



20
YEARS

ARIZONA'S
BIOSCIENCE
ROADMAP

BIOSCIENCES IN ARIZONA

2022 Performance Review

Mitch Horowitz and Ryan Helwig, TEconomy Partners LLC

April 20, 2022

What Is Arizona's Bioscience Roadmap?

- 20-year plan to bring Arizona to competitiveness in Biosciences
- Commissioned by the Flinn Foundation, tracked by TEconomy Partners
- **Goals:** Economic strength and diversity; access to health innovations for Arizonans
- **Focus:** Leverage research strengths and build critical mass of firms

Vision for Arizona in 2025

“Arizona is **globally competitive** and a **national leader** in the biosciences in such fields as precision medicine, cancer, neurosciences, bioengineering, diagnostics, and agricultural biotechnology.”

“It excels in offering a **deep talent base**, a critical mass of **entrepreneurs and enterprises**, and **clinical excellence** to turn discovery into firms, products, and talent.”

Source: Second Decade Roadmap, available at www.flinn.org

Summary of 2022 Performance Review

- Overall Arizona receives **another strong report card** with gains recorded across every performance metric, **but not always keeping pace with the nation**
- The state's bioscience industry continues to outpace the nation in job gains and demonstrated resilience during the first year of the pandemic, and continues to bolster the overall economy with job gains under difficult economic conditions
- Bio-related VC investments in emerging AZ firms reached a new peak in 2021—outpacing the country on deal flow but not growth in overall funding
- The biosciences R&D base is still on an upward trajectory – in particular, continued strong gains in NIH funding awards to AZ institutions
- Still a need for Arizona to **focus on higher value activities in the biosciences** that can generate increased economic output and wages for its growing biosciences workforce – today Arizona lags behind the nation in both value added per worker (productivity) and wages across subsectors of the biosciences

Defining the Biosciences Industry

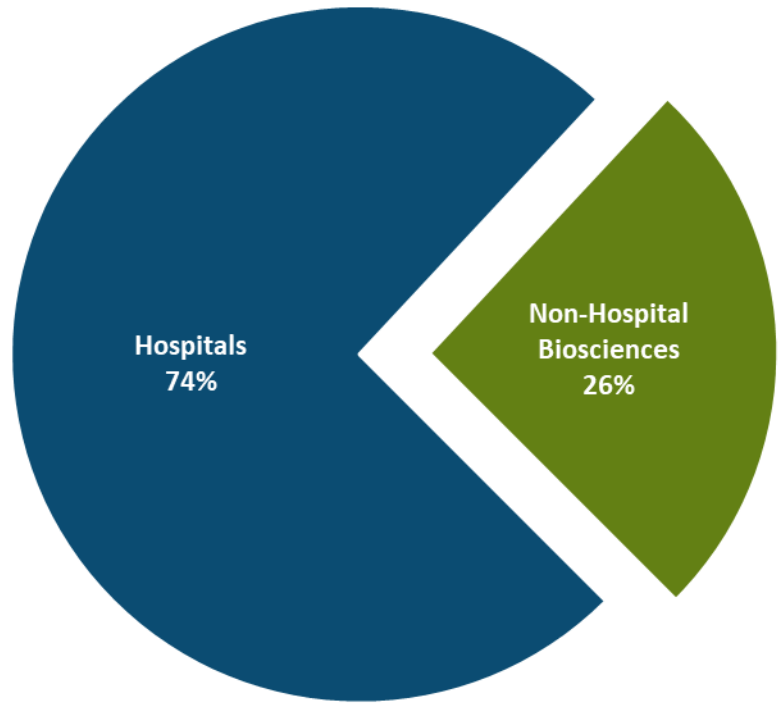
- Agricultural Feedstock & Industrial Biosciences
- Bioscience-Related Distribution
- Drugs, Pharmaceuticals & Diagnostics
- Medical Devices & Equipment
- Research, Testing & Medical Labs
- Hospitals



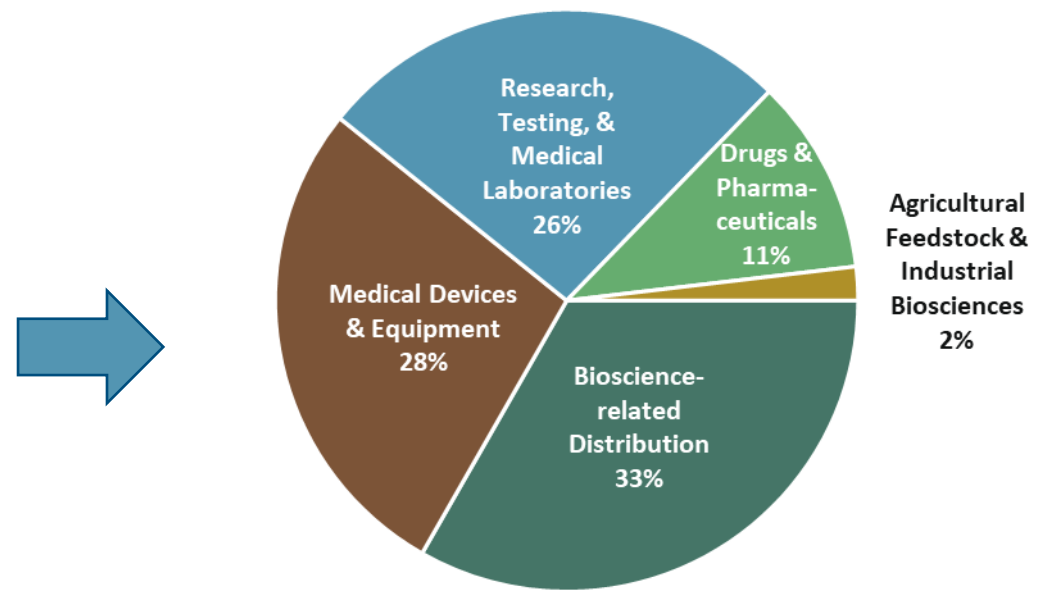
Metric: Jobs

Composition of Bioscience Industry in AZ, 2020

133,000 Total AZ Biosciences Jobs

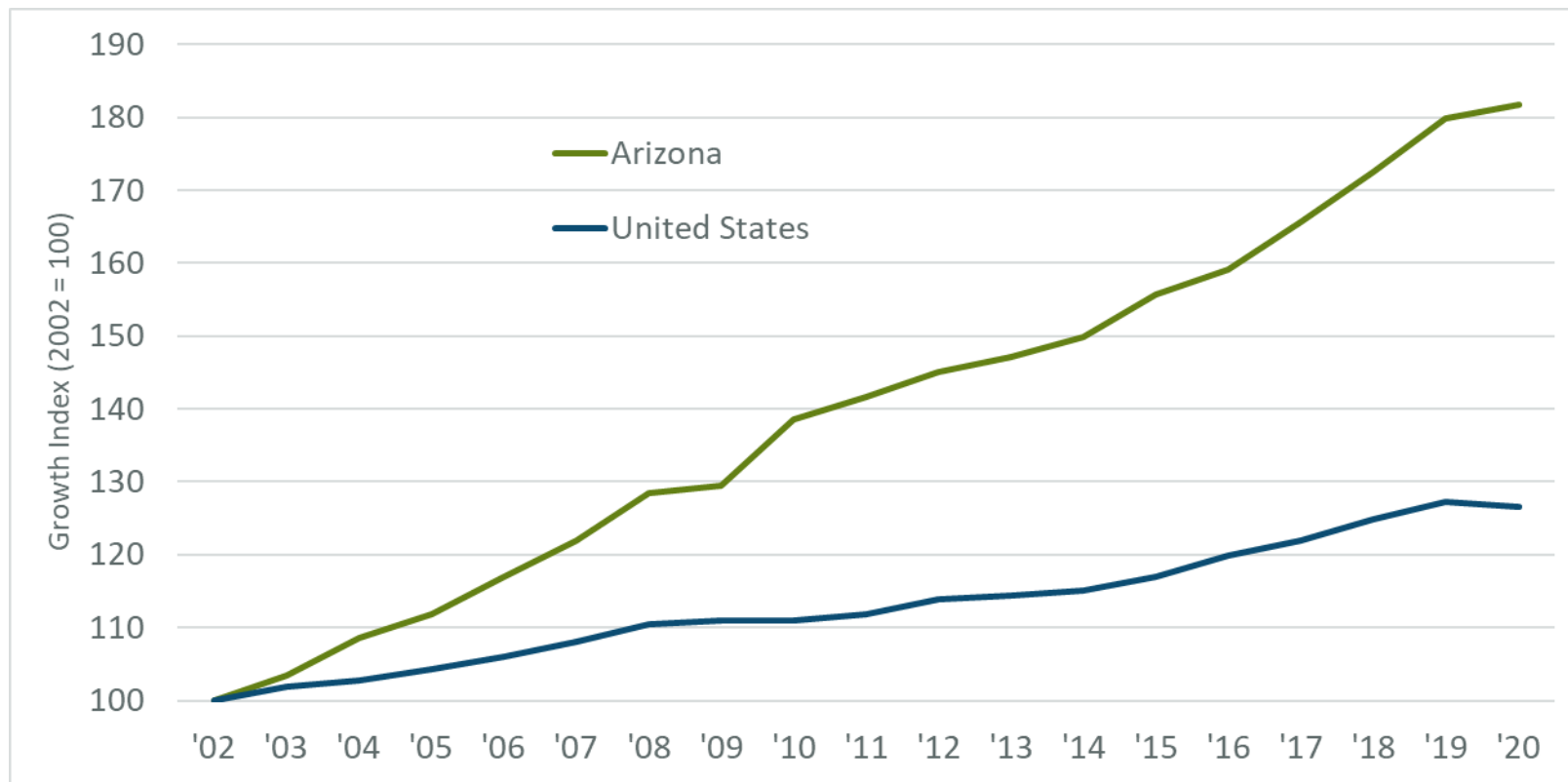


34,000 AZ Non-Hospital Biosciences Jobs



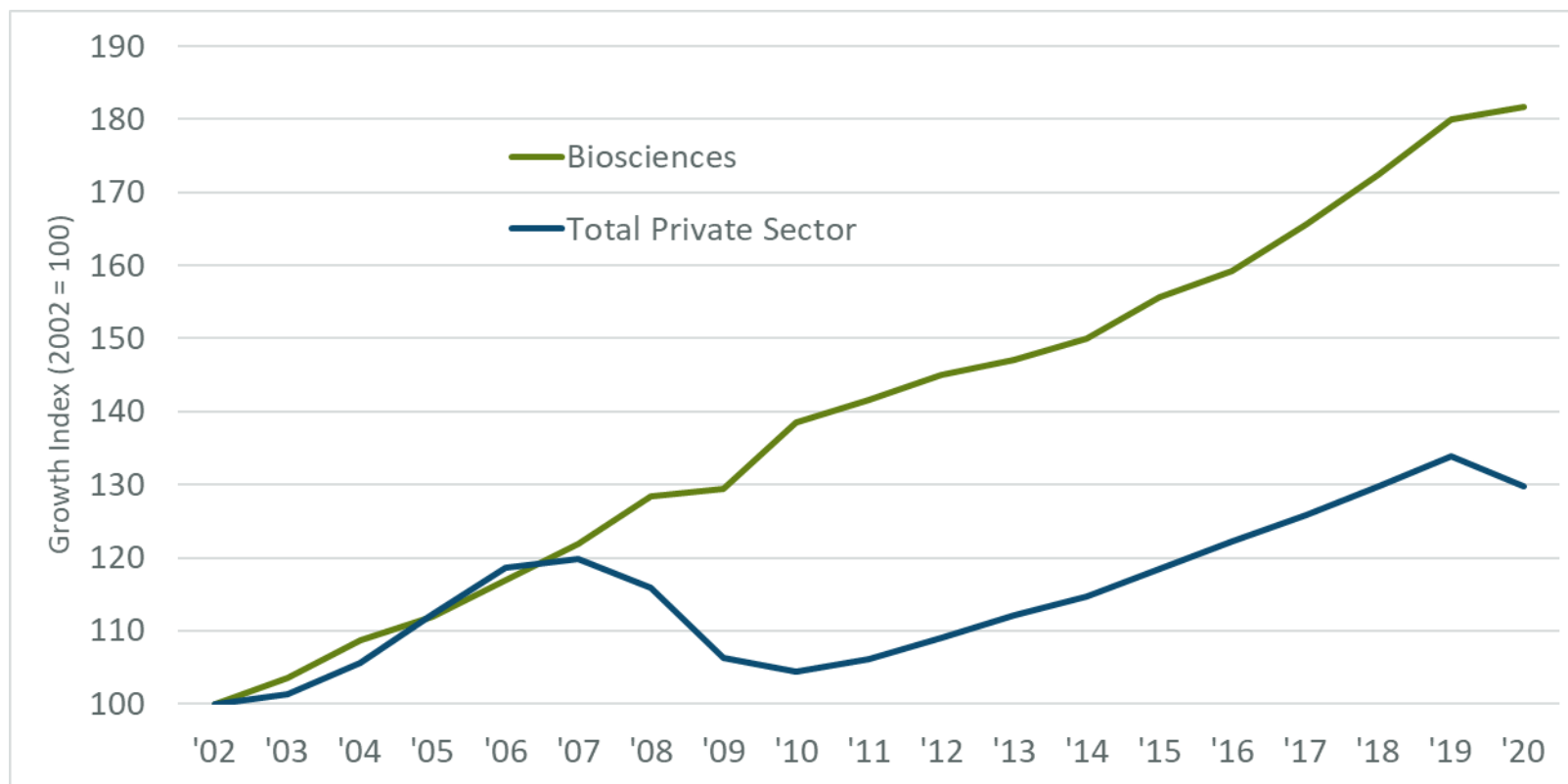
Metric: Jobs

AZ & U.S. Bioscience Industry Employment: 2002-20

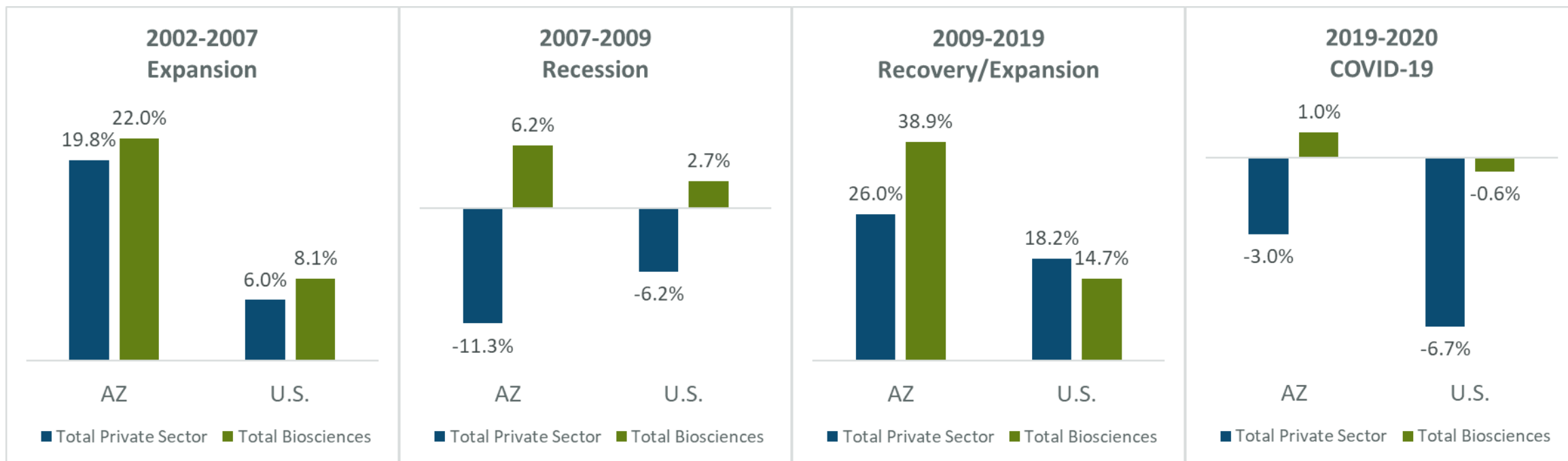


Metric: Jobs

Arizona Employment Trends: 2002-20



Metric: Jobs Employment Across Business Cycles



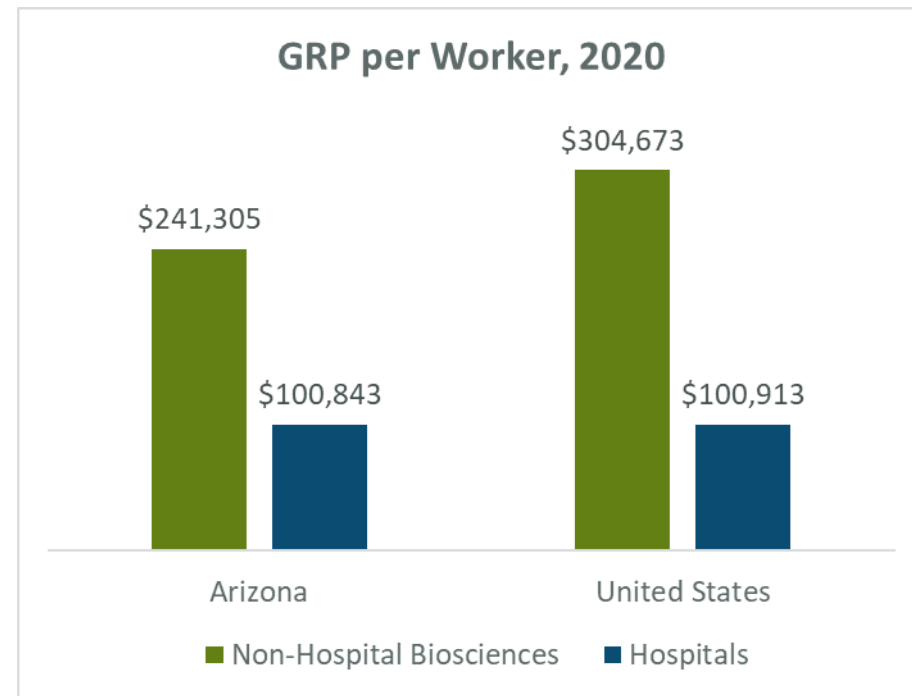
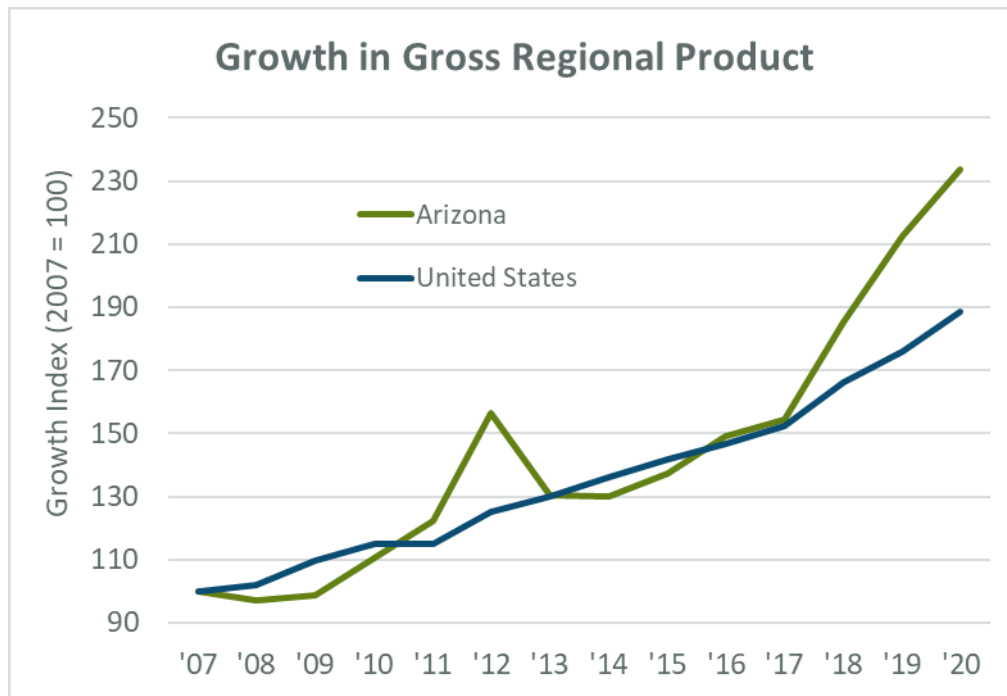
Metric: Jobs Employment Across Business Cycles

Industry Subsector	Arizona Share of AZ Private Sector Jobs		Arizona Share of U.S. Subsector Jobs			2020 Arizona Specialization Relative to U.S. (Location Quotient)
	2002	2020	2002	2020		
Agricultural Feedstock & Industrial Biosciences	0.03%	0.03%	0.7%	1.0%	↑	0.45
Bioscience-related Distribution	0.4%	0.5%	1.7%	2.0%	↑	0.95
Drugs, Pharmaceuticals & Diagnostics	0.1%	0.2%	0.3%	1.2%	↑↑	0.57
Medical Devices & Equipment	0.2%	0.4%	0.9%	2.5%	↑↑	1.20
Research, Testing, & Medical Laboratories	0.2%	0.4%	1.2%	1.6%	↑	0.65
Hospitals	3.1%	4.1%	1.4%	2.0%	↑	0.95
Total Non-Hospital Biosciences	0.9%	1.4%	1.1%	1.7%	↑	0.82
TOTAL BIOSCIENCES	3.9%	5.5%	1.3%	1.9%	↑	0.92

Metric: Jobs Employment Across Business Cycles

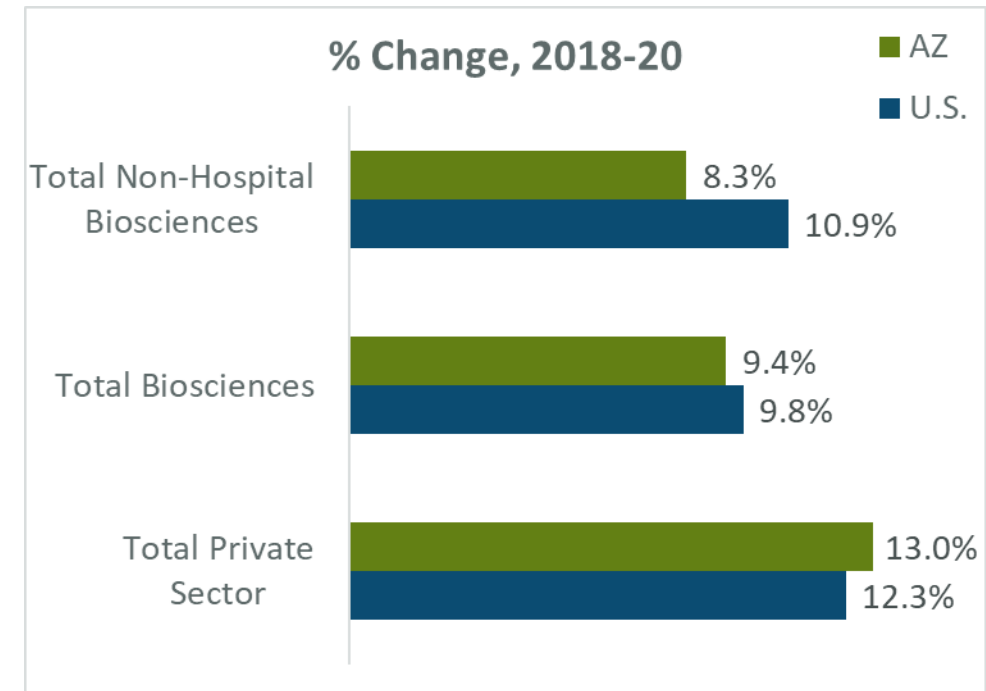
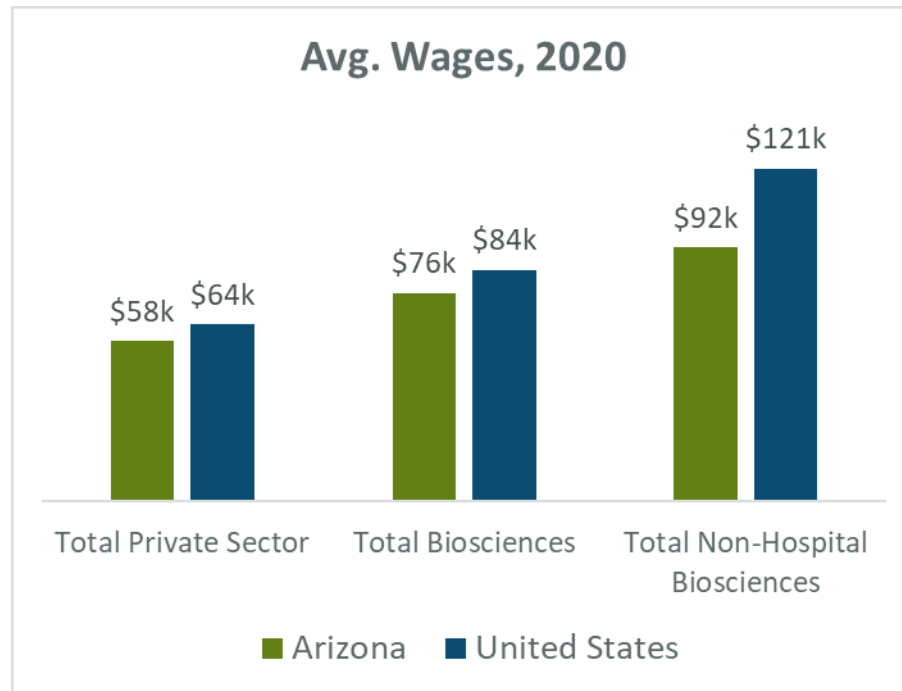
Industry Subsector	Arizona Share of AZ Private Sector Jobs		Arizona Share of U.S. Subsector Jobs			2020 Arizona Specialization Relative to U.S. (Location Quotient)
	2002	2020	2002	2020		
Agricultural Feedstock & Industrial Biosciences	0.03%	0.03%	0.7%	1.0%	↑	0.45
Bioscience-related Distribution	0.4%	0.5%	1.7%	2.0%	↑	0.95
Drugs, Pharmaceuticals & Diagnostics	0.1%	0.2%	0.3%	1.2%	↑↑	0.57
Medical Devices & Equipment	0.2%	0.4%	0.9%	2.5%	↑↑	1.20
Research, Testing, & Medical Laboratories	0.2%	0.4%	1.2%	1.6%	↑	0.65
Hospitals	3.1%	4.1%	1.4%	2.0%	↑	0.95
Total Non-Hospital Biosciences	0.9%	1.4%	1.1%	1.7%	↑	0.82
TOTAL BIOSCIENCES	3.9%	5.5%	1.3%	1.9%	↑	0.92

Metric: Gross Regional Product and Industry Productivity

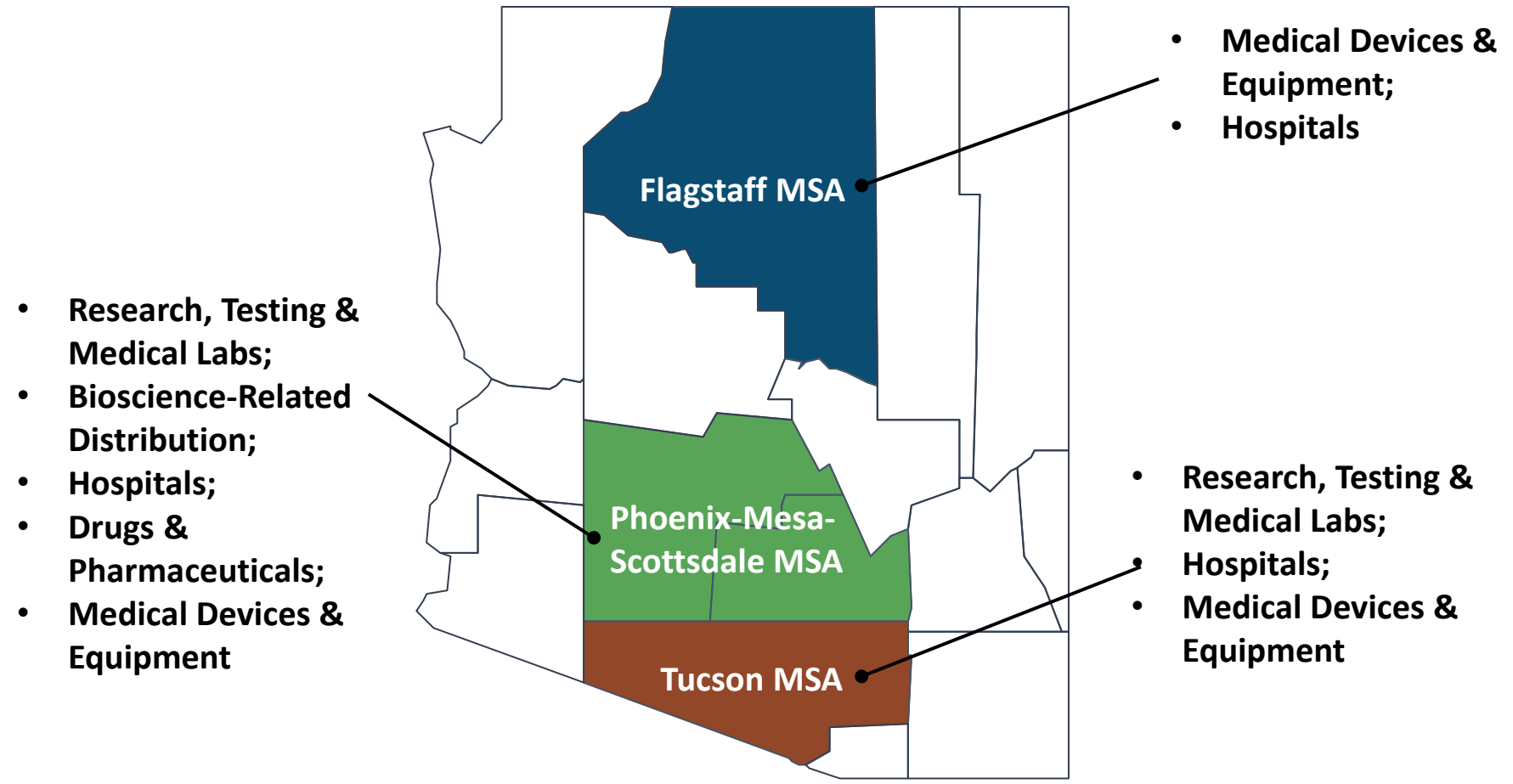


Metric: Wages

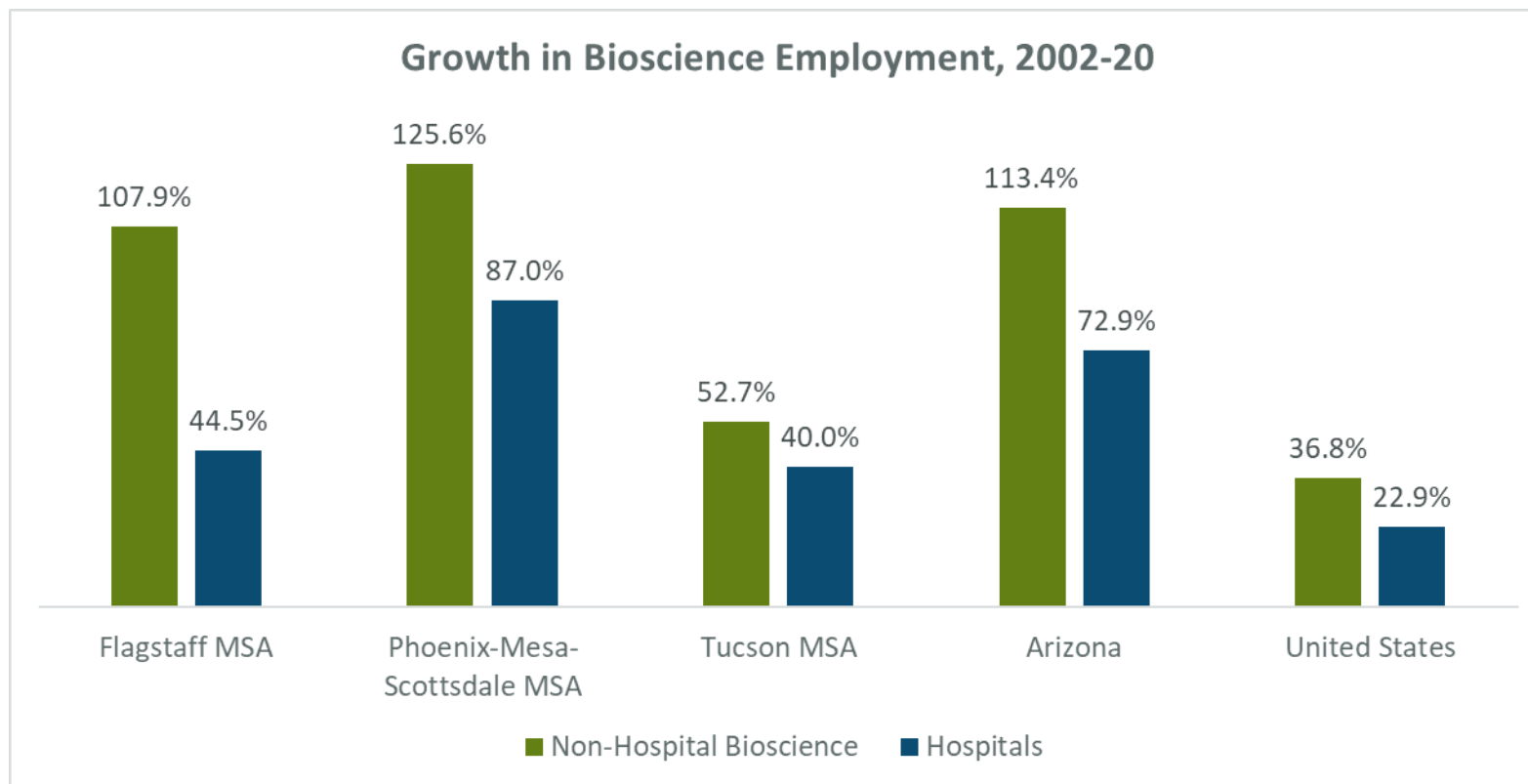
Bioscience Wages and Growth: 2018-20



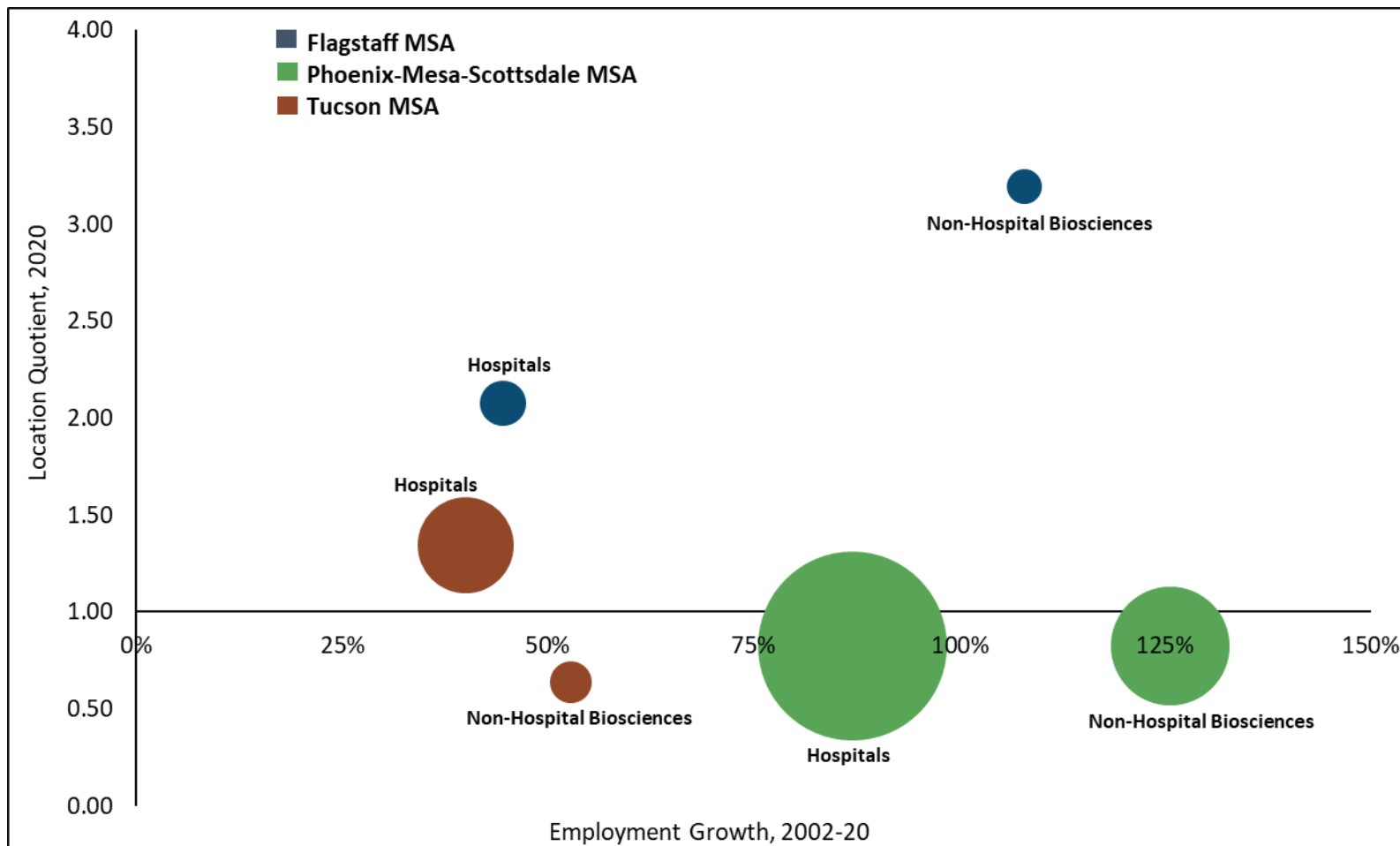
Regional Bioscience Industry Strengths



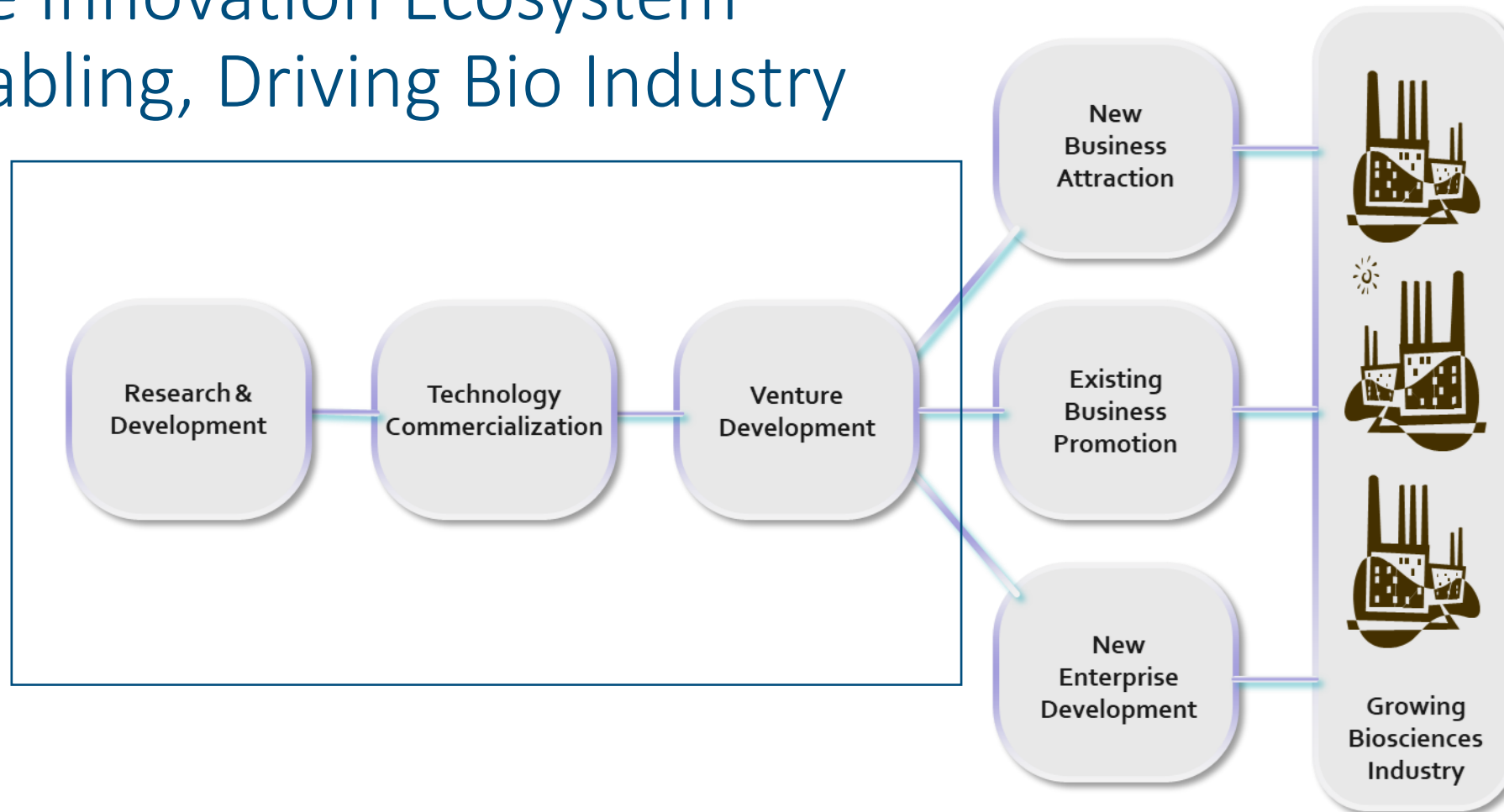
Regional Bioscience Employment Performance



Regional Bioscience Employment Performance



The Innovation Ecosystem Enabling, Driving Bio Industry

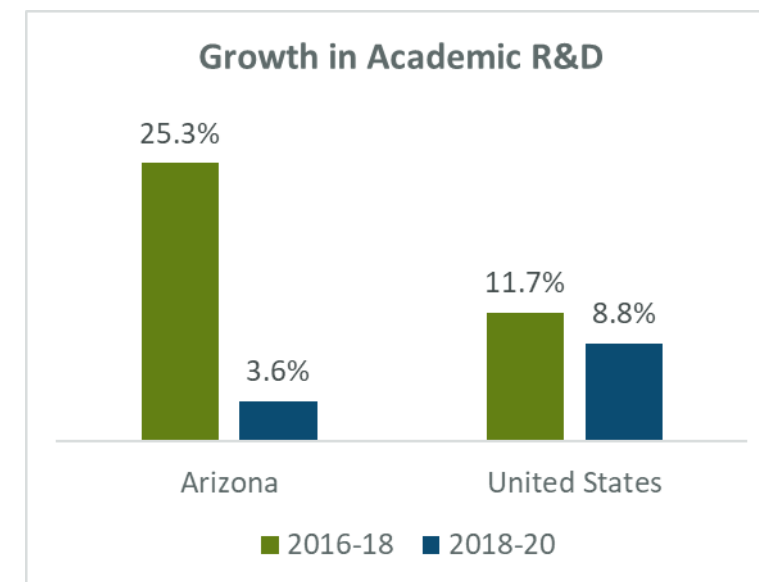
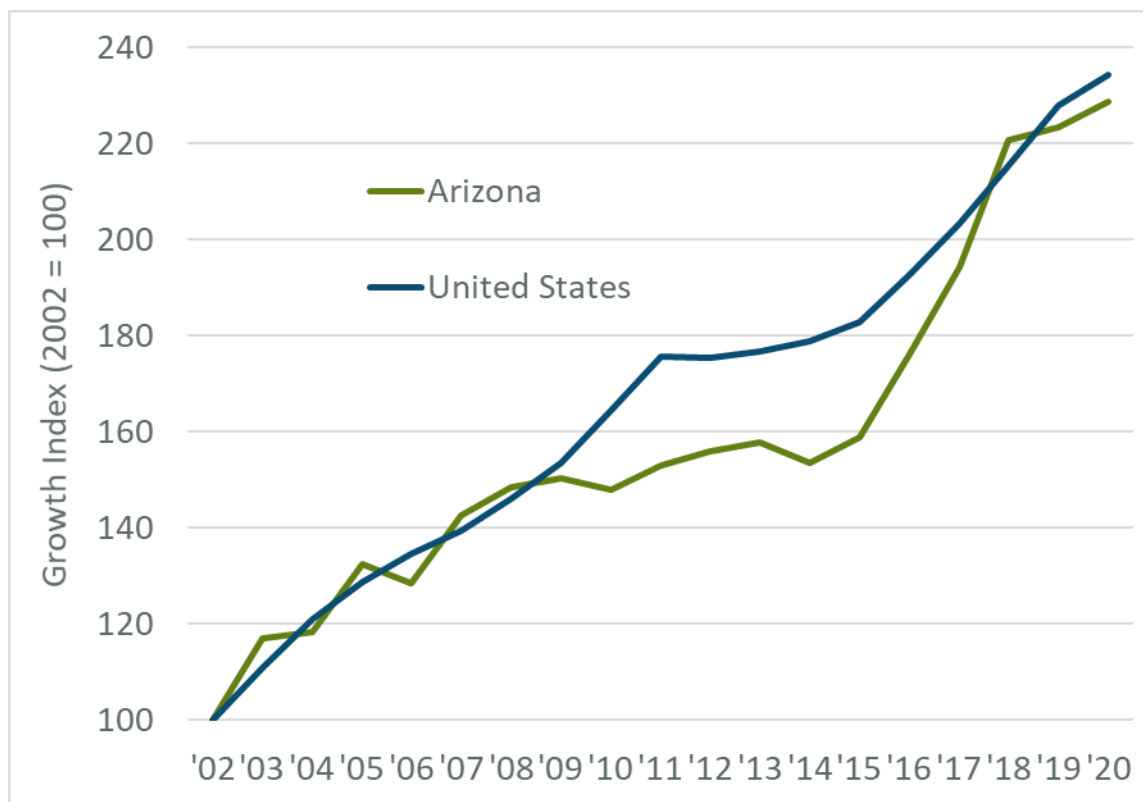


Metric: Bioscience R&D

AZ & U.S. Bioscience Academic R&D: 2002-20

Arizona Totals

2002: \$273M
2020: \$623M

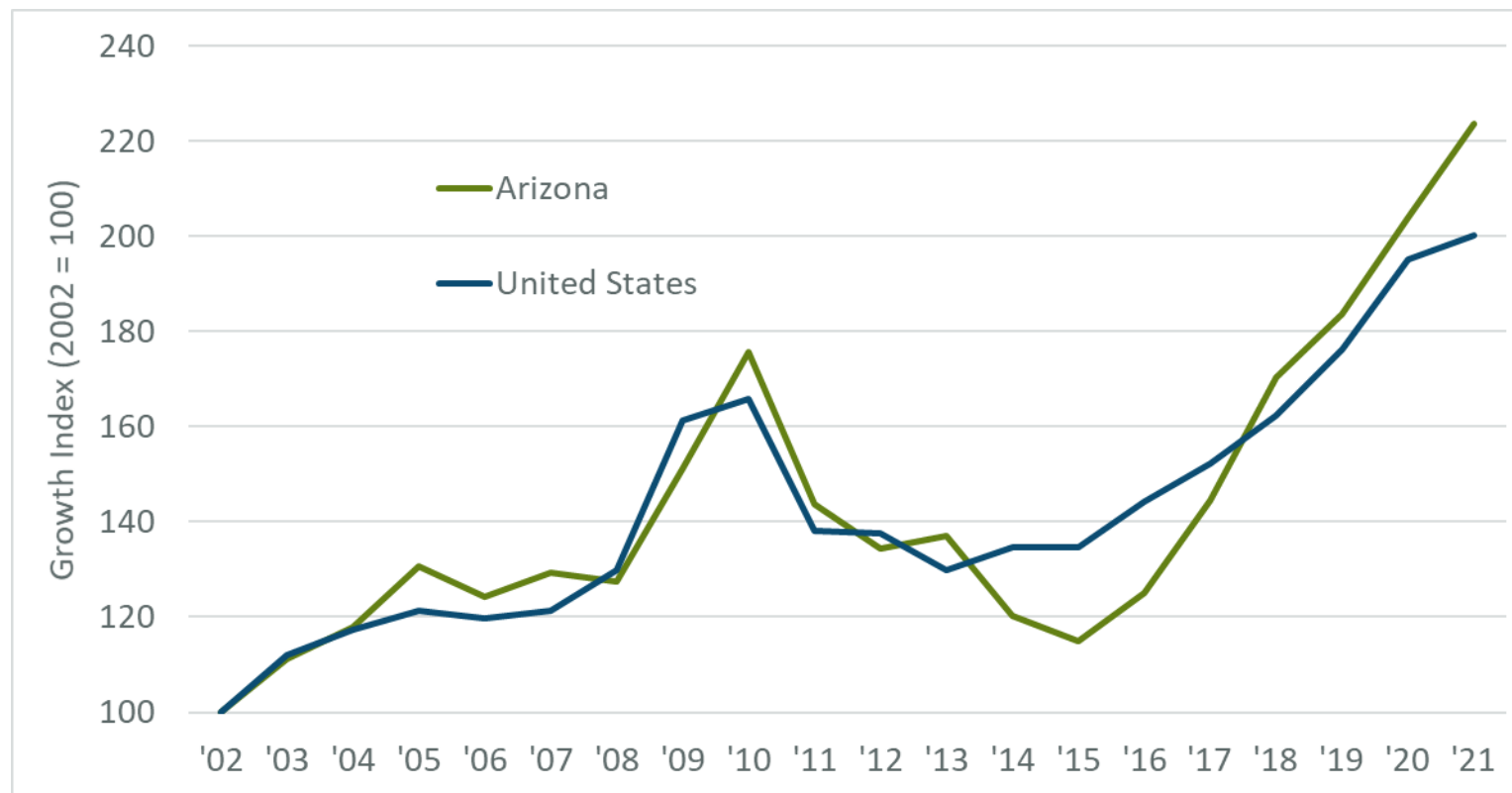


Metric: NIH Funding

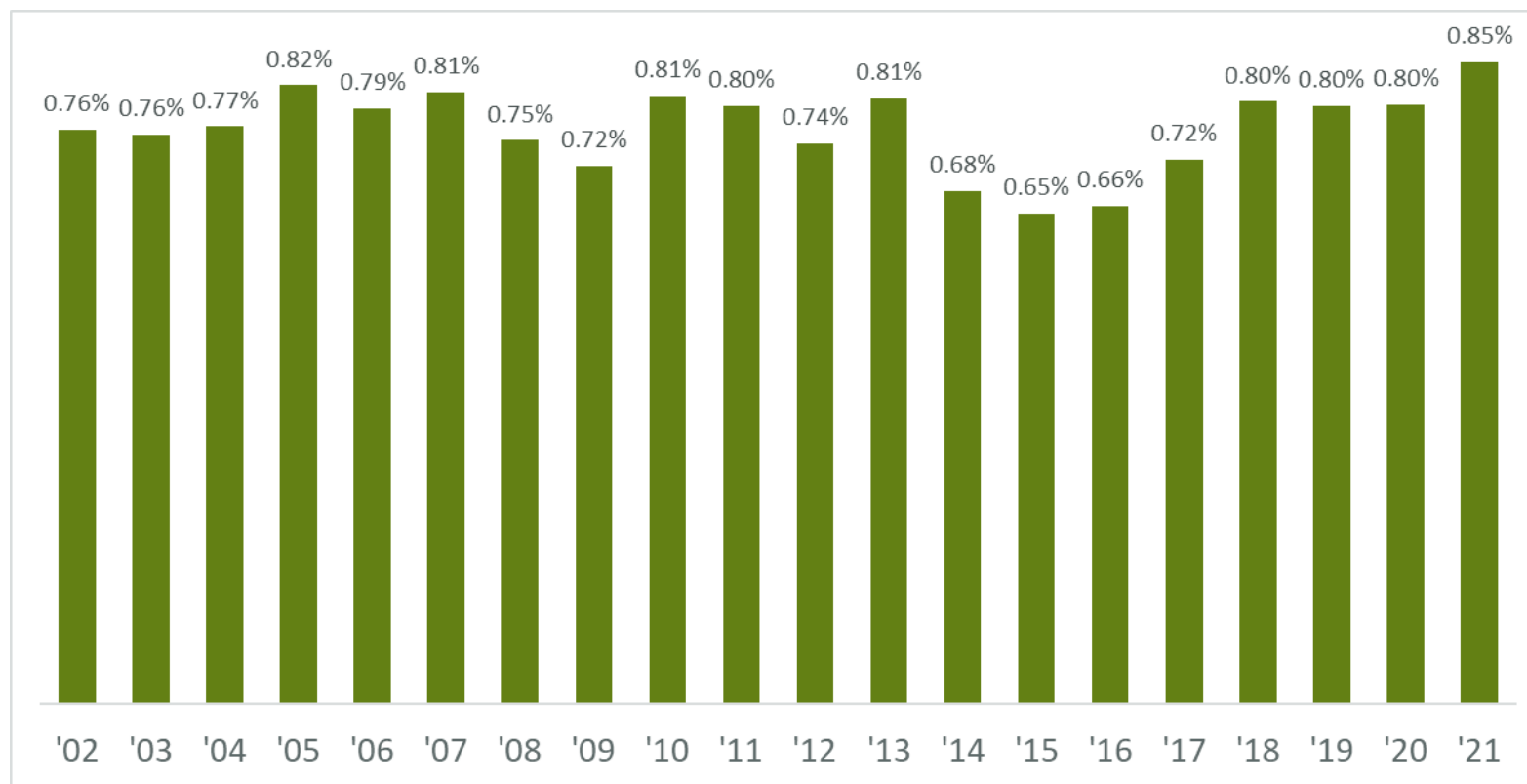
AZ & U.S. NIH Funding Trends: 2002-21

Arizona Totals

2002: \$133M
2021: \$297M

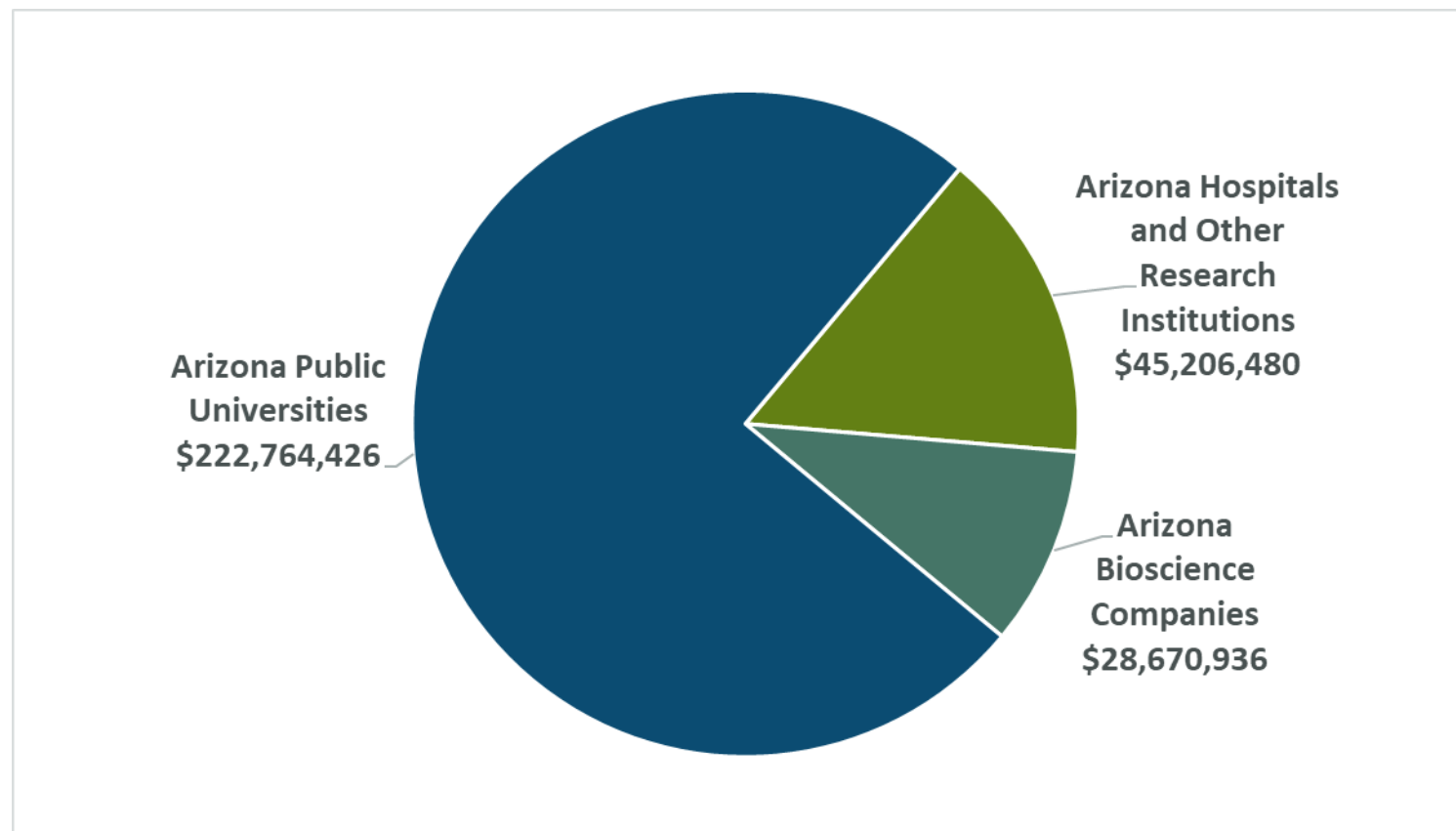


Metric: NIH Funding Arizona Share of NIH Support



Metric: NIH Funding

AZ NIH Funding Distribution: FY 2021

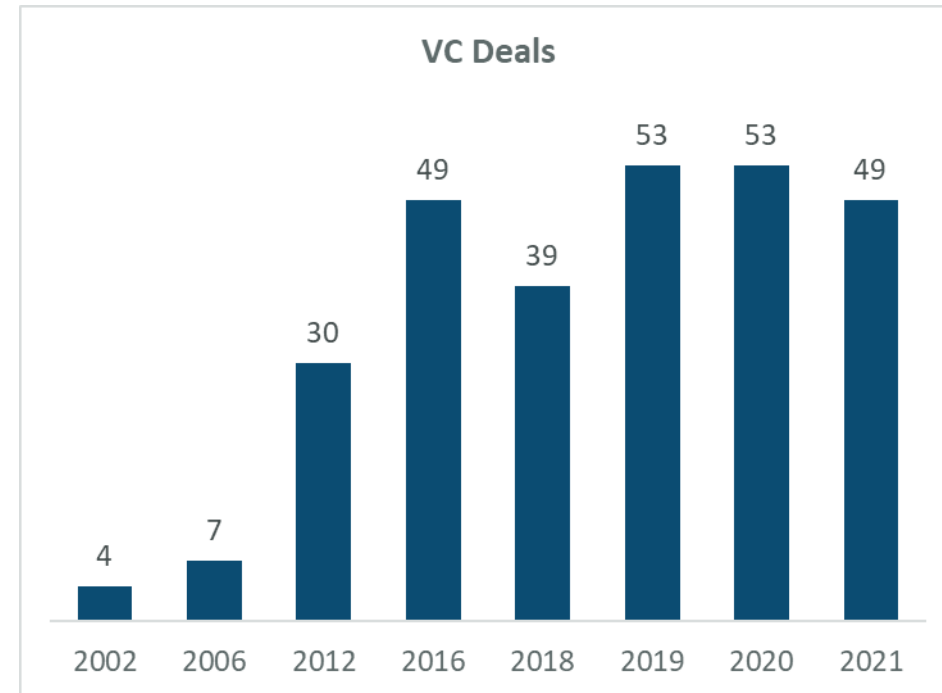
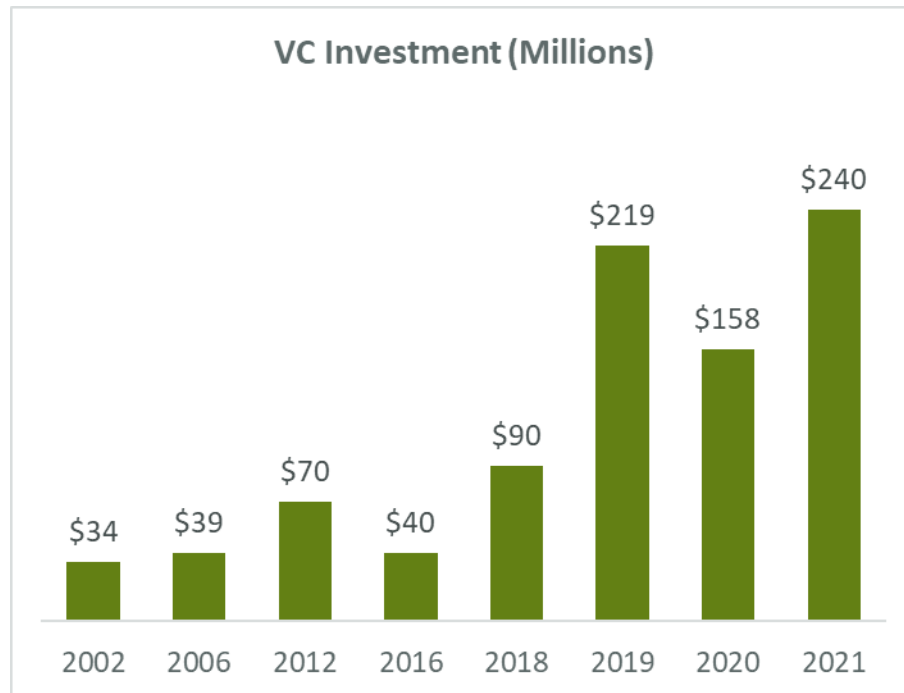


Metric: University Technology Transfer

Key Tech-Transfer Metrics	Total 2020-21	Growth 2018-19 to 2020-21	Bio Share of Tech Transfer 2020-21
Invention Disclosures Received	569	7%	46%
Total U.S. Patent Applications Filed	642	3%	51%
U.S. Patents Issued	234	30%	46%
Licenses & Options Executed	173	34%	45%
Adjusted Gross License Income Received	\$13.4M	54%	77%
Bioscience Startups from University IP	52	63%	63%

METRIC: VENTURE CAPITAL INVESTMENT

AZ Bio Venture Capital: 2002-21

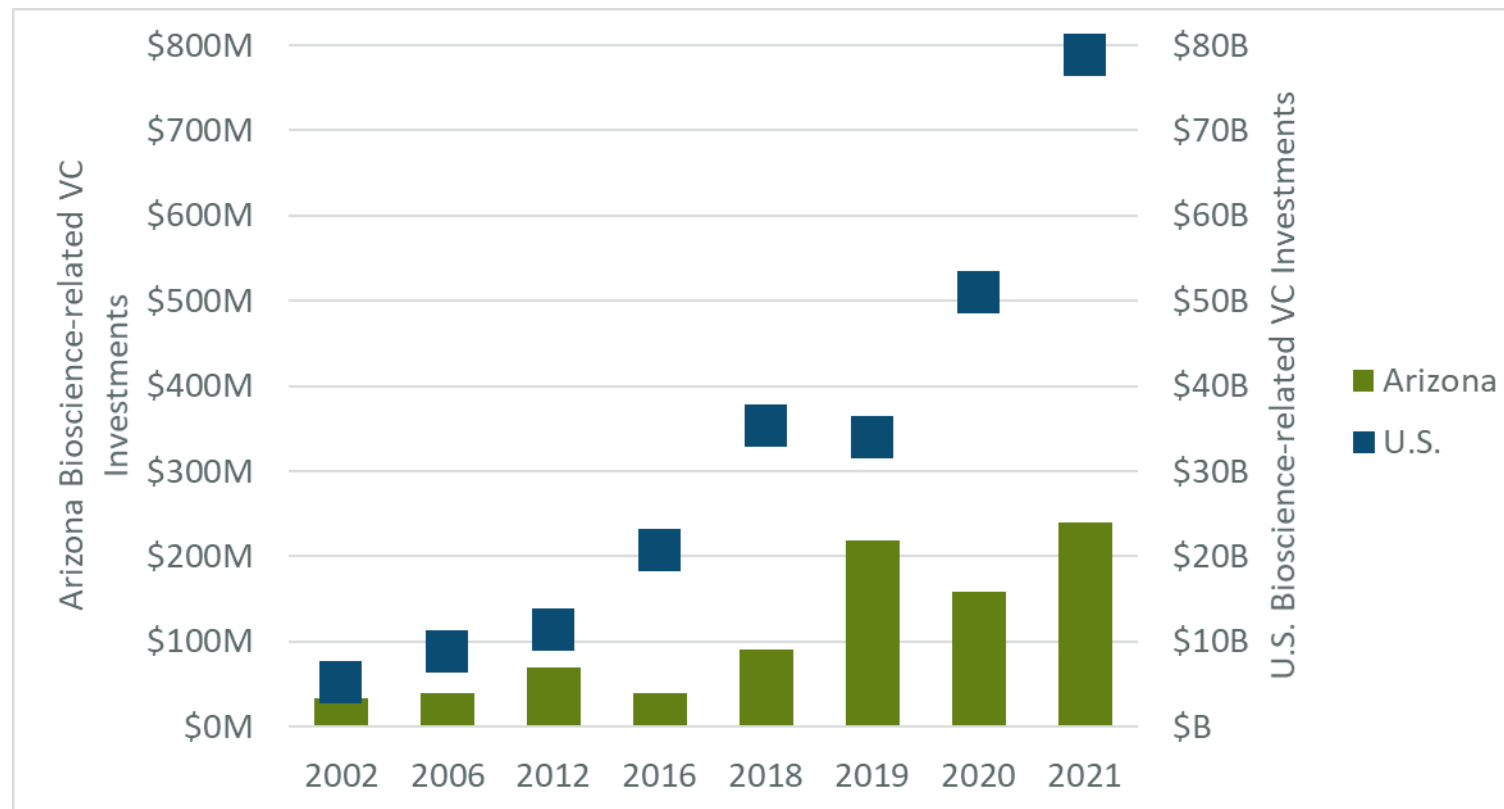


METRIC: VENTURE CAPITAL INVESTMENT

AZ & U.S. Bio Venture Capital: 2002-21

Arizona Totals

2002: \$34M
2021: \$240M



METRIC: VENTURE CAPITAL

Perspective on Venture Capital:

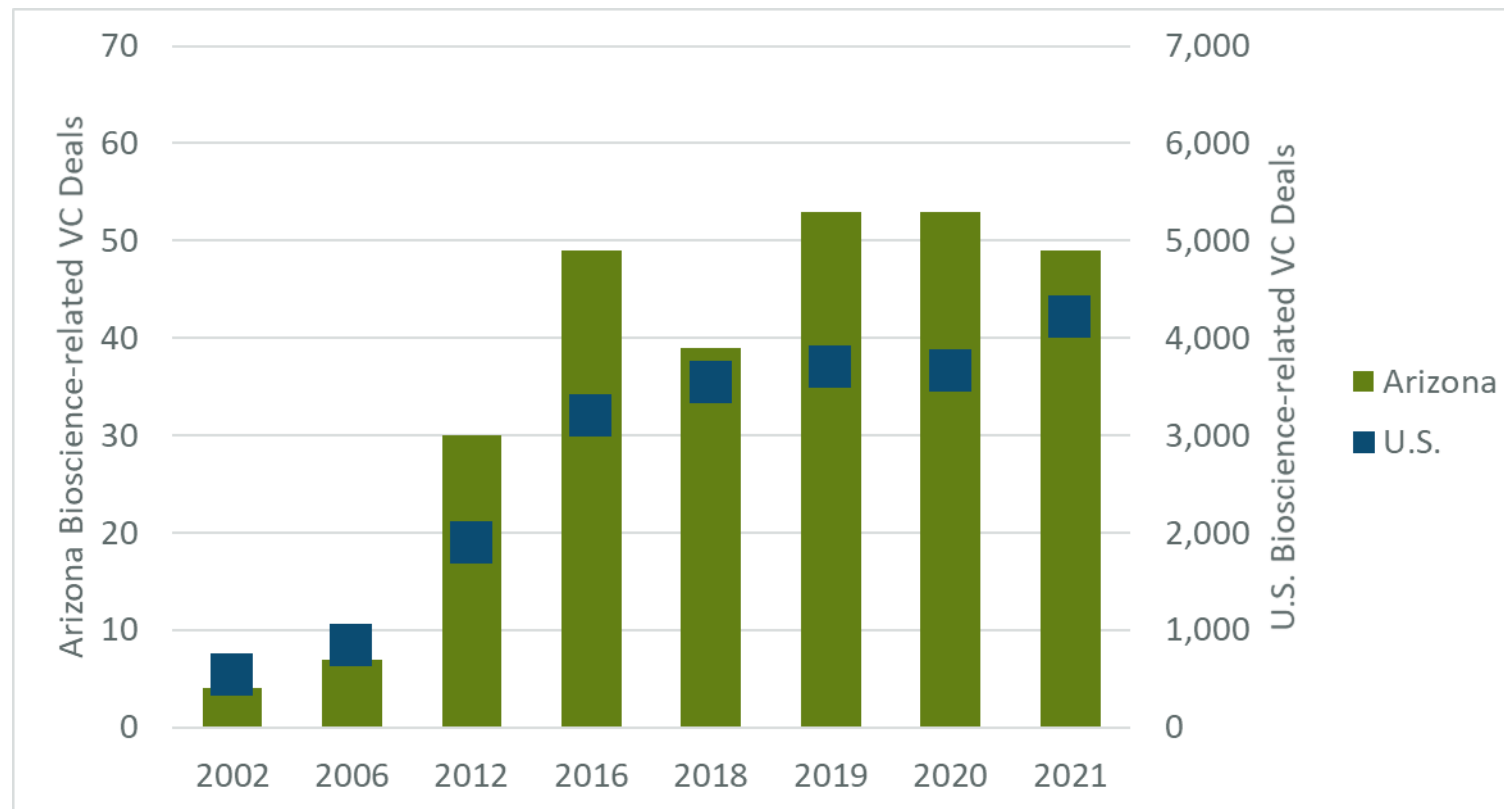
State	Amount of bioscience venture capital per \$1 in NIH funding, Avg. 2018-21
Arizona	\$0.68
Texas	\$0.83
Florida	\$0.94
U.S. Average	\$1.56
Massachusetts	\$3.58
California	\$4.22

METRIC: VENTURE CAPITAL DEALS

AZ & U.S. Bio Venture Capital: 2002-21

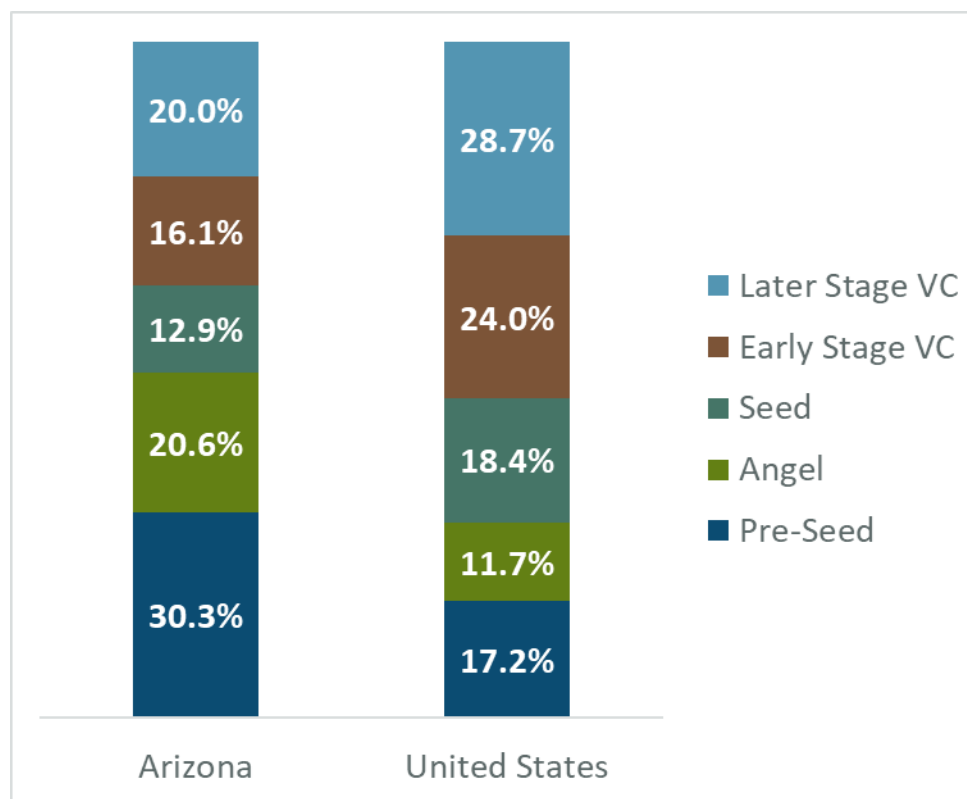
Arizona Totals

2002: 4
2021: 49



METRIC: VENTURE CAPITAL

AZ & U.S. Venture Capital Deals by Stage, 2018-21

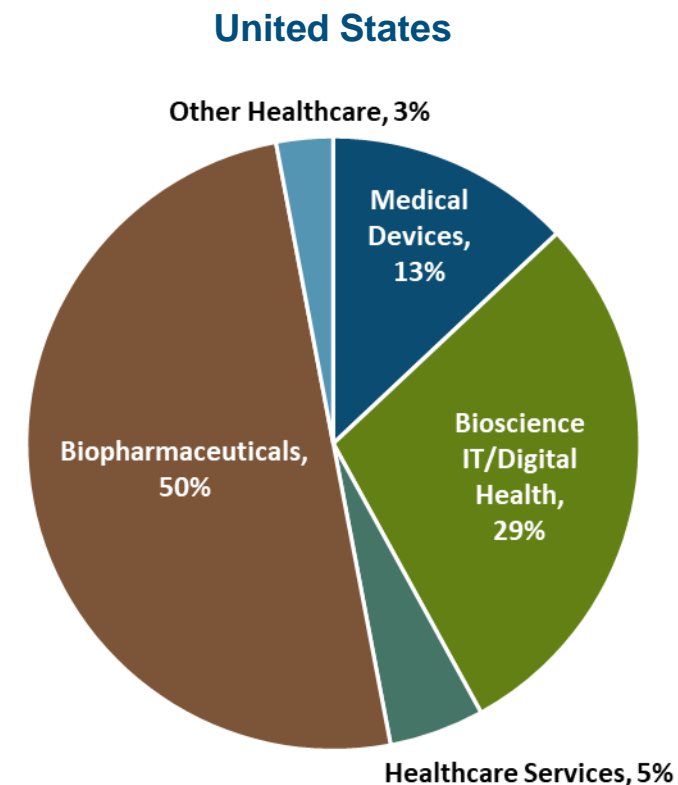
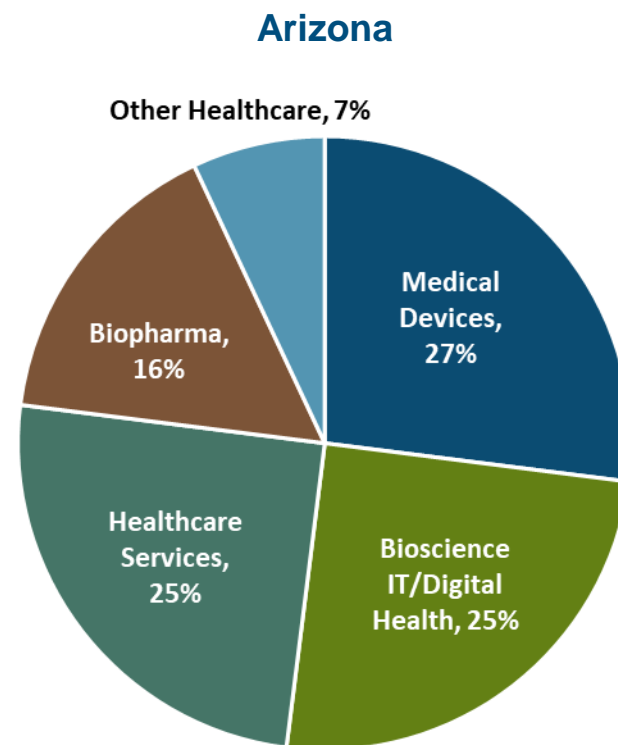


METRIC: VENTURE CAPITAL

Share of VC Investment by Bio-Related Industry, 2018-21

Arizona Strengths

- Clinics/Outpatient Services
- Drug Discovery
- Therapeutic Devices
- Diagnostic Equipment



Summary of Bioscience Industry Metrics of Success:

Metrics	Growth in AZ Since 2018	AZ Growth Relative to U.S.
Bio Industry Job Growth	↑	↑
Bio Average Wages	↑	↓
University Bio R&D Expenditures	↑	↓
NIH Funding	↑	↑
Bio University IP	↑	N/A
Bio Risk Capital	↑	↔

2002-2022: Marking 20 Years of Roadmap Progress

Long-Term Trends Show Significant Growth in Arizona's Bioscience Ecosystem



Jobs

2002: 73K
2020: 133K



1.8x



Univ. R&D

2002: \$273M
2020: \$623M



2.3x



VC

2002: \$34M
2021: \$240M



7.1x



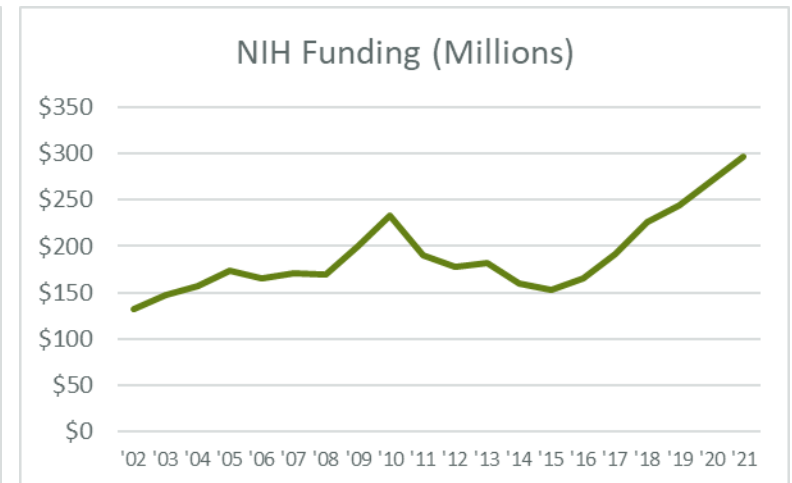
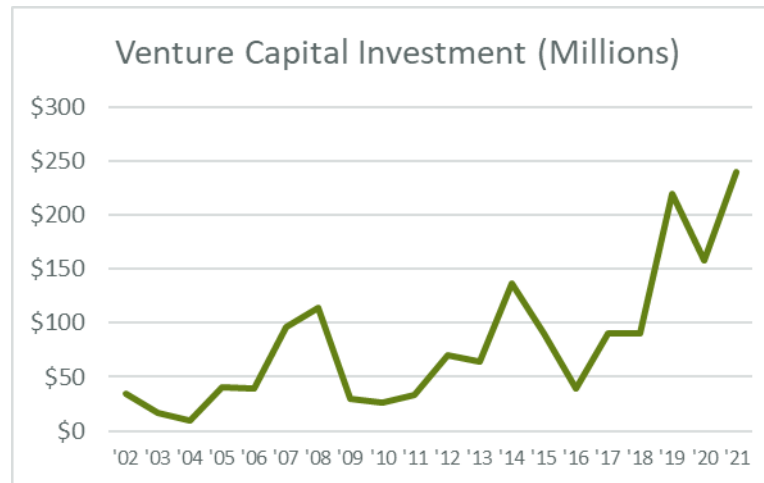
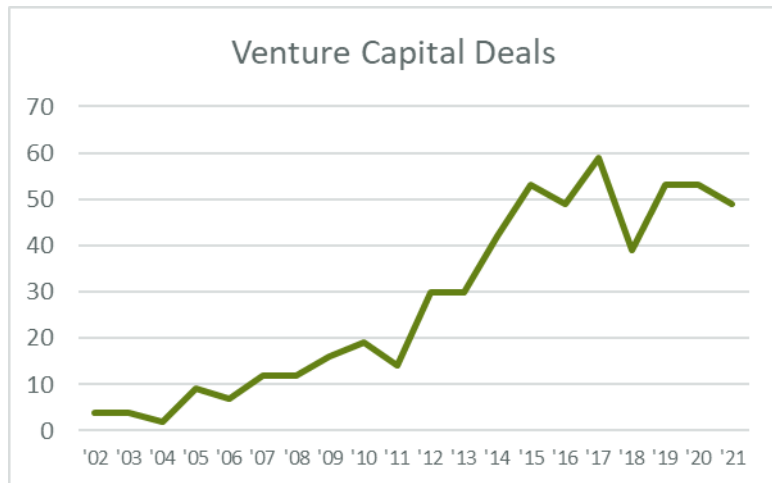
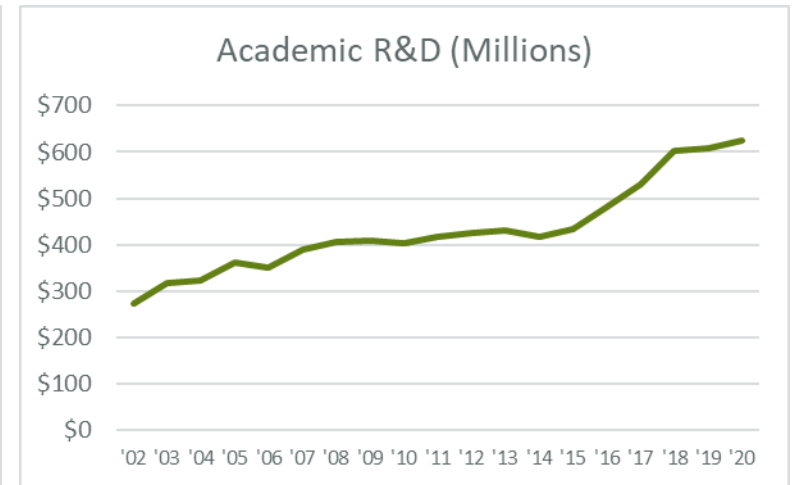
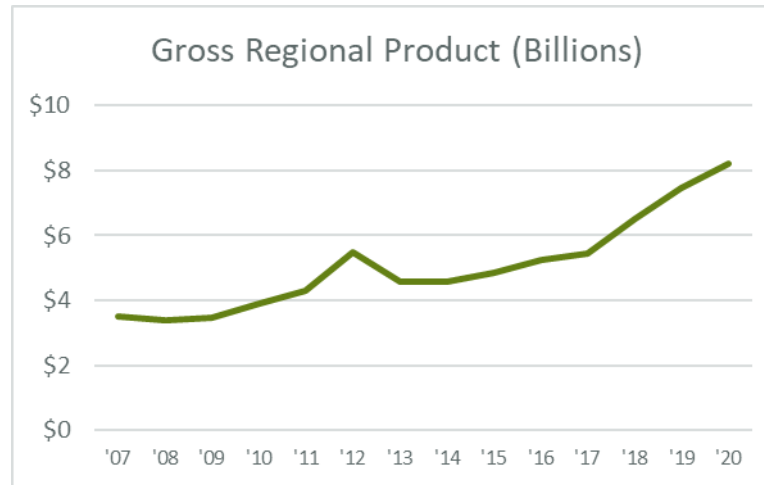
NIH

2002: \$133M
2021: \$297M



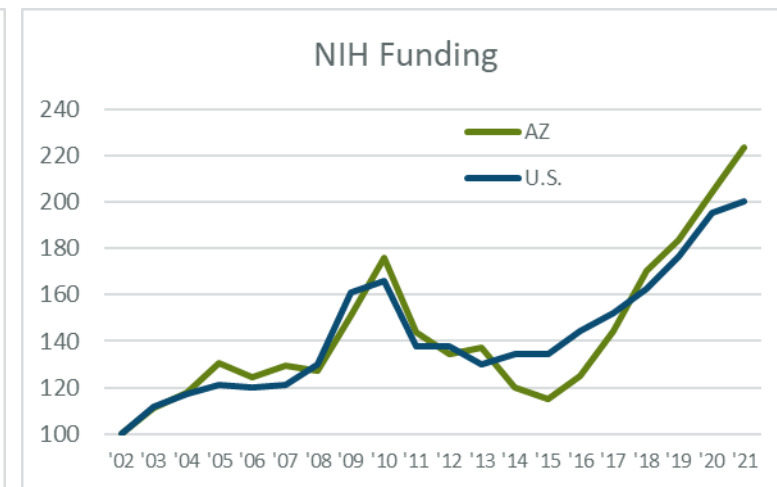
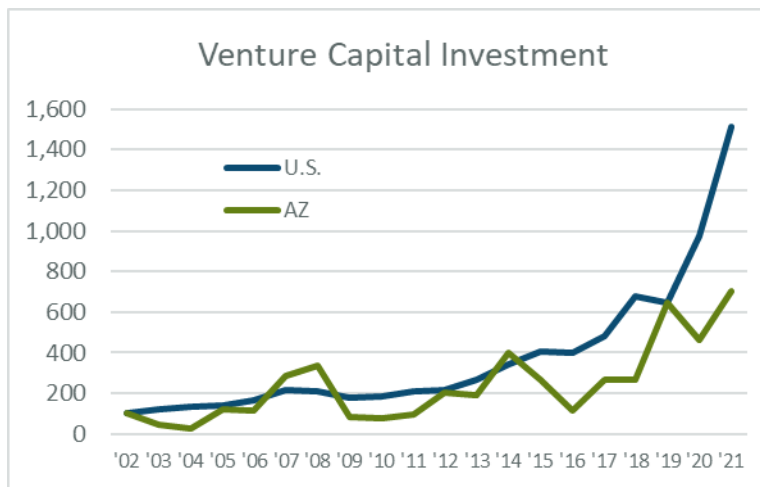
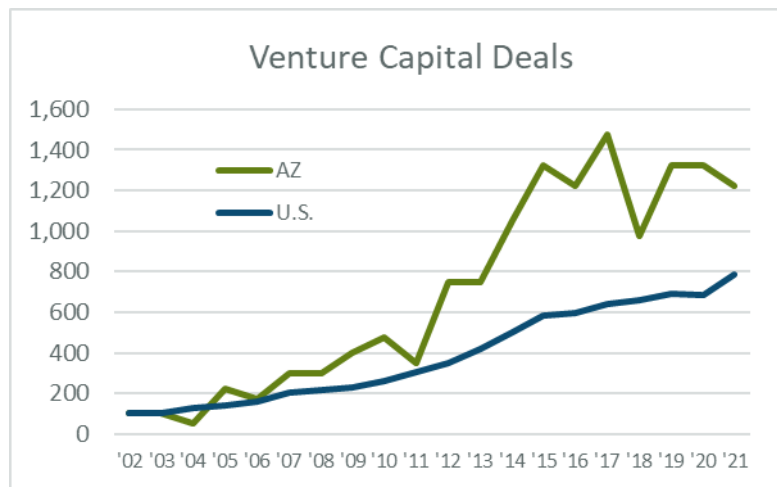
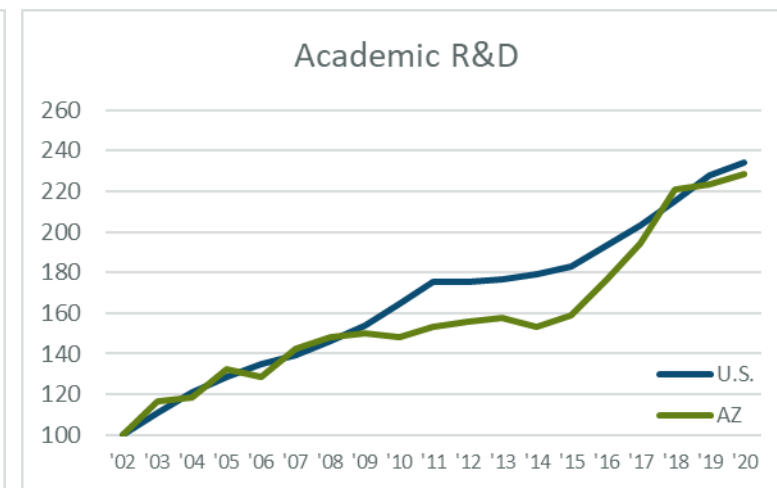
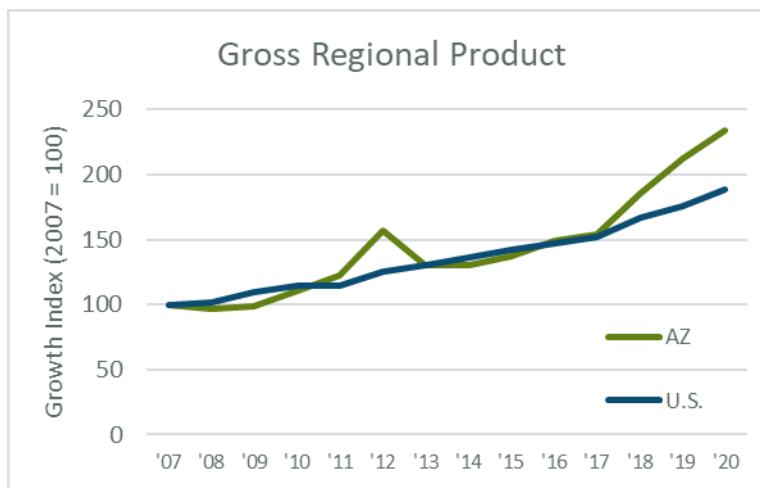
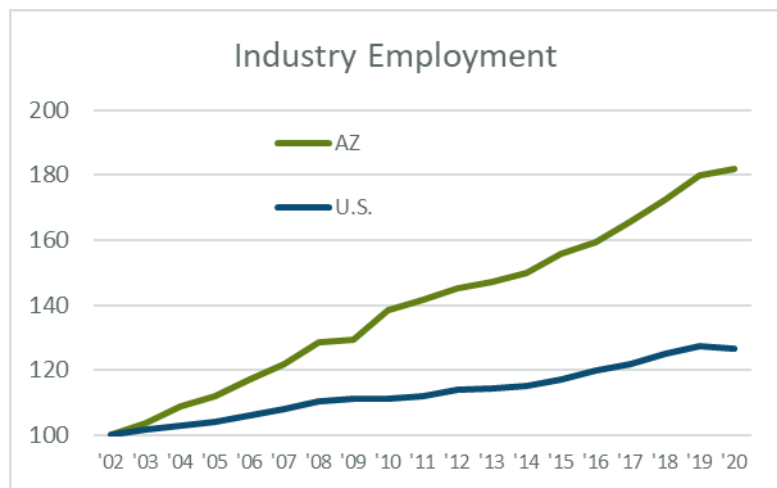
2.2x

Growth Trends in Key Arizona Biosciences Metrics Since 2002*



*Note: Regional GSP data only available back to 2007 for detailed AZ industries.
 Source: TEconomy Partners' analysis of Emsi 2022.1 data set; PitchBook; NSF HERD Surveys; NIH RePORTER.

Indexed Biosciences Trends Since 2002: AZ and U.S.



*Note: Regional GSP data only available back to 2007 for detailed AZ industries.
 Source: TEconomy Partners' analysis of Emsi 2022.1 data set; PitchBook; NSF HERD Surveys; NIH RePORTER.

Contact TEConomy Partners

Mitch Horowitz

Co-Founder and Senior Fellow

TEConomy Partners, LLC

(240) 462-5456

horowitzm@teconomypartners.com

Ryan Helwig

Principal and Project Director

TEConomy Partners, LLC

216-385-1935

helwigr@teconomypartners.com



BIOSCIENCES IN ARIZONA

www.flinn.org/progress

TEconomy Partners, LLC

teconomypartners.com