MILKEN INSTITUTE
CENTER FOR REGIONAL ECONOMICS

Supporting the Growth of California's Life Sciences Industry

Milken Institute Center for Regional Economics
and California Center

May 2021

California leads the nation in R&D spending, most of which is funded by industry

Location	Total Business R&D Spending	R&D Funded by the Company	Percent Funded by the Company
United States	$441.0	$377.8	85.7%
California	**$144.5**	**$129.7**	**89.7%**
Washington	$30.3	$29.5	97.3%
Massachusetts	$27.3	$22.5	82.8%
Michigan	$22.4	$20.3	90.7%
Texas	$20.9	$18.3	87.3%
New Jersey	$20.2	$16.8	83.2%

MILKEN INSTITUTE

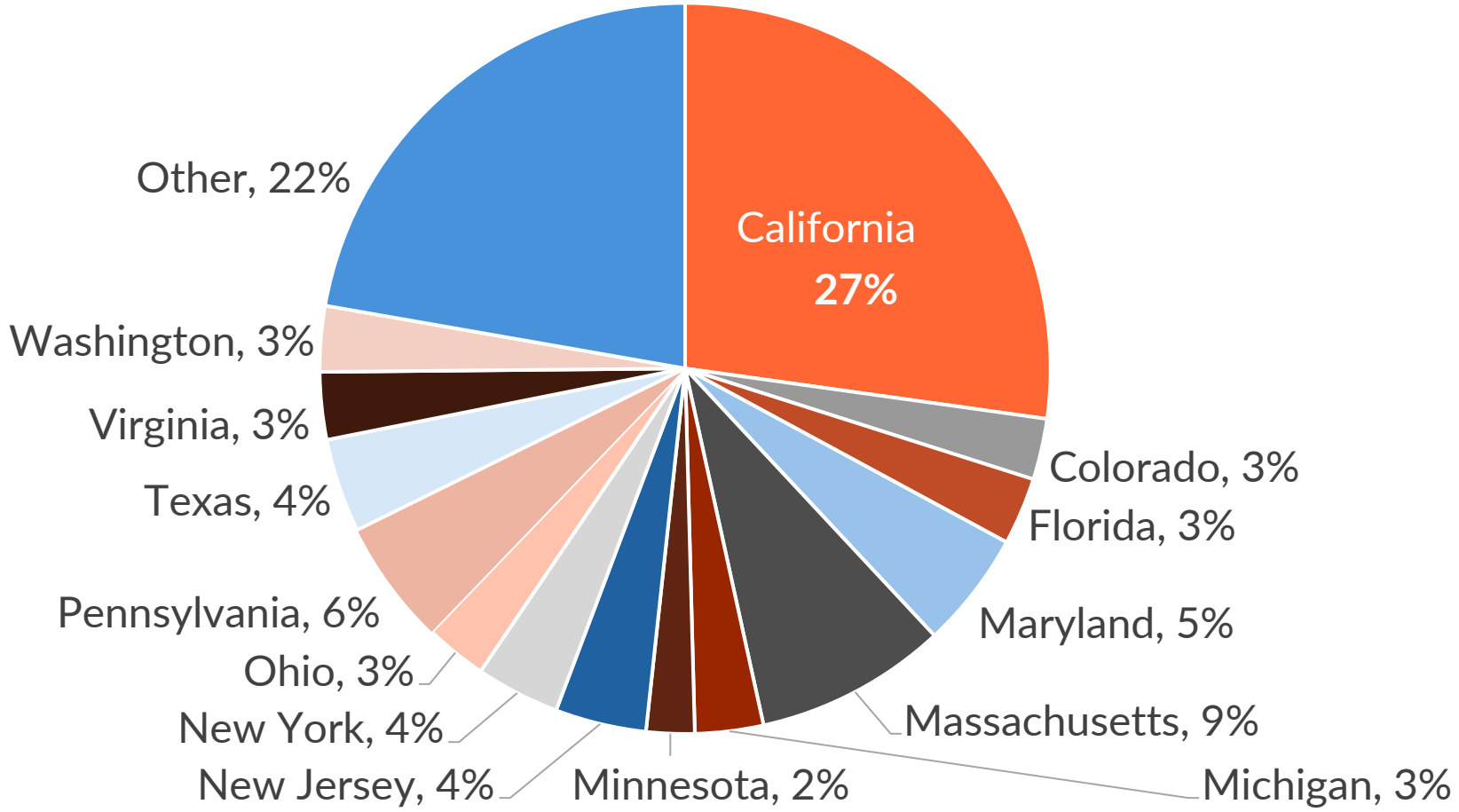
Source: National Science Foundation - Business Enterprise Research & Development Survey (2018)

California ranks highly for recent growth of scientific R&D services

State	Total R&D Establishments	Growth 2014–2019	Growth National Rank
California	**4,296**	**17.8%**	**3rd**
Massachusetts	1,484	33.2%	2nd
Texas	1,087	9.0%	12th
New York	1,009	9.7%	8th
Florida	946	9.5%	9th
Maryland	800	2.8%	20th

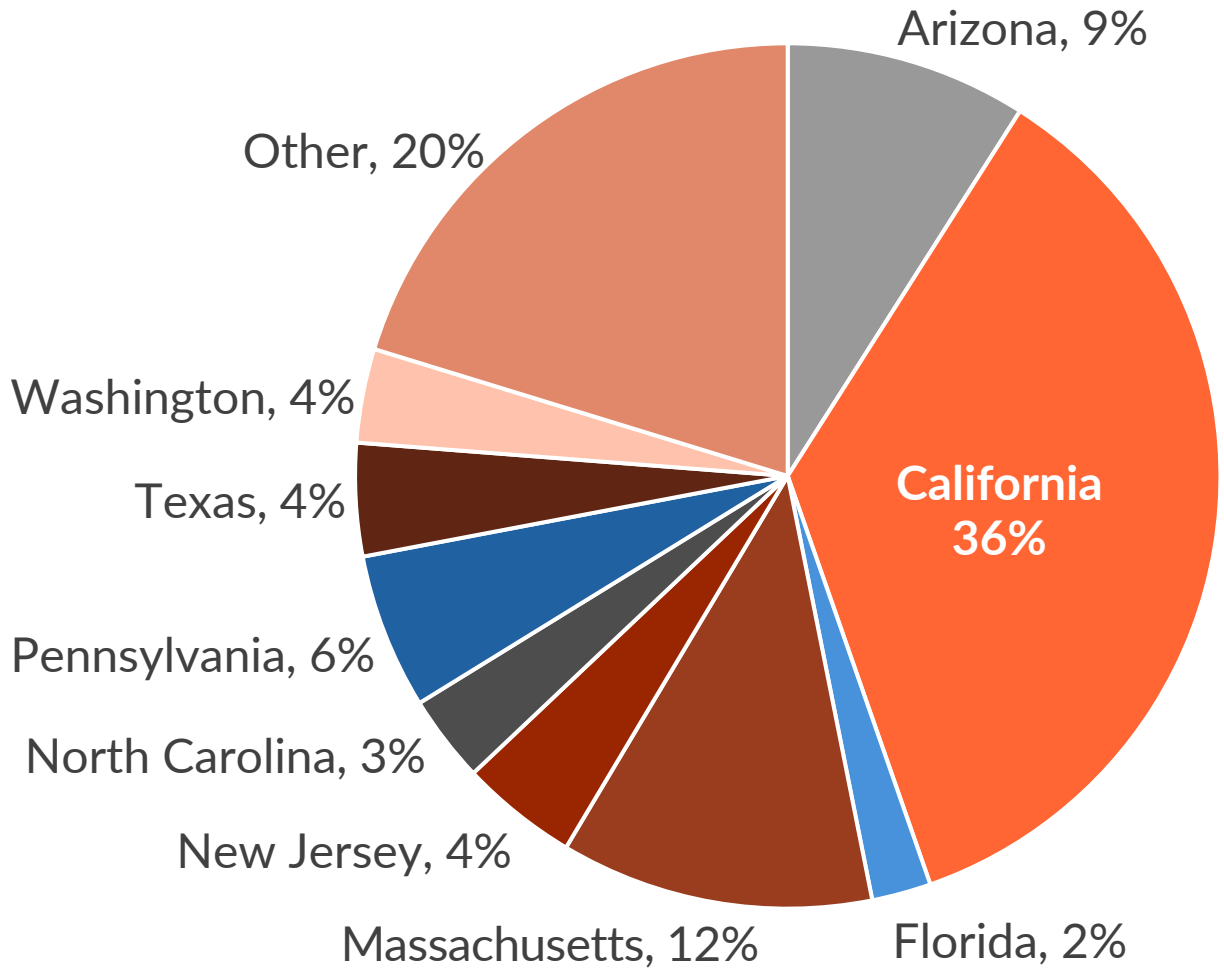
Source: Census Bureau - County Business Patterns (2019)

California accounted for one-quarter of US industry-funded life sciences R&D services in 2014…



Source: National Science Foundation - Business Enterprise Research & Development Survey (2014)

…and over one-third of US industry-funded life sciences R&D services in 2018



Source: National Science Foundation - Business Enterprise Research & Development Survey (2018)

Manufacturing also accounts for a substantial amount of life sciences business R&D

State	Food	Beverage and tobacco products	Pesticide and fertilizer	Pharmaceuticals and medicines	Medical equipment
United States	$4,412	$1,004	$1,135	$64,800	$14,267
California	$182	$66	$42	$15,532	$4,186
Massachusetts	$103	$7	$4	$10,598	$1,835
New Jersey	$270	$1	$195	$9,674	$544
Pennsylvania	$65	$1	$1	$5,287	$402
Illinois	$774	$91	$27	$3,781	$419
Connecticut	$39			$4,049	$87
Minnesota	$385	$1	$42	$172	$2,801
Indiana	$27	$1	$3	$2,807	$404
New York	$38	$233	$1	$2,723	$153
North Carolina	$19	$80	$152	$1,659	$178
Missouri	$27	$3	$347	$1,611	$20
Maryland	$58		$1	$1,238	$209

MILKEN INSTITUTE

Note: figures in USD millions
Source: National Science Foundation - Business Enterprise Research and Development Survey (2018)

What constitutes R&D activity?

Filing Tax Credit Claims (California FTB Form 3523)

Qualified Research Expenses

Undertaken to discover new technology or to develop improved business component

Must involve a process of experimentation

May be in-house or paid to non-employees (e.g., contract research organizations, cloud computing to support research activities)

Wages

Engaging in qualified research or direct supervision/support of research activities

Over 80 percent of employees' working hours spent on R&D

Frequent audits: base period calculations, state location of contractors, senior-level jobs

Supplies

Tangible property other than land or improvements to land

Must be subject to allowance for depreciation

MILKEN INSTITUTE

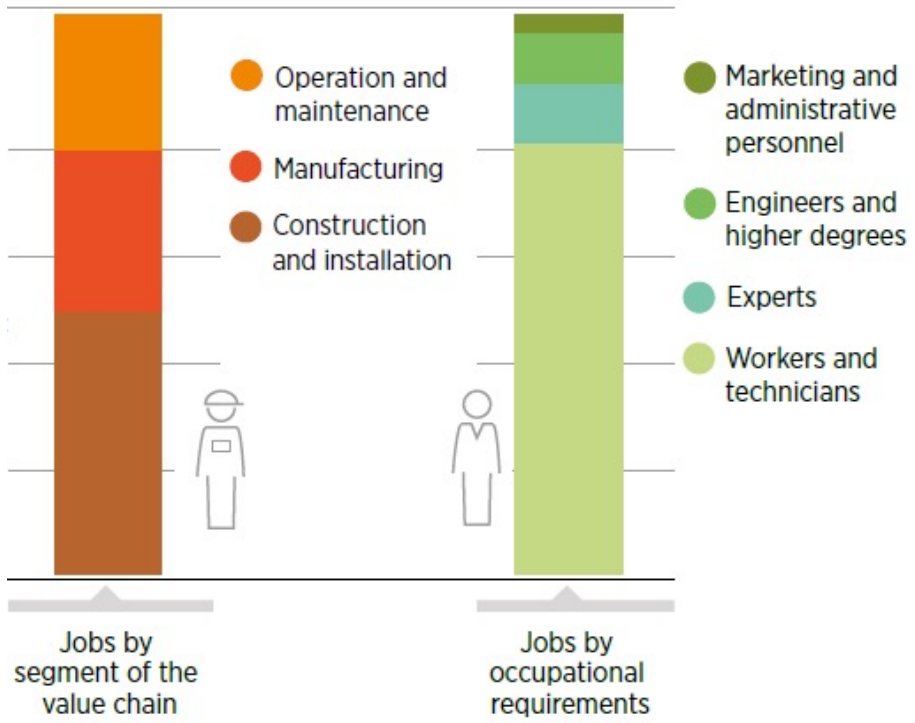
R&D investment generates new technologies that create different types of jobs

Directly supports job creation in the lab

- Analysts
- Engineers
- Scientists

Indirectly supports job creation outside the lab

- Maintenance technicians
- Marketing and advertising
- Office managers and sales associates
- Technology operators



Source: International Renewable Energy Agency - Global Renewables Outlook: Energy Transformation 2050 (April 2020)

MILKEN INSTITUTE

R&D spending supports job creation across a variety of industries

	Computers & Mathematics	Architecture & Engineering	Life & Physical Science	Arts, Design, & Media
California Jobs	640,210	331,090	188,940	294,960
National Jobs	4,587,700	2,515,040	1,296,060	1,857,500
California Job Concentration*	**1.18**	**1.11**	**1.23**	**1.34**
California Avg Income	$116,820	$105,310	$90,800	$80,590
National Avg Income	$96,770	$90,300	$79,360	$64,400

MILKEN INSTITUTE

**Note: Job concentration measured by Location Quotient (LQ). If > 1, industry has a larger relative share of area employment than it does nationwide.*
Source: US Bureau of Labor Statistics - Occupational Employment Statistics (2020)

Life sciences R&D supports job creation across a variety of occupations

Occupation	2016	2017	2018	2019
Pharmaceutical Manufacturing	1.50	1.51	1.34	1.28
Medical Equipment Manufacturing	1.45	1.42	1.44	1.45
Scientific R&D Services (Physical/Life Sciences)	1.81	1.74	1.80	1.81
Medical and Diagnostic Labs	1.09	1.10	1.09	1.13

MILKEN INSTITUTE

**Note: Job concentration measured by Location Quotient (LQ). If > 1, industry has a larger relative share of area employment than it does nationwide.*
Source: US Bureau of Labor Statistics - Occupational Employment Statistics (2020)

Life & Physical Sciences

Large number of jobs beyond the pharmaceutical sector

Occupation	California Jobs	Jobs per 100k	Average Income
Biochemists + Biophysicists	7,650	47	$115,110
Microbiologists	4,180	26	$116,630
Biological Scientists	11,790	72	$101,040
Medical Scientists	22,170	135	$116,230
Biological Technicians	8,600	52	$54,510
Chemical Technicians	7,070	43	$50,710*

MILKEN INSTITUTE

** signifies California average Income lower than national average income*
Source: US Bureau of Labor Statistics - Occupational Employment Statistics (2020)

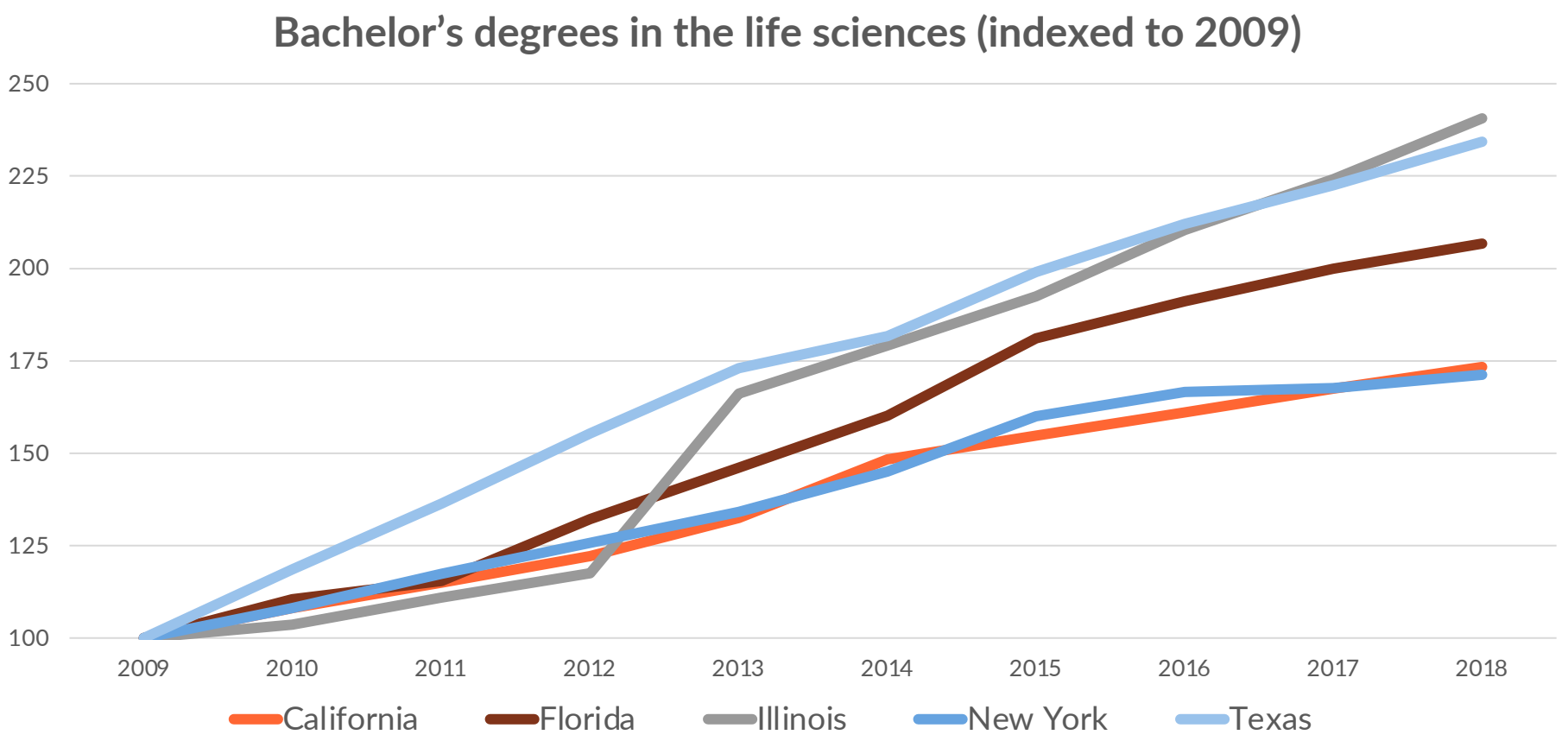
R&D supports a notable proportion of the workforce in multiple California metros

Metro Area	Computers & Mathematics	Architecture & Engineering	Life & Physical Sciences	Arts, Design, & Media
Bakersfield	1.4%	2.7%	1.2%	0.7%
Fresno	0.9%	0.9%	0.9%	0.9%
LA-Long Beach-Anaheim	3.0%	1.8%	0.8%	2.8%
Riverside-San Bernardino	1.2%	1.1%	0.7%	0.7%
Sacramento	3.5%	1.7%	1.5%	1.1%
San Diego	3.9%	2.7%	**1.8%**	1.2%
San Francisco-Oakland	6.8%	2.4%	**1.7%**	1.9%
San Jose	13.1%	4.7%	1.3%	1.8%

MILKEN INSTITUTE

Source: US Bureau of Labor Statistics - Occupational Employment Statistics (2020)

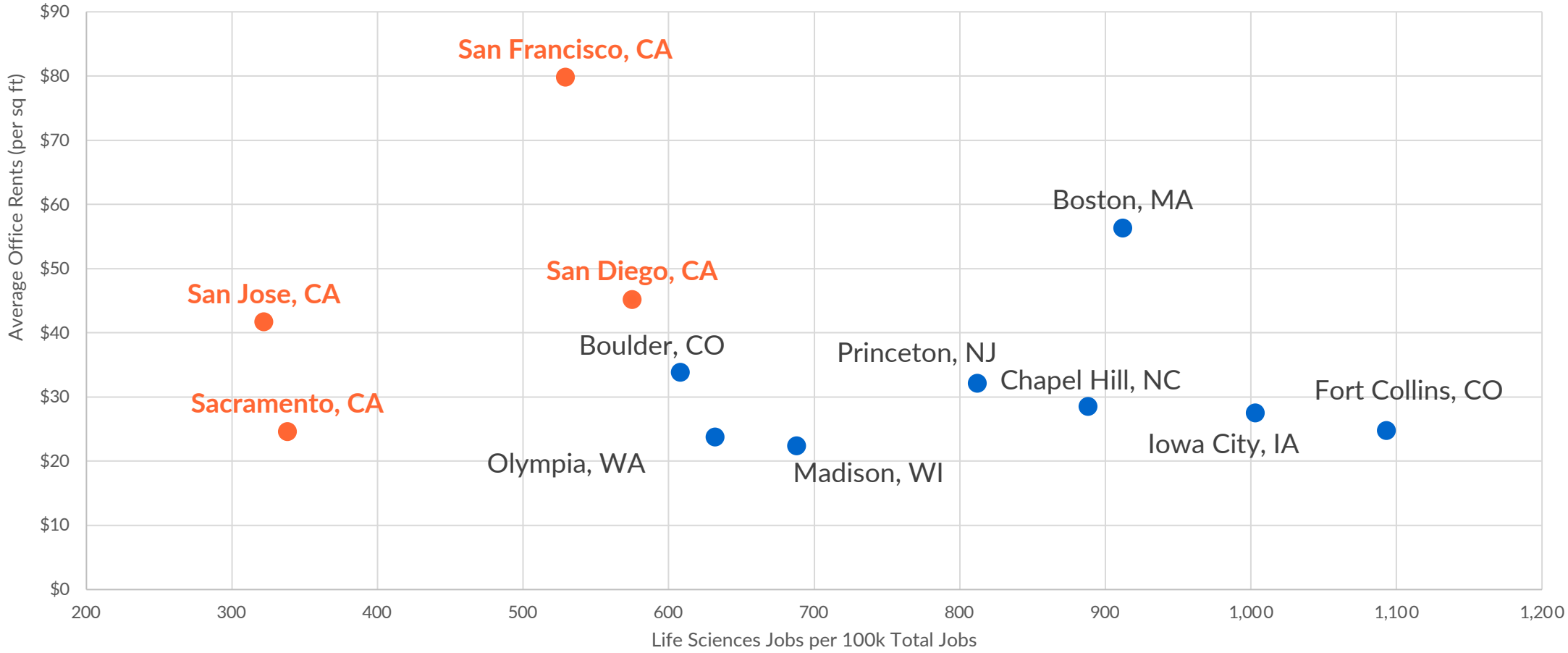
California faces increasing competition as a source of talent in the life sciences industry



MILKEN INSTITUTE

Source: National Science Foundation - National Center for Science and Engineering Statistics

California metros face competition from other life sciences clusters due to higher costs



MILKEN INSTITUTE

Sources: Average office rents based on Milken Institute analysis of Commercial Café using Yardi Matrix data (2019); Life sciences jobs based on Bureau of Labor Statistics - Occupational Employment Statistics (2019)

Firms and workers in California face relatively high local costs

Metro Area	2021 Overall	2020 Overall	1-Year High-Tech Concentration	1-Year Housing Affordability	5-Year Housing Affordability
San Jose, CA	22	5	1	165	165
San Francisco, CA	24	1	2	142	159
Sacramento, CA	47	50	73	175	174
San Diego, CA	49	38	13	196	196
Santa Rosa, CA	59	34	53	185	185
Fresno, CA	60	32	172	188	184
Anaheim, CA	61	46	18	189	192
Oakland, CA	65	17	14	177	173
Los Angeles, CA	93	53	20	199	199

MILKEN INSTITUTE

Note: Metro area rankings on Milken Institute Best-Performing Cities (BPC) 2021 index, out of 200 large metro areas.
Source: Milken Institute analysis of American Community Survey 1-Year (2019) and 5-Year (2014-18) Estimates

Where does California go from here?

Reconsidering the R&D Tax Credit

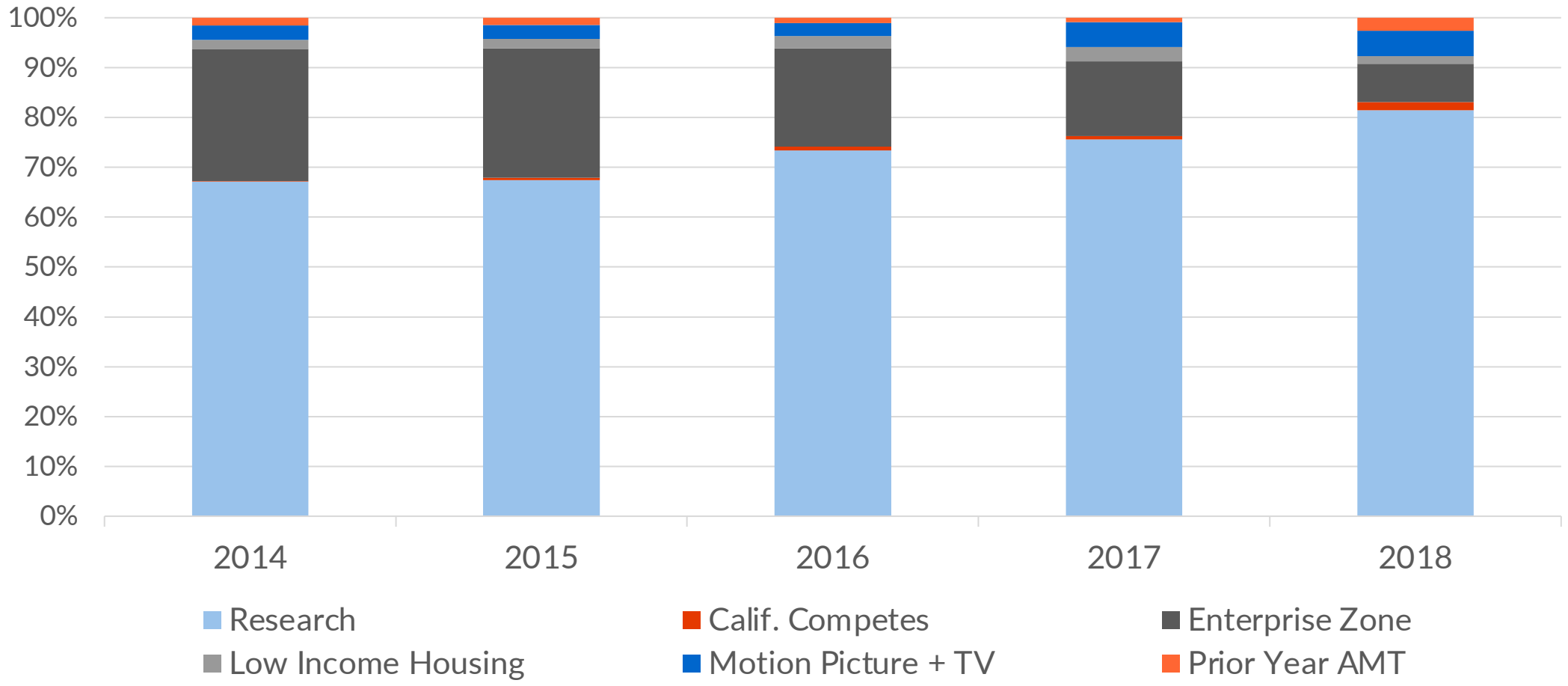
Sustaining Business R&D Spending in California

- Evidence that incentives have been a key component of supporting business R&D
- R&D spending has supported high-tech business formation and high-wage job creation
- Spending has also generated job creation in occupations that require fewer credentials as well as in non-tech-intensive industries

R&D Policy Requires a Long-Term Outlook

- Companies favor a more predictable policy environment; changes to tax credit in 2020 were approved during a period of significant uncertainty
- Research spending relies on longer-term planning, so any activities relocated outside California may take longer to return (if they return at all)

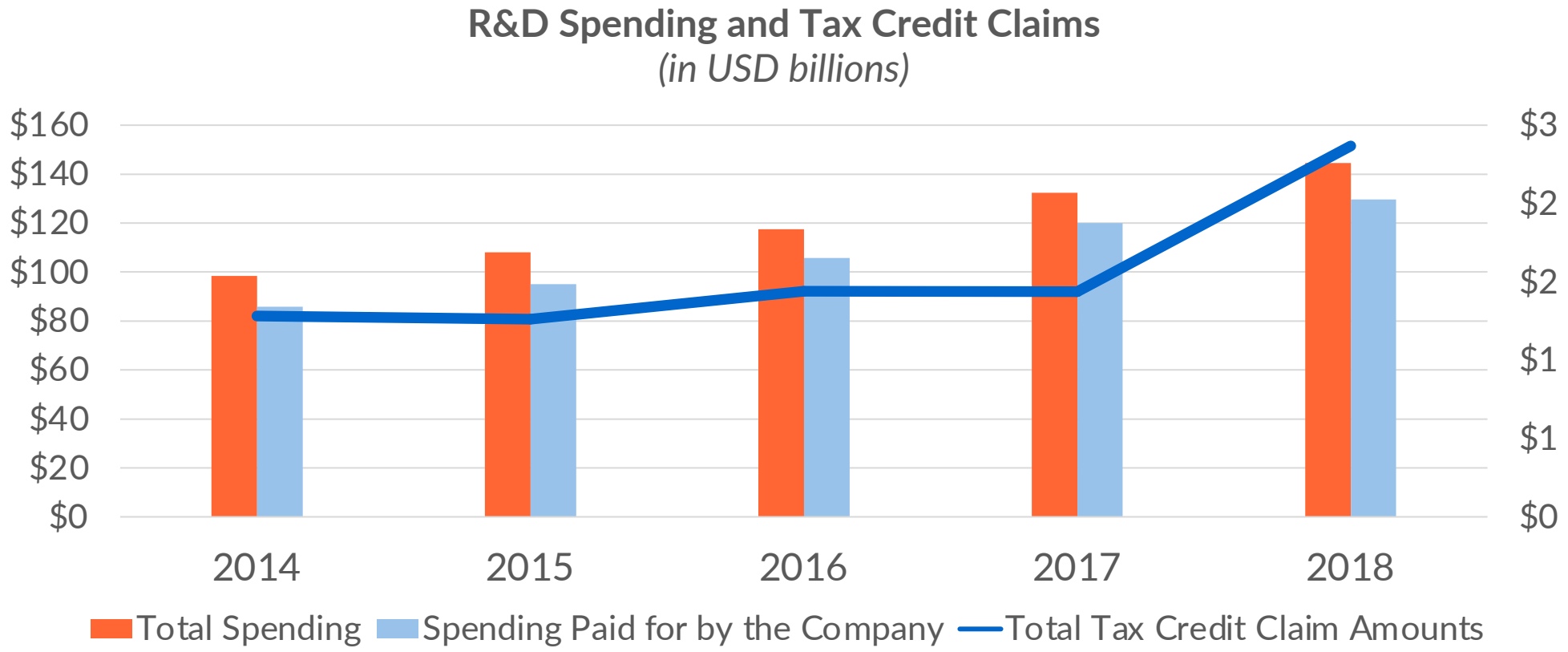
R&D is California's most popular tax credit



MILKEN INSTITUTE

Source: California Franchise Tax Board (FTB) Annual Reports (2015–2019)

Tax credit claims have generally risen in line with total R&D spending



Source: California Franchise Tax Board (FTB) Annual Reports (2015–2019)

Where does California go from here?

Additional policy options for consideration

Refund credits for small businesses

- Example: Maryland SMEs (with assets under $5 million) can receive a refund for R&D credits that exceed tax liabilities
- Total refunded credits could be capped each fiscal year; need more information on share of unused research credits earned by small businesses

Expanded credits for university research

- Example: Arizona firms that make basic research payments to a public university are eligible for additional credit of 10 percent
- In addition to reducing universities' marginal research costs, can establish job opportunities (and potential career pathways) for local graduates

MILKEN INSTITUTE

Source: "California's Innovation-Based Economy: Policies to Maintain and Enhance It" (Milken Institute, 2015)

California life sciences and biotech growing at fast rates outside of traditional clusters

Metro Area	Biotech Establishments	Pct. Growth 2014–2019
San Francisco-Oakland-Hayward	407	42.3%
San Diego-Carlsbad	341	35.9%
Los Angeles-Long Beach-Anaheim	218	39.7%
San Jose-Sunnyvale-Santa Clara	155	20.2%
Sacramento-Roseville-Arden-Arcade	30	15.4%
Oxnard-Thousand Oaks-Ventura	20	**53.8%**
Riverside-San Bernardino-Ontario	18	**38.5%**
Santa Cruz-Watsonville	8	0%
Santa Maria-Santa Barbara	8	100%
San Luis Obispo-Paso Robles-Arroyo Grande	3	0%

MILKEN INSTITUTE

**Note: Job concentration measured by Location Quotient (LQ). If > 1, industry has a larger relative share of area employment than it does nationwide.*
Source: US Bureau of Labor Statistics - Occupational Employment Statistics (2020)

California metros host universities that are key centers of life sciences R&D investments

University	Metro Area	Total R&D Spending	Life Sciences R&D Spending	Life Sciences R&D as Pct. of Total
UC Davis	Sacramento	$789 million	$588 million	74.6%
UC Riverside	Riverside-San Bernardino	$168 million	$85 million	50.7%
UC Merced	Merced	$38 million	$7.7 million	20.2%
Humboldt State	Eureka-Arcata	$15 million	$7.5 million	50.2%
Cal Poly-SLO	San Luis Obispo	$16 million	$6.3 million	38.7%
Fresno State	Fresno	$9.0 million	$4.7 million	52.5%
CSU Monterey Bay	Salinas	$5.8 million	$3.7 million	63.3%
CSU San Bernardino	Riverside-San Bernardino	$17 million	$1.9 million	11.4%
Sacramento State	Sacramento	$21.4 million	$1.3 million	6.4%
CSU Chico	Chico	$2.4 million	$1.2 million	47.7%
CSU Stanislaus	Modesto	$1.4 million	$1.0 million	73.7%
CSU Bakersfield	Bakersfield	$5.6 million	$430,000	7.7%

MILKEN INSTITUTE

Source: National Science Foundation, Higher Education R&D Expenditures (2018)

MILKEN
INSTITUTE

milkeninstitute.org