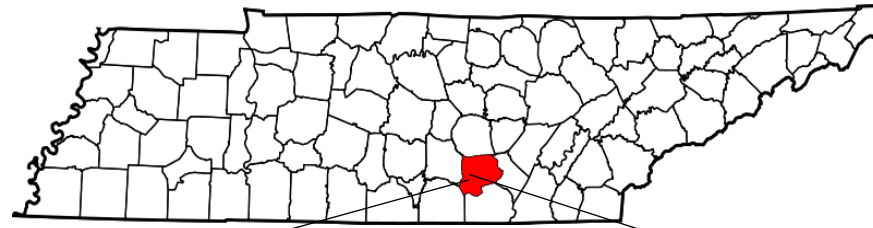
1844 Denmark Folk High Schools



- Informal, no degrees
- Low-cost, 2-6 mons.
- Social agency, "citizenship"



1932 Grundy, TN Highlander Folk School



1955-1961 Civil Rights Community Building



Envisioning Our Preferred Innovation Future

Making Visible the Invisible...

- “In a world of change, the learners shall inherit the earth, while the learned are perfectly suited for a world that no longer exists.”-- Eric Hoffer
- Let’s make America the human development capital of the world, by making **visible** the invisible:

