



ARIZONA'S
BIOSCIENCE
ROADMAP

BIOSCIENCES IN ARIZONA

2020 Performance Review

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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.”

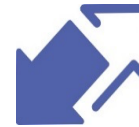
Source: Second Decade Roadmap, available at www.flinn.org

Summary of 2020 Performance Review

- Strong report card—growth found across nearly every performance metric
- Both private industry and university research continuing to make strong strides
- Suggests recent renewals of TRIF and Angel Investment Tax Credit paying off

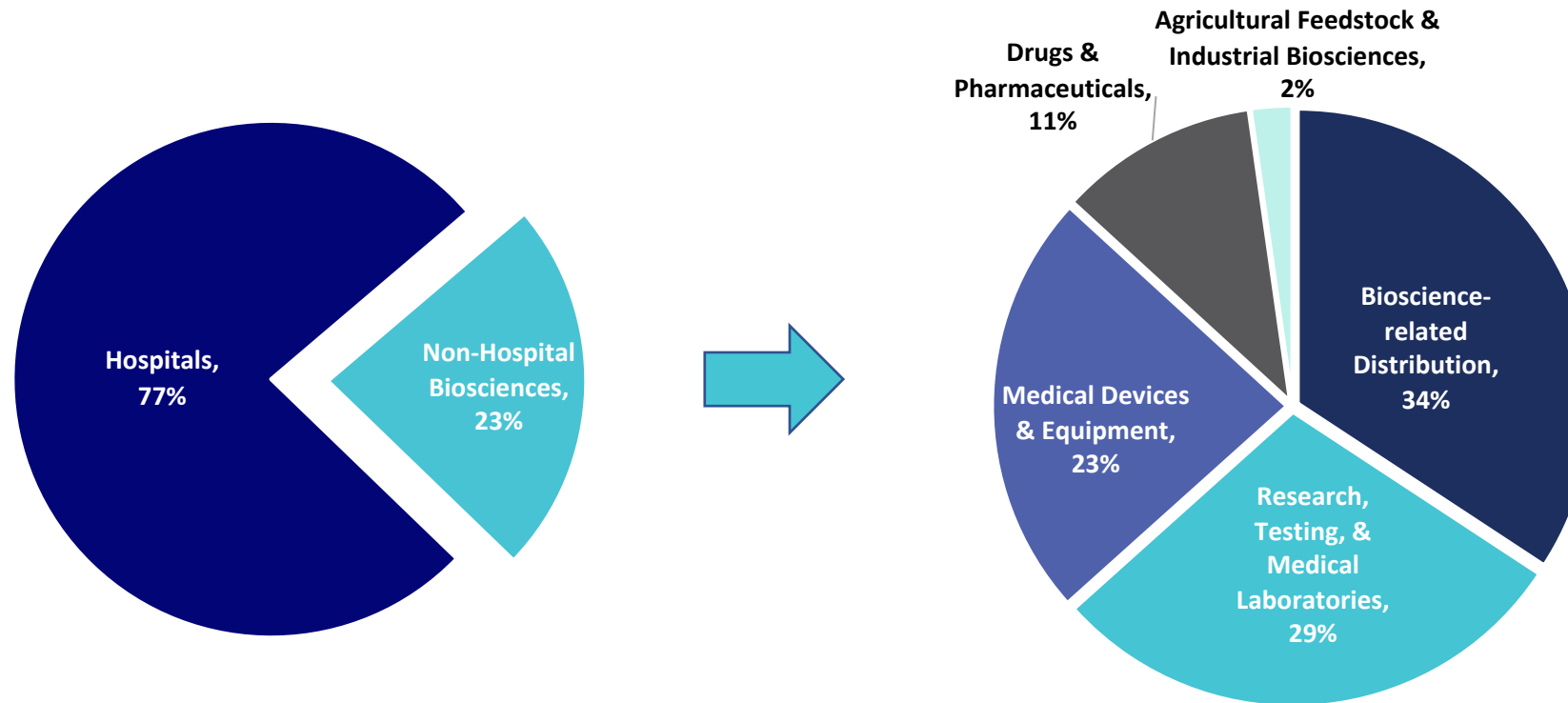
What are the Biosciences?

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



Metric: Jobs

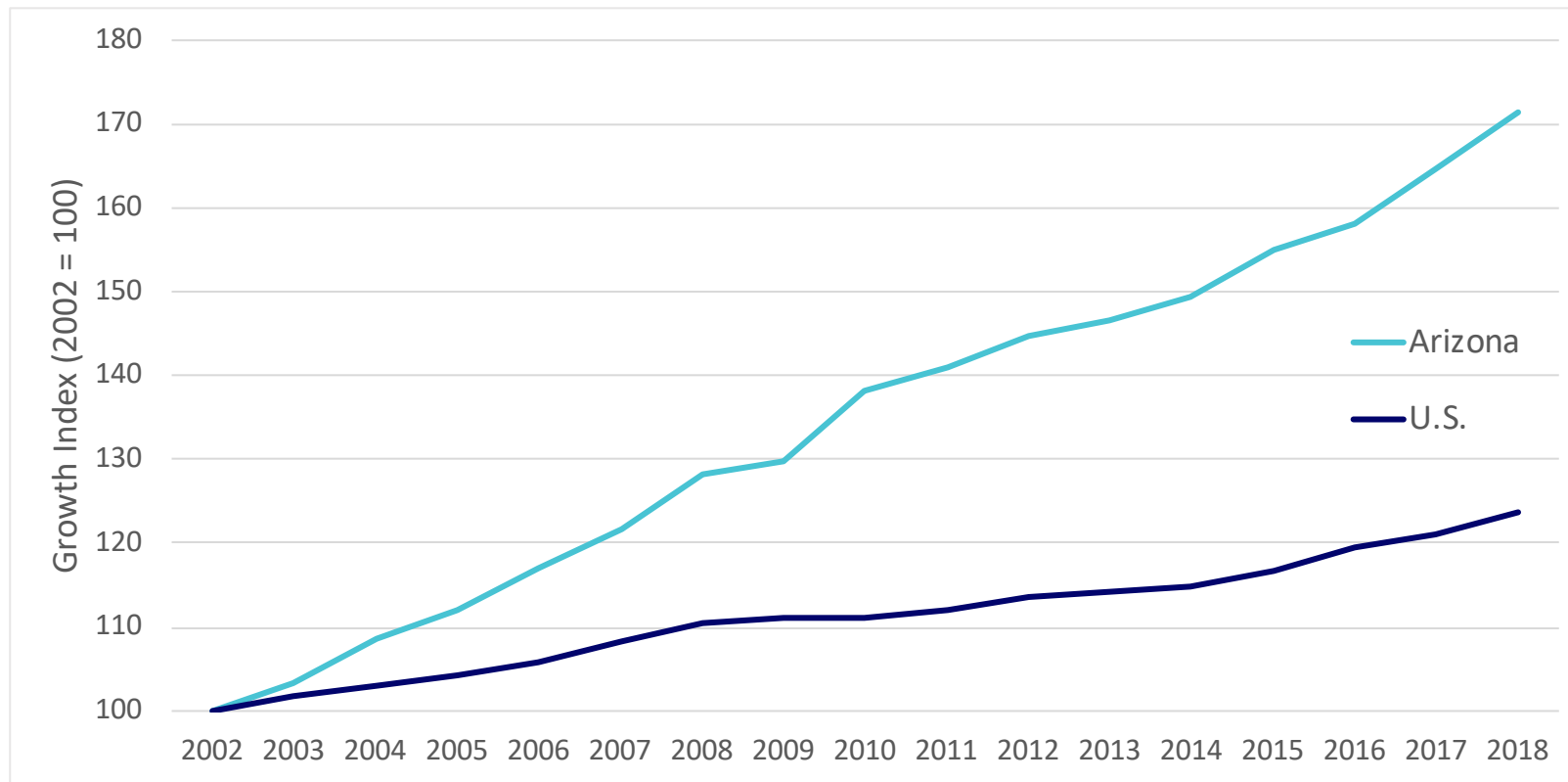
Composition of Bioscience Jobs in AZ, 2018



Source: TEconomy Partners LLC analysis of Bureau of Labor Statistics, QCEW data from IMPLAN Group LLC

Metric: Jobs

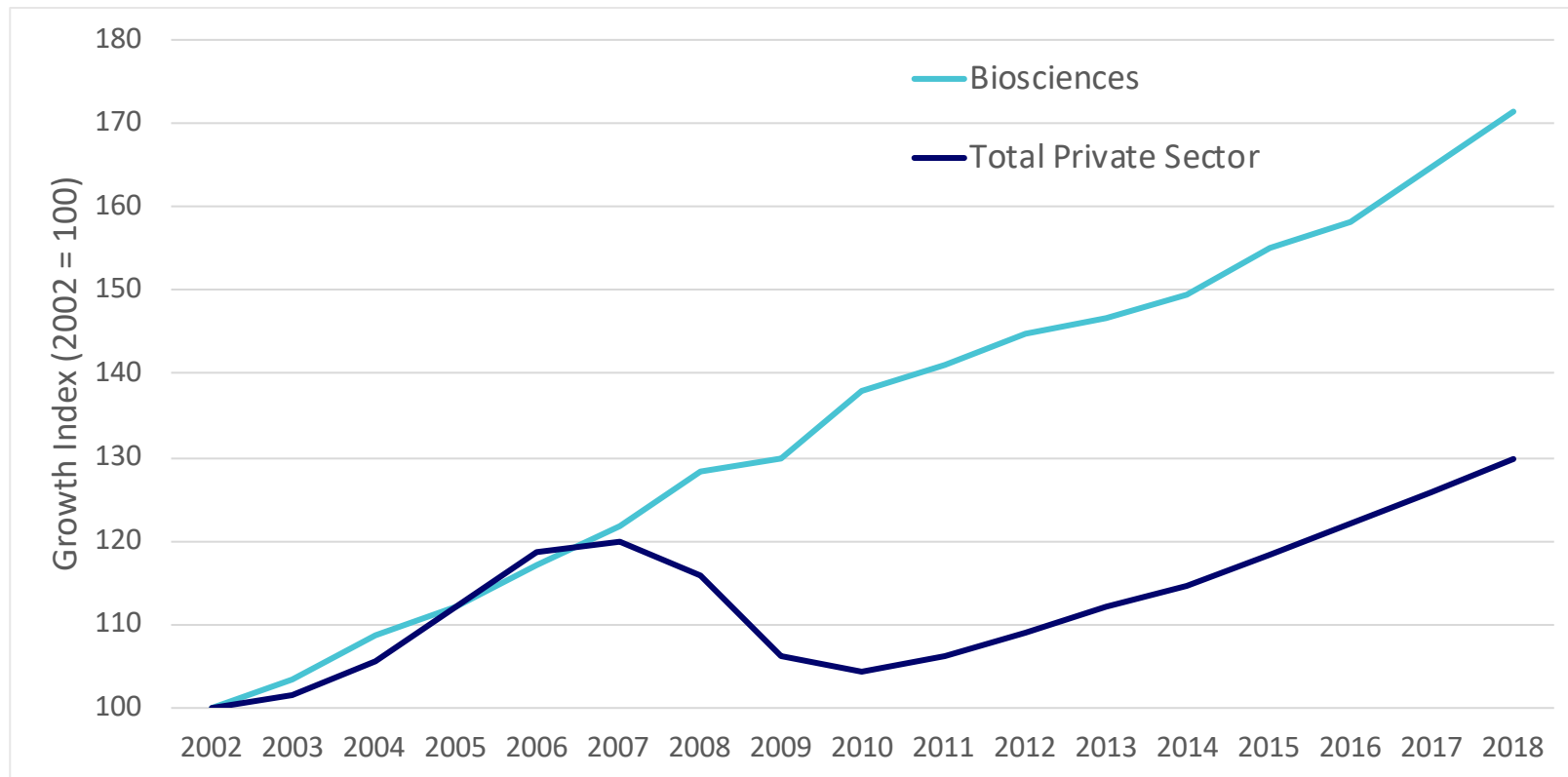
AZ & U.S. Bioscience Employment: 2002-18



Source: TEconomy Partners LLC analysis of Bureau of Labor Statistics, QCEW data from IMPLAN Group LLC

Metric: Jobs

Arizona Employment: 2002-18



Source: TEconomy Partners LLC analysis of Bureau of Labor Statistics, QCEW data from IMPLAN Group LLC

Metric: Jobs Employment Across Business Cycles

Industry Subsector	2002-2007 Expansion		2007-2009 Recession		2009-2018 Recovery/Expansion		2016-2018	
	AZ	U.S.	AZ	U.S.	AZ	U.S.	AZ	U.S.
Total Private Sector	19.8%	5.9%	-11.3%	-6.2%	22.2%	16.3%	6.2%	3.3%
Total Biosciences	21.6%	8.3%	6.7%	2.5%	32.0%	11.5%	8.3%	3.6%
Total Non-Hospital Biosciences	16.3%	7.5%	5.9%	-0.9%	48.5%	17.8%	15.1%	7.2%

Source: TEconomy Partners LLC analysis of Bureau of Labor Statistics, QCEW data from IMPLAN Group LLC

Metric: Jobs

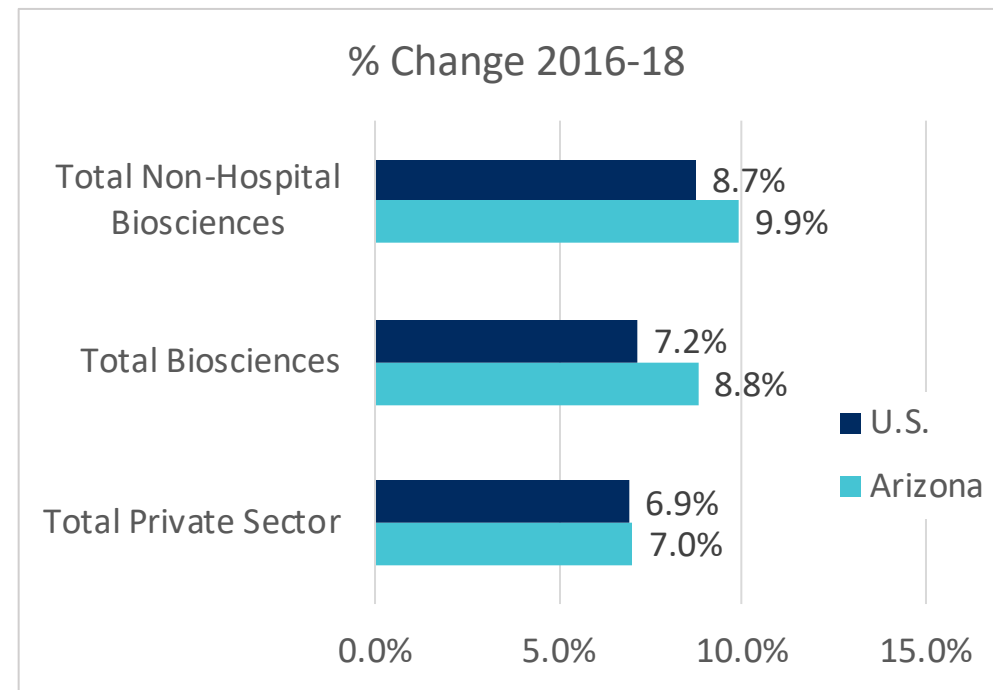
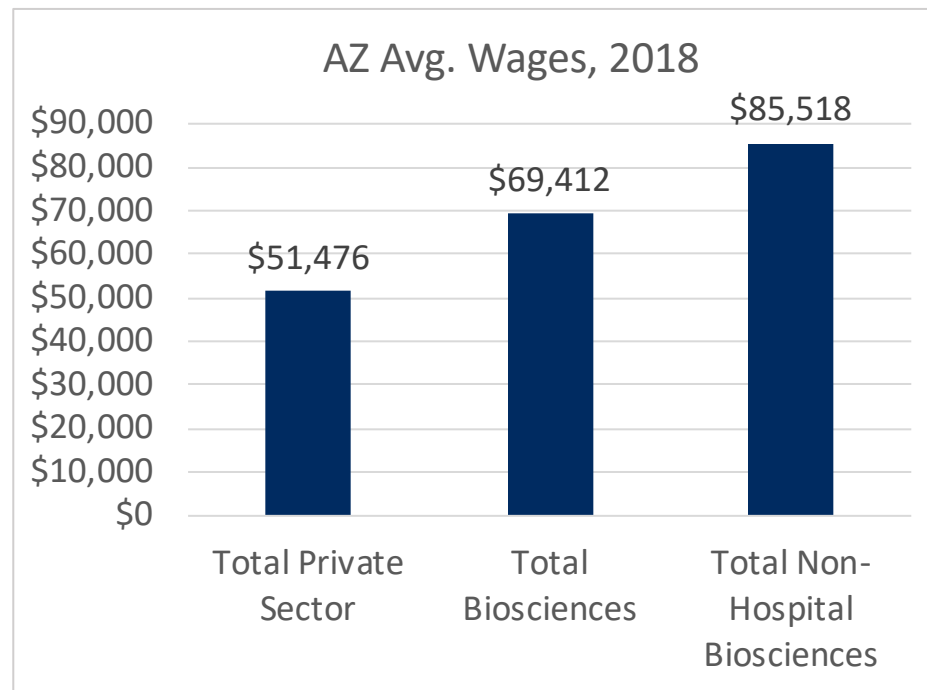
Arizona Gaining Market Share in Biosciences Industry

Industry Subsector	2002 Arizona Share of U.S. Total Jobs	2018 Arizona Share of U.S. Total Jobs		2018 Arizona Specialization Relative to U.S. (Location Quotient)
Agricultural Feedstock & Industrial Biosciences	0.68%	0.97%	↑	0.50
Bioscience-related Distribution	1.69%	1.86%	↑	0.95
Drugs, Pharmaceuticals & Diagnostics	0.30%	1.05%	↑	0.54
Medical Devices & Equipment	0.87%	1.83%	↑	0.94
Research, Testing, & Medical Laboratories	1.35%	1.51%	↑	0.78
Hospitals	1.39%	1.90%	↑	0.97
Total Non-Hospital Biosciences	1.08%	1.58%	↑	0.81
TOTAL BIOSCIENCES	1.31%	1.81%	↑	0.93

Source: TEconomy Partners LLC analysis of Bureau of Labor Statistics, QCEW data from IMPLAN Group LLC

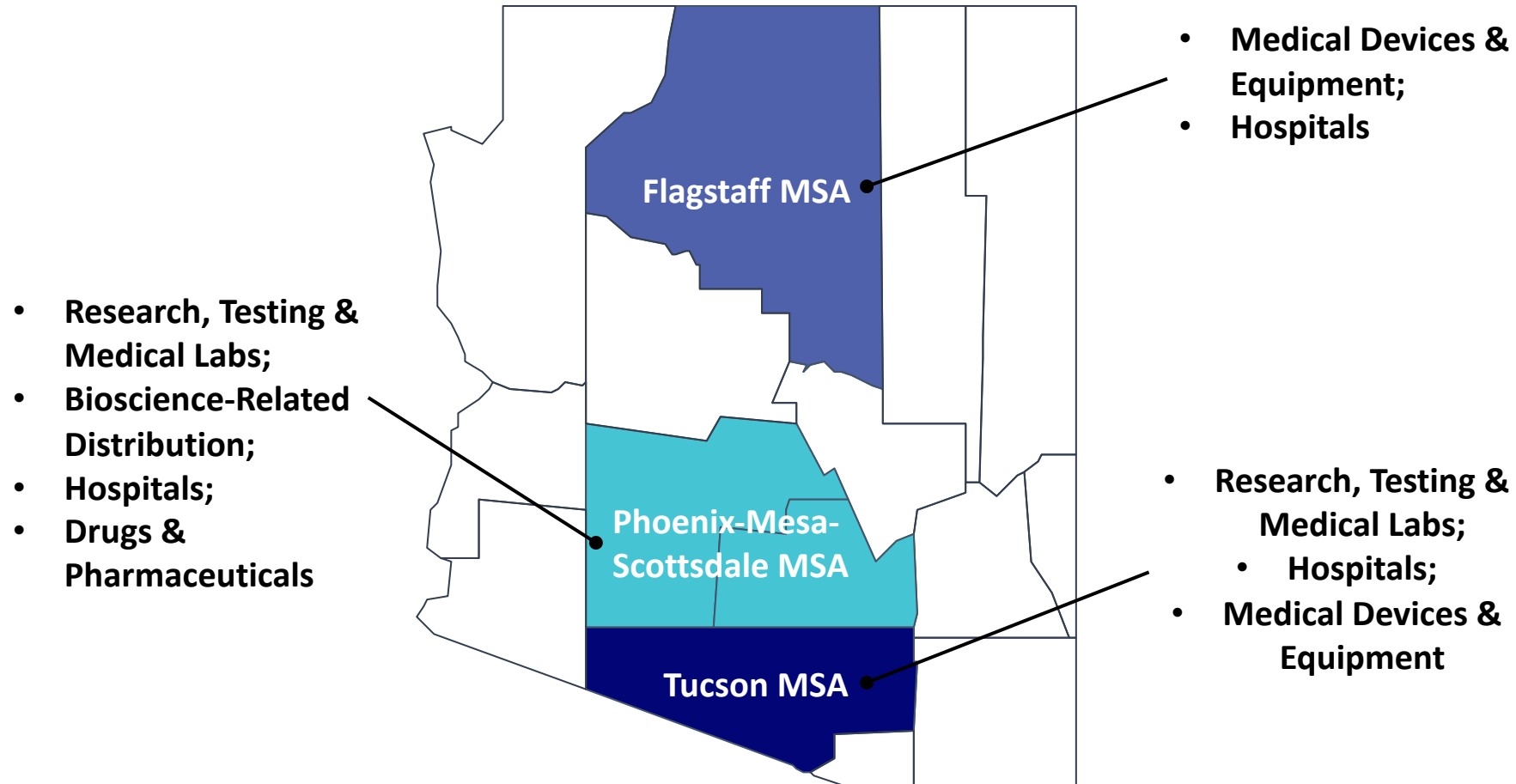
Metric: Wages

Bioscience Wages and Growth: 2016-18



Source: TEconomy Partners LLC analysis of Bureau of Labor Statistics, QCEW data from IMPLAN Group LLC

Regional Bioscience Industry Strengths



Source: TEconomy Partners LLC analysis of Bureau of Labor Statistics, QCEW data from IMPLAN Group LLC

Flagstaff Metro Area

Key Bioscience Subsector	Establishments, Employment Level & Concentration (2018)	Regional Strengths/ Highlights
Medical Devices & Equipment	Establishments: 3 Employed: 2,763 Employment Growth (02-18): 210.1% Location Quotient: 19.11	Flagstaff remains highly specialized in medical devices, at more than 19 times the average employment concentration of the nation.
Hospitals	Establishments: 3 Employed: 3,972 Employment Growth (02-18): 60.3% Location Quotient: 2.04	The hospital subsector is a large employer in Flagstaff, with over 3,900 workers in 2018. It is also growing rapidly, with employment increasing by 60% from 2002-18.

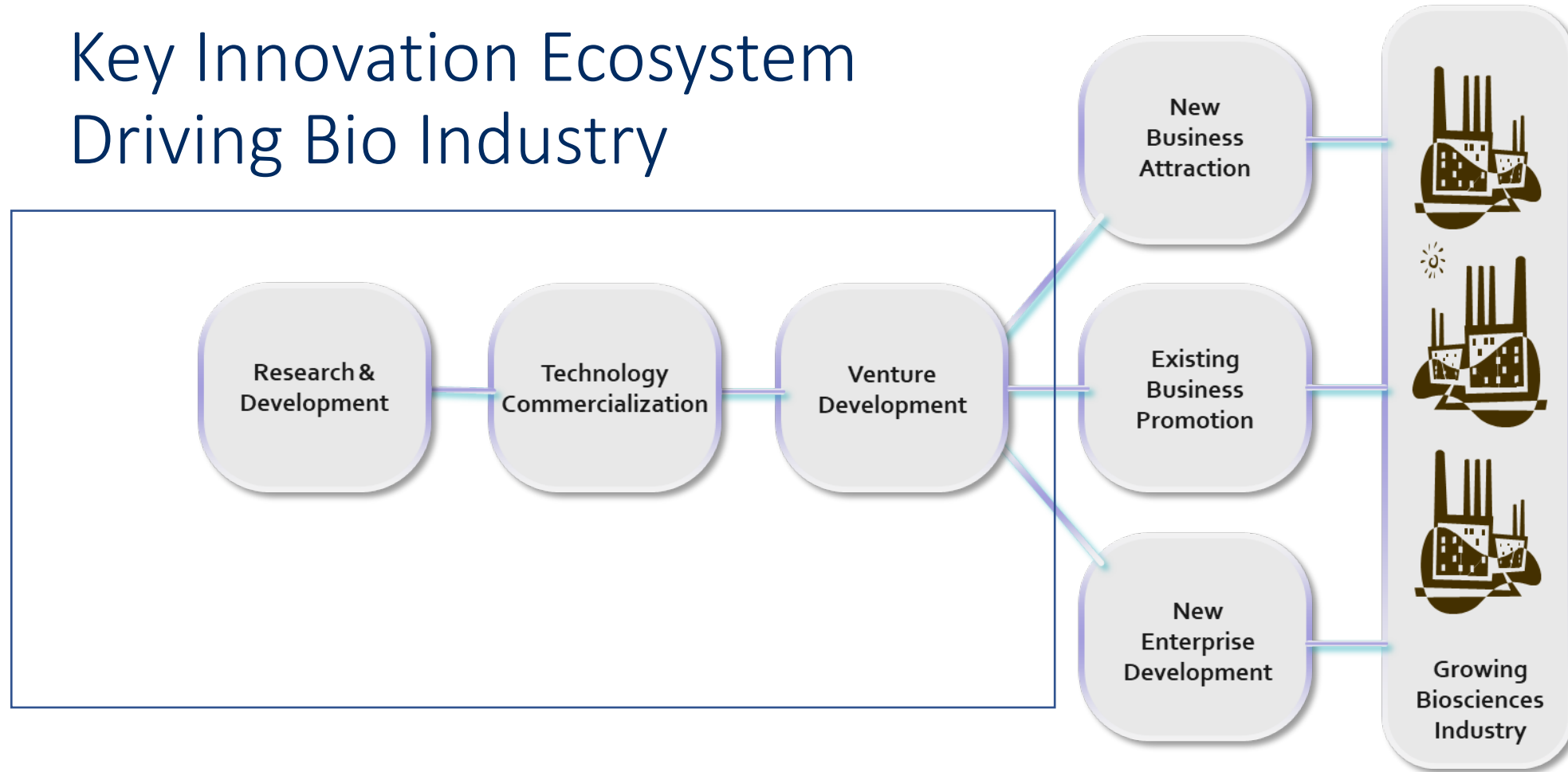
Phoenix-Mesa-Scottsdale Metro Area

Key Bioscience Subsector	Establishments, Employment Level & Concentration (2018)	Regional Strengths/ Highlights
Research, Testing & Medical Laboratories	Establishments: 395 Employed: 7,141 Employment Growth (02-18): 96.7% Location Quotient: 0.85	Employment in research, testing & medical labs over 7,000 in metro Phoenix, with substantial growth of 97% from 2002-18.
Bioscience-related Distribution	Establishments: 1,193 Employed: 8,871 Employment Growth (02-18): 46.3% Location Quotient: 1.10	Bioscience-related distribution in the Phoenix area is largest non-hospital subsector, 10% more concentrated than national average.
Hospitals	Establishments: 157 Employed: 63,241 Employment Growth (02-18): 77.0% Location Quotient: 0.84	Hospitals remain the predominant subsector for bioscience employment in metro Phoenix, with 77% growth over 2002-18 period.
Drugs & Pharmaceuticals	Establishments: 65 Employed: 3,130 Employment Growth (02-18): 239.8% Location Quotient: 0.69	Employment in Drugs & Pharmaceuticals has experienced growth of 240% from 2002-18 in Phoenix, though it is still significantly less concentrated than the national average. Nearly all state gains are found in Phoenix in recent years.

Tucson Metro Area

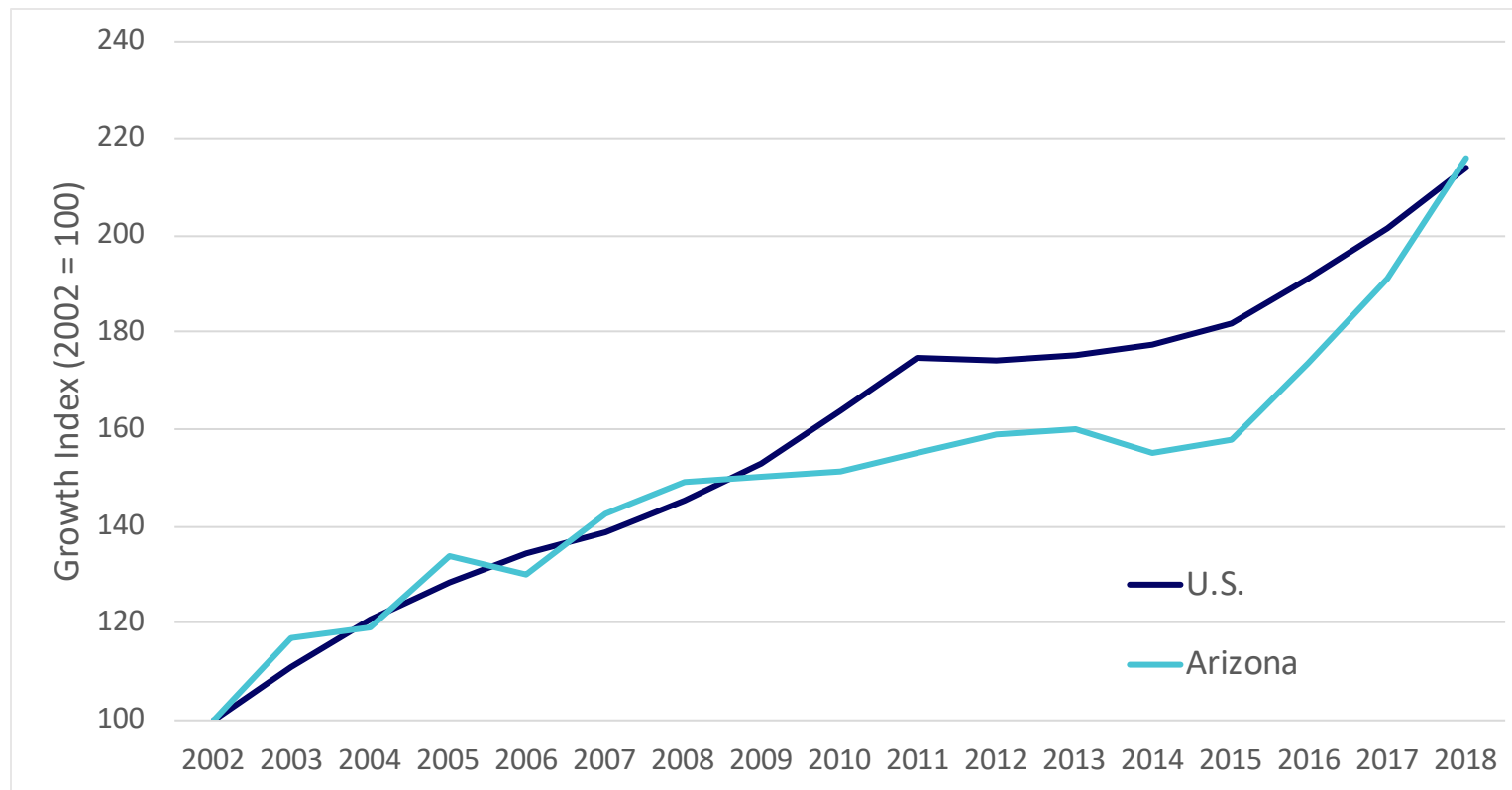
Key Bioscience Subsector	Establishments, Employment Level & Concentration (2018)	Regional Strengths/ Highlights
Research, Testing & Medical Laboratories	Establishments: 101 Employed: 1,054 Employment Growth (02-18): 30.6% Location Quotient: 0.77	The research, testing & medical labs subsector in the Tucson area increased employment by 31% over the 2002-18 period.
Hospitals	Establishments: 18 Employed: 16,741 Employment Growth (02-18): 34.7% Location Quotient: 1.36	Tucson has a large, growing, and specialized hospital subsector with 36% higher employment concentration than the national average.
Medical Devices & Equipment	Establishments: 19 Employed: 715 Employment Growth (02-18): 24.3% Location Quotient: 0.78	Tucson's medical devices & equipment subsector grew by 24% over the 2002-18 period, but is 22% less concentrated than the national average.

Key Innovation Ecosystem Driving Bio Industry



Metric: Bioscience R&D

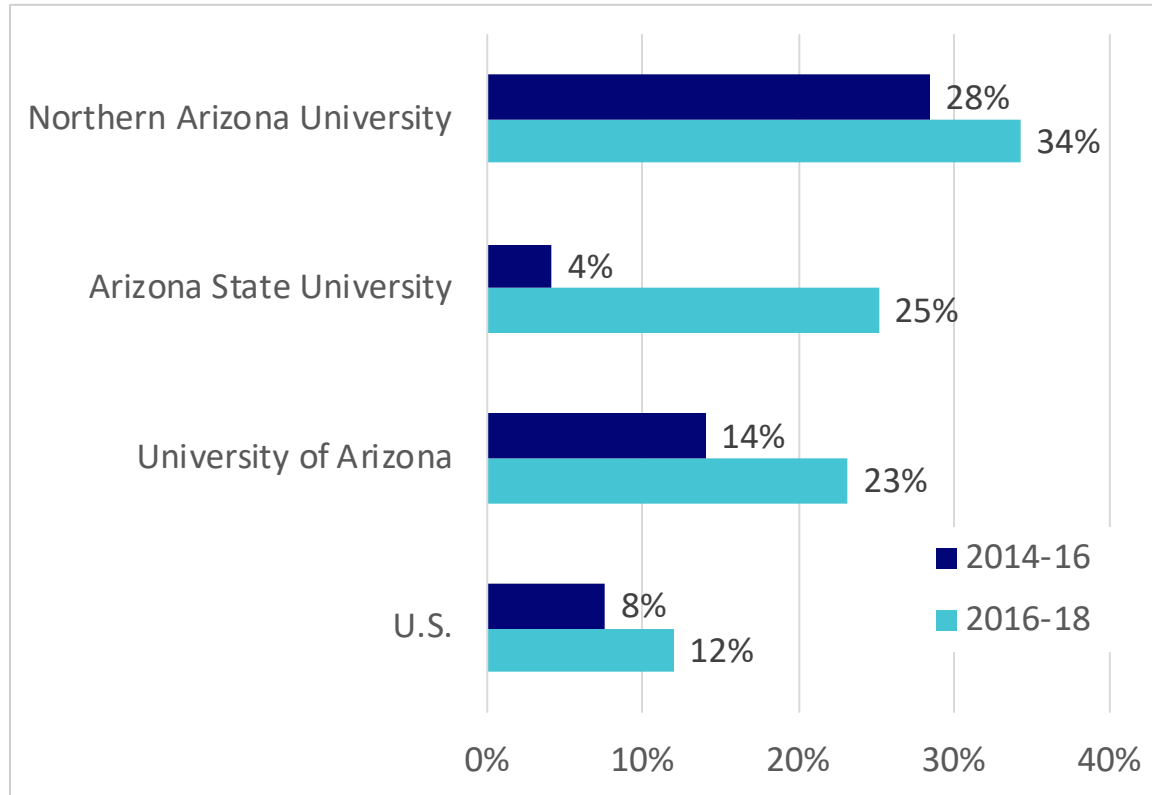
AZ & U.S. Bioscience Academic R&D: 2002-18



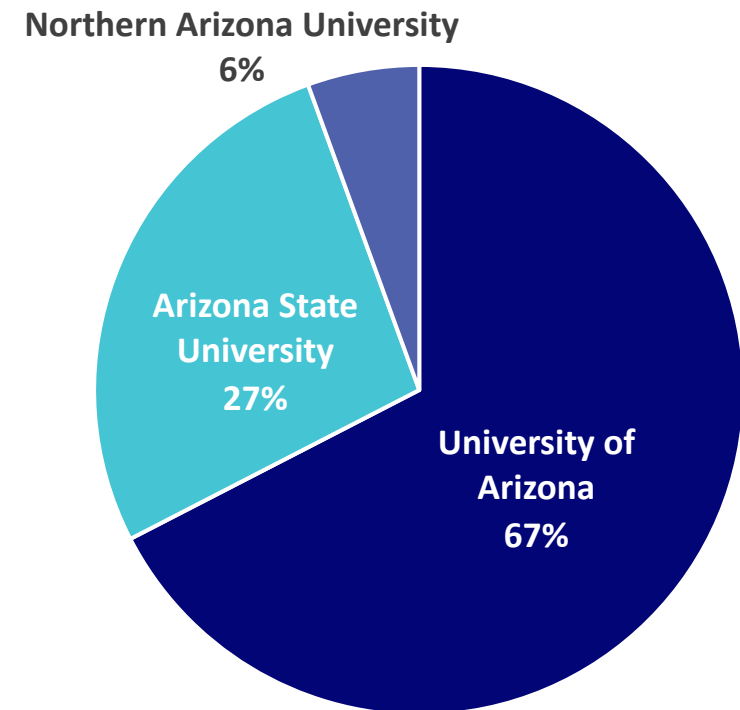
Source: NSF Academic S&E R&D Expenditures and TEconomy Partners calculations

Metric: Bioscience R&D Arizona Universities

Percent Change in Total Bioscience R&D by University

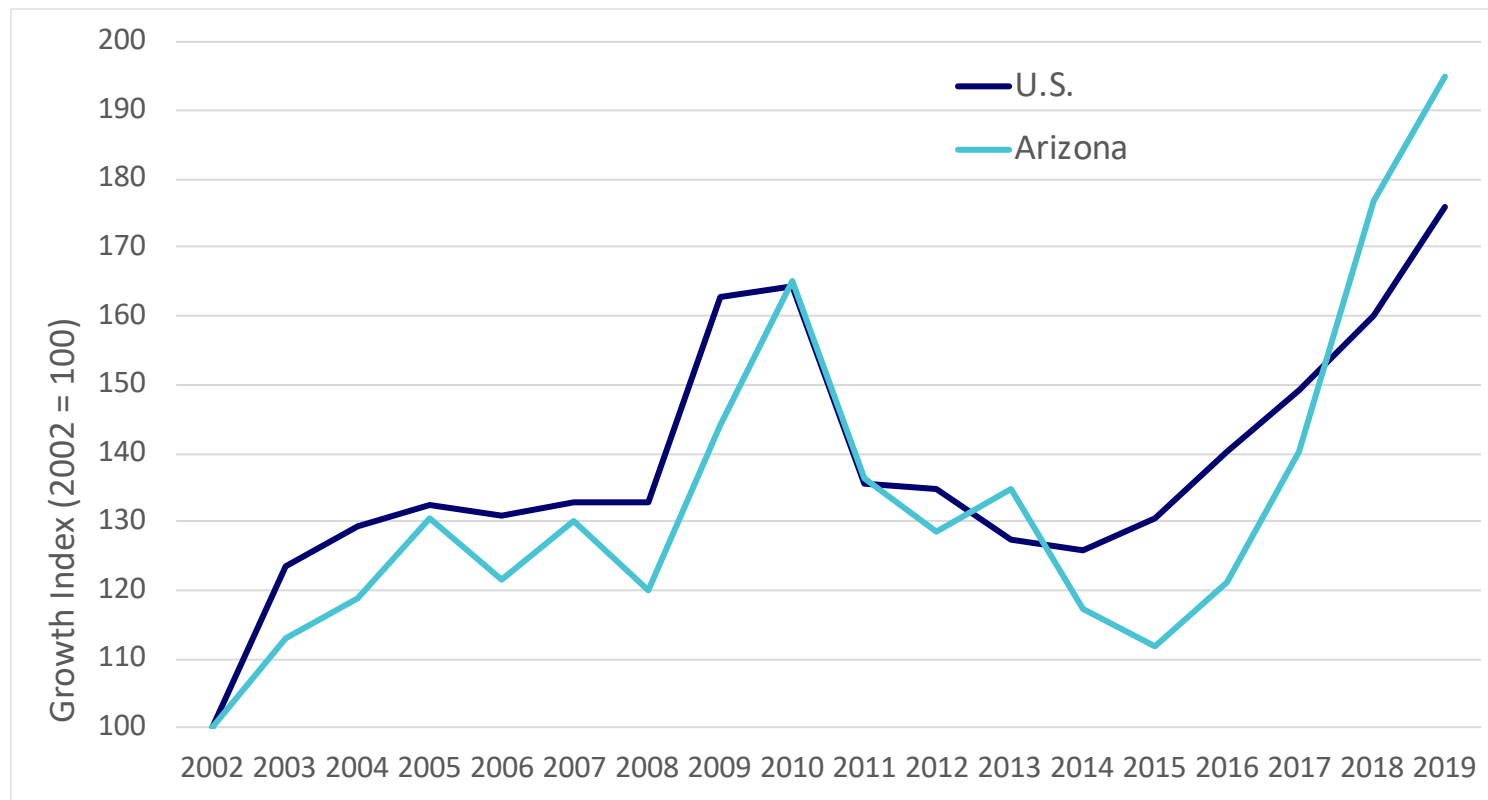


Bioscience R&D Expenditures by University, 2018



Metric: NIH

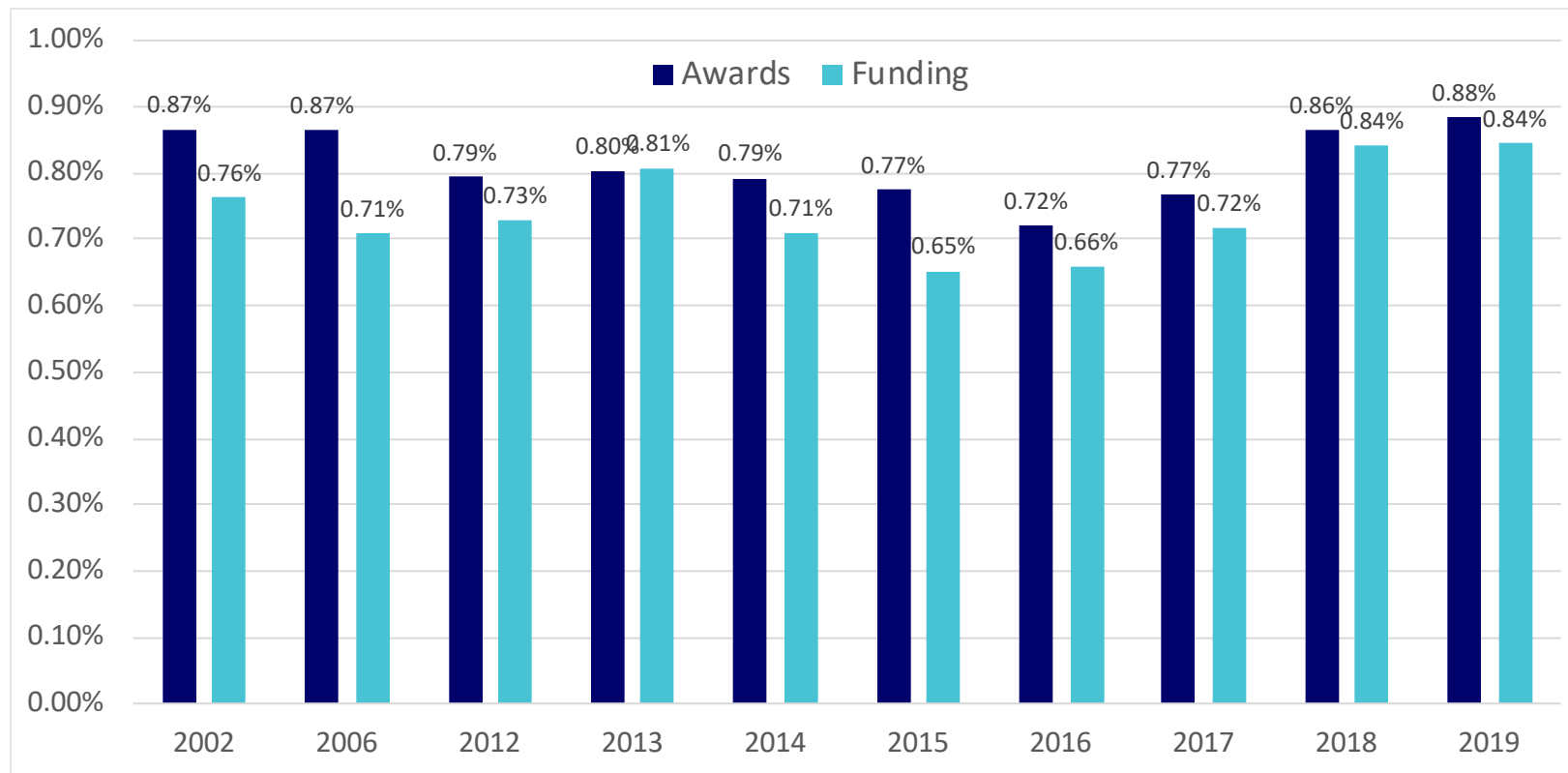
AZ & U.S. NIH Funding: 2002-19



Source: NIH RePORT database, and TEconomy Partners calculations

Metric: NIH

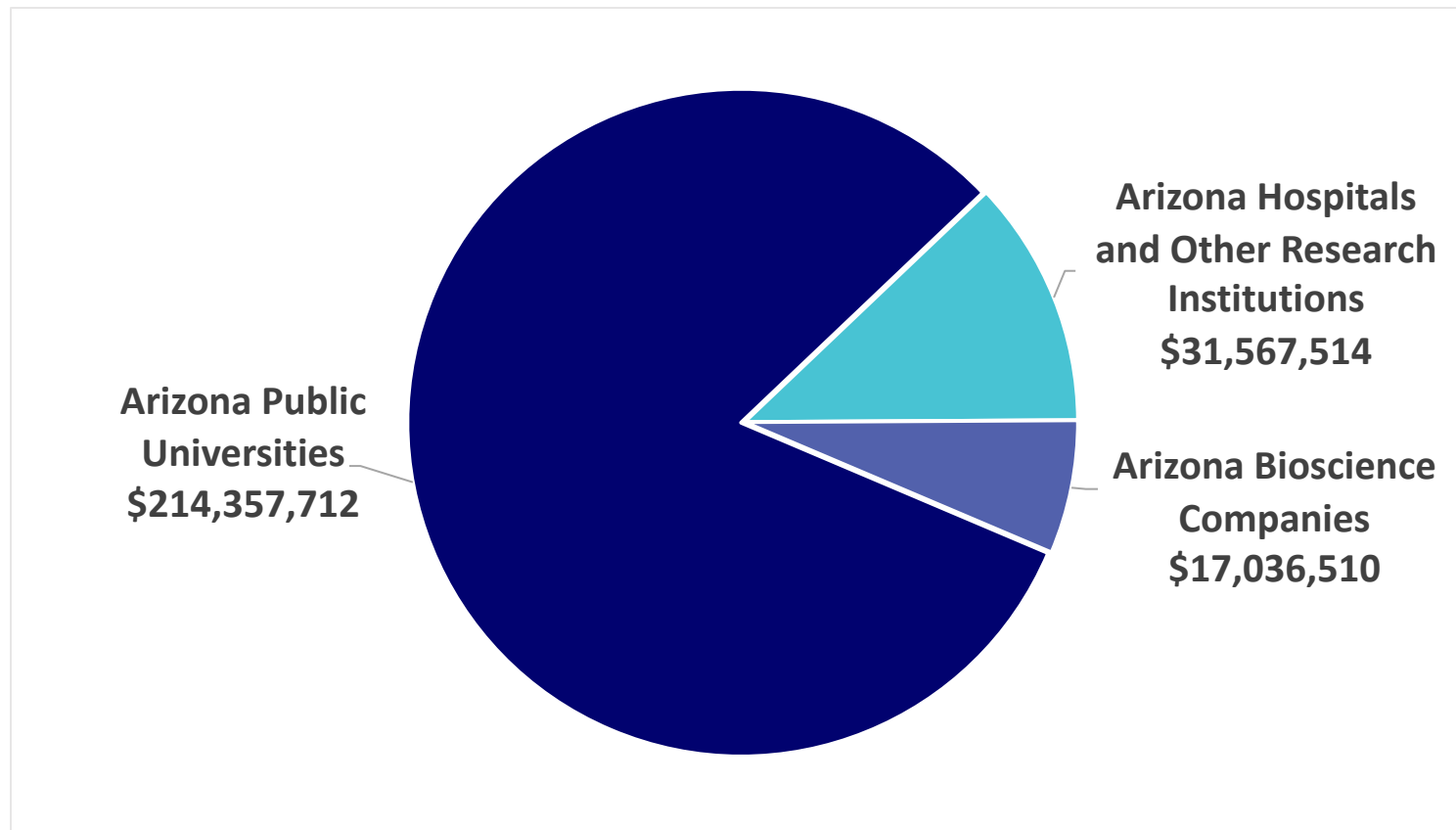
Arizona Share of NIH Support



Source: NIH RePORT database, and TEconomy Partners calculations

Metric: NIH

AZ NIH Funding Distribution: FY 2019



Source: NIH RePORT database, and TEconomy Partners calculations

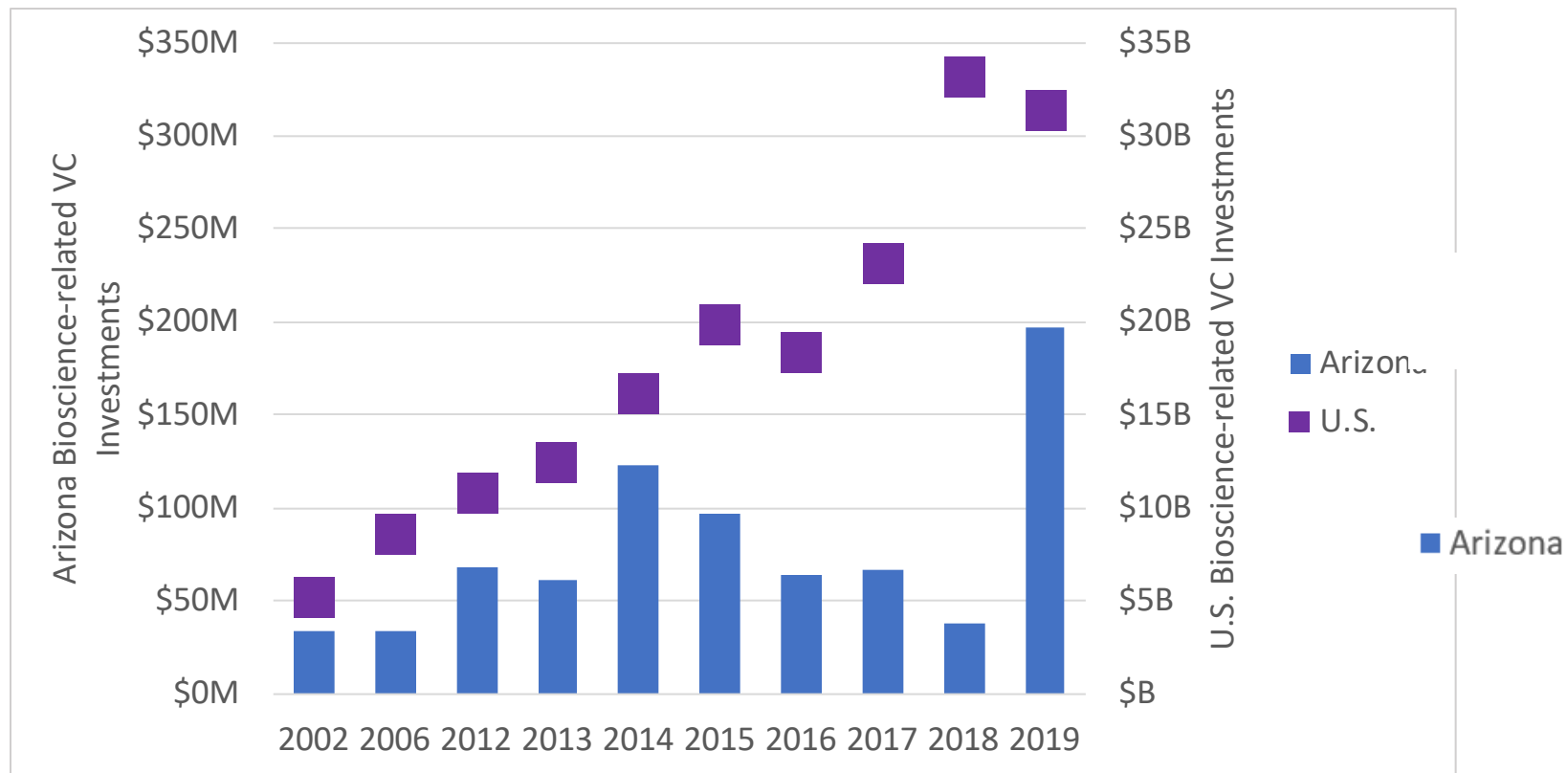
Metric: Technology Transfer

Key Bioscience Tech-Transfer Metrics	Total Bio 2018-2019	Growth 2016-17 to 2018-19	Bio Share of Tech Transfer 2018-19
Invention Disclosures Received	531	-9%	43%
Total U.S. Patent Applications Filed	623	9%	53%
U.S. Patents Issued	180	51%	48%
Licenses & Options Executed	129	-2%	35%
Adjusted Gross License Income Received	\$8.7 m	-36%	75%
Bioscience Startups from University IP	32	-3%	52%

Source: Arizona university technology transfer offices

Metric: Venture Capital

AZ & U.S. Bio Venture Capital: 2002-19



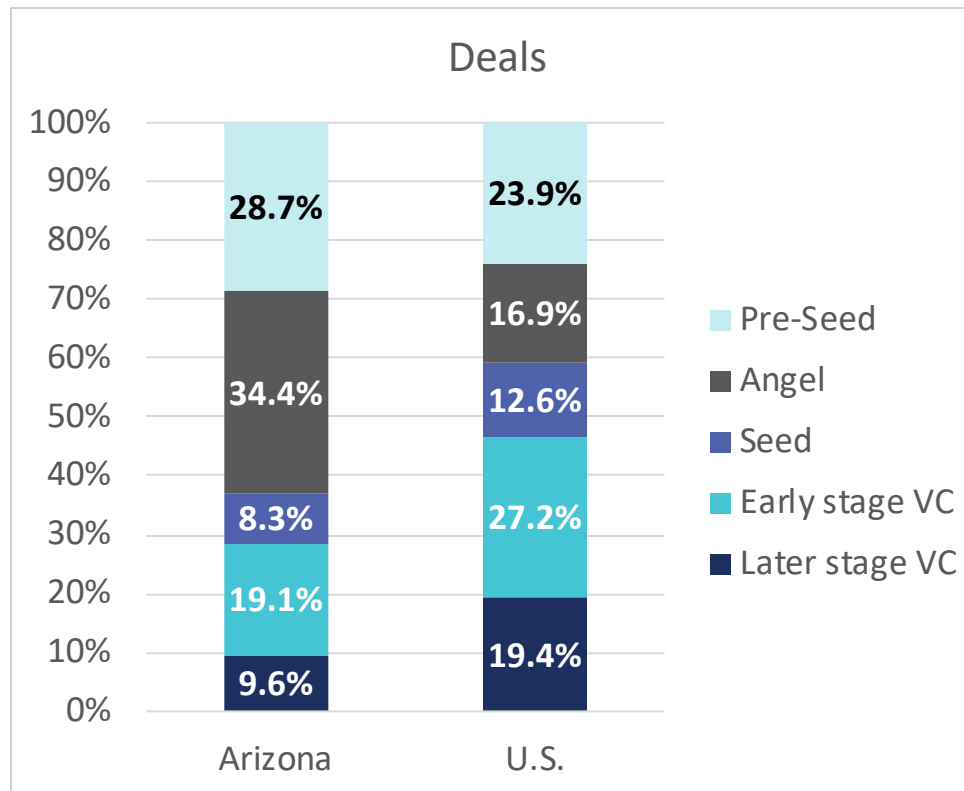
Source: PitchBook Data with TEconomy Partners Calculations

Metric: Venture Capital Perspective on Venture Capital:

State	Amount of bioscience venture capital per \$1 in NIH funding, 2019
Texas	\$0.66
Florida	\$0.68
Arizona	\$0.75
U.S. Average	\$1.02
Massachusetts	\$1.93
California	\$2.62

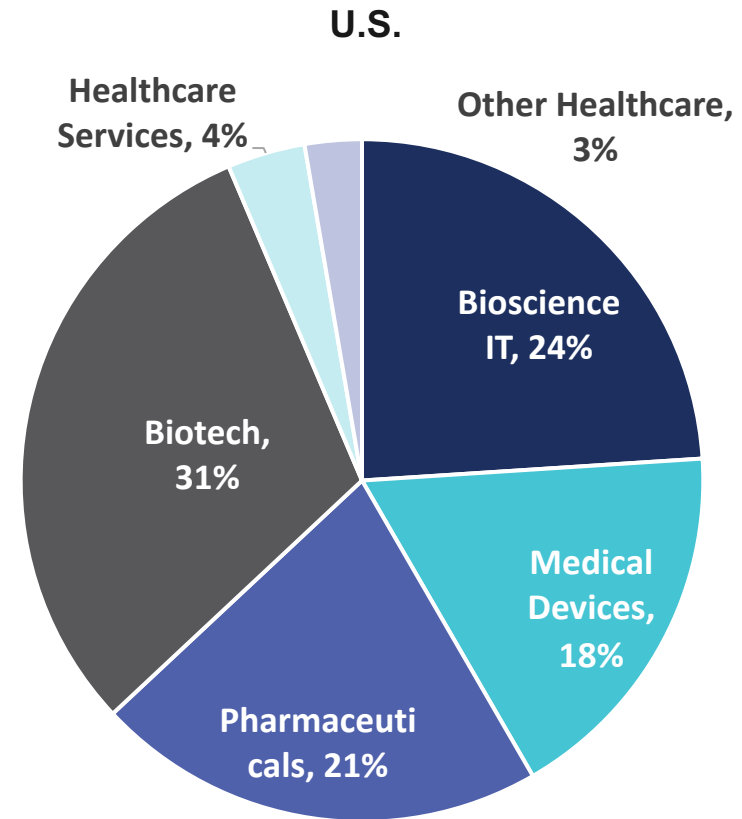
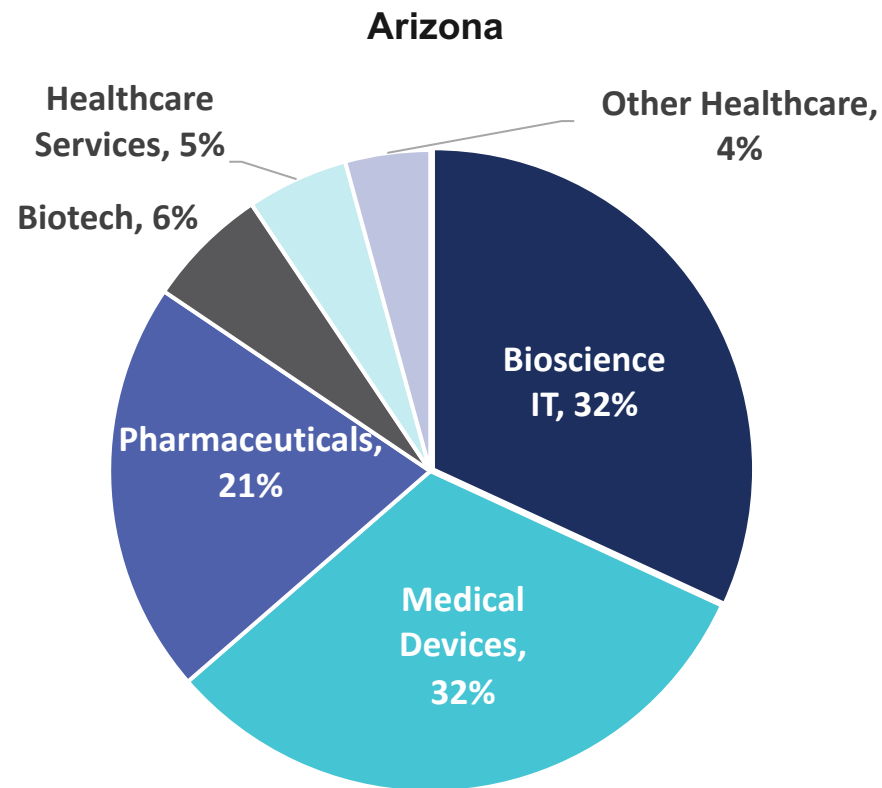
Metric: Venture Capital

AZ & U.S. Venture Capital Deals by Stage, 2016-19





Source: PitchBook Data with TEconomy Partners Calculations

Metric: Venture Capital Share of VC Investments by Bio-Related Industry, 2016-19



Source: PitchBook Data with TEconomy Partners Calculations

Summary of Bioscience Industry Metrics of Success:

Metrics	Performance	Details
Bio Industry Sector Job Growth		<ul style="list-style-type: none">• 8.3% Bio growth in AZ from 2016-2018• More than 2x U.S. growth of 3.6%• Outpacing all private sector job growth in AZ of 6.2% from 2016-2018• Generally strong growth across Bio industry sub-sectors in Arizona
Bio Average Wages		<ul style="list-style-type: none">• 8.8% Bio growth in AZ from 2016-2018 – higher than U.S. Bio growth of 7.2%• At \$69k for total Bio, 35% higher than average for all private sector jobs• Even higher metrics for Bio non-hospital: \$86k, 9.9% growth

Summary of Bio Innovation Ecosystem Metrics of Success:

Metrics	Performance	Details
University Bio R&D Funding	↑	<ul style="list-style-type: none">• All AZ research universities growing faster from 2016-18 than 2014-16 periods• 25% growth outpaced national growth of 12%
NIH Funding	↑	<ul style="list-style-type: none">• Major upswing since 2015• AZ highest level of US share since started tracking back in 2002
Bio University IP	↔	<ul style="list-style-type: none">• Strong gains in patents issued and applications• Startups and licenses on par with prior years• Disclosures down slightly and license income declined more substantially
Bio Risk Capital	↑	<ul style="list-style-type: none">• Strong rebound in Bio Risk funding in 2019• Arizona now above Florida and Texas in bio risk capital per NIH funding• Share of early stage Bio deals above US and 2002-2019 average for Arizona

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