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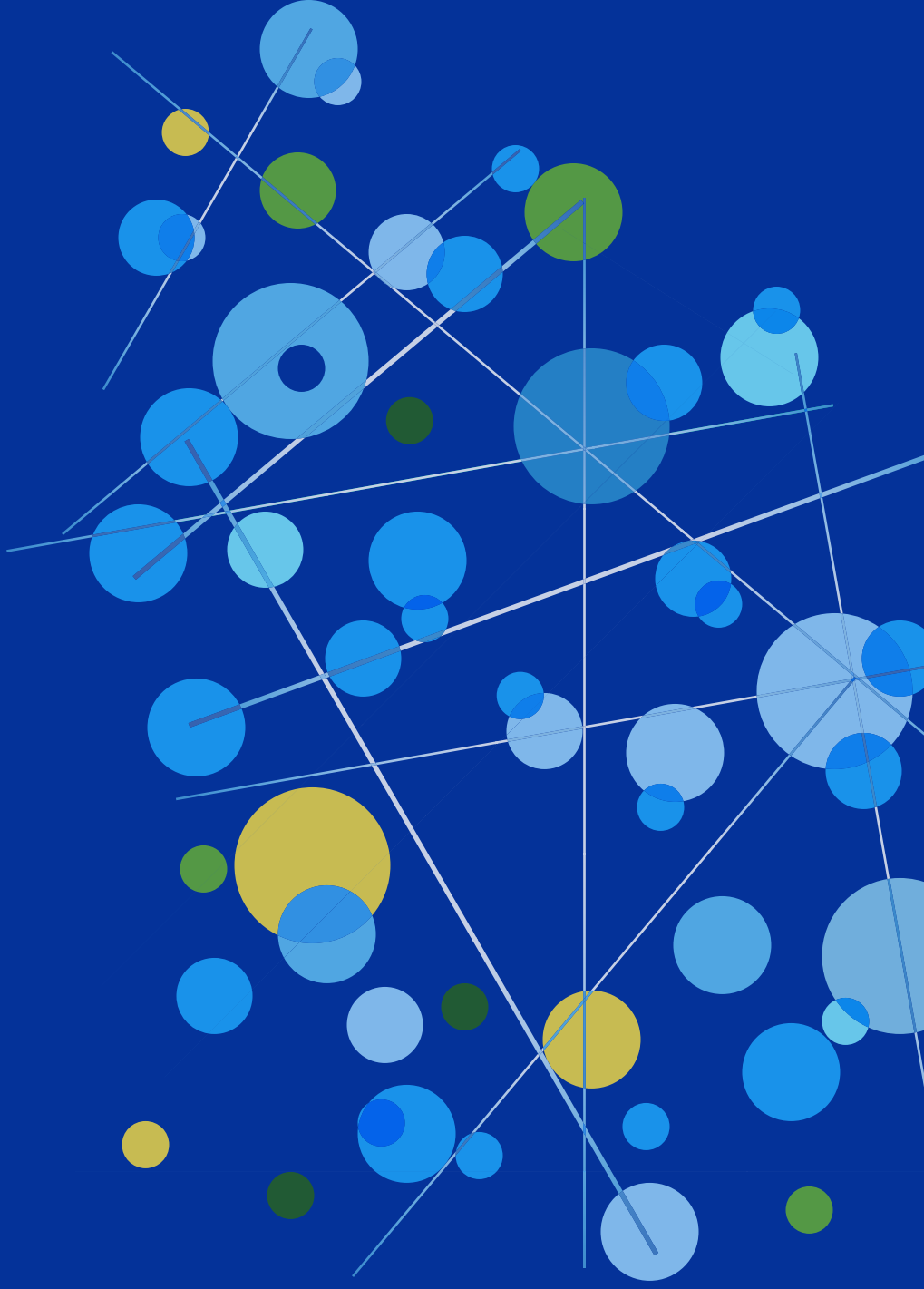

Supporting the Growth of California's Life Sciences Industry

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ABOUT US

About the Milken Institute

The Milken Institute is a nonprofit, nonpartisan think tank.

For the past three decades, the Milken Institute has served as a catalyst for practical, scalable solutions to global challenges by connecting human, financial, and educational resources to those who need them. Guided by a conviction that the best ideas, under-resourced, cannot succeed, we conduct research and analysis and convene top experts, innovators, and influencers from different backgrounds and competing viewpoints. We leverage this expertise and insight to construct programs and policy initiatives.

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About the Center for Regional Economics and California Center

The Milken Institute Center for Regional Economics produces research, programs, and events designed to inform and activate innovative economic and policy solutions to drive job creation and industry expansion. The Milken Institute California Center is dedicated to identifying solutions to strengthen California's role as a global incubator for innovation in policy, technology, and business.

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INTRODUCTION

The life sciences are a cornerstone of technological innovation in California. Local firms, laboratories, and universities perform cutting-edge research and development (R&D) activities that have led to numerous technological breakthroughs and generated commercial products with significant positive impacts on health outcomes, energy efficiency, and economic well-being far beyond the state's borders. Despite its tremendous assets, however, the Golden State can do more to remain a national—and global—leader in the life sciences. Evidence supports a thorough review of the incentives available to industry actors, including recent changes to the state's R&D tax credit, as well as consideration of additional place-based investment strategies that could improve the industry's long-term growth trajectory.

Background

The COVID-19 pandemic has focused a spotlight on the life sciences because of the particular need for the products of industry innovation, such as testing materials, therapeutics, and vaccines. Yet the life sciences industry's long-term contribution to the state's prosperity extends far beyond the sector's central role during this recent crisis.

According to the California Life Sciences Association, the state was home to more than 3,700 life sciences companies with 320,000 employees as of 2019. Precisely because the life sciences industry employs such a large number of Californians, it is responsible for a substantial portion of tax revenues used to fund key government programs. The life sciences industry also plays a central role in expanding the frontiers of human knowledge, creating the potential for further growth opportunities through the movement of new technologies from concept to commercialization. Investments in human capital—including research initiatives and degree programs at institutions of higher education—support the industry's growth by providing access to a large population of skilled workers. But non-degree training programs and career and technical education are also crucial resources, providing Californians with access to high-paying jobs in the life sciences industry.

The large number of economic opportunities made available through the life sciences industry's growth is also due to the industry's remarkable diversity across the state. The size of the pharmaceutical sector is substantial, employing more than 50,000 state residents as of 2019. But thousands also work across a range of non-pharmaceutical occupations, such as food science and technology, soil and plant science, zoology, and conservation. Diversity has made the industry a key source of job creation and wage growth in recent years, even in the face of increasing competition for investment in the life sciences from other states.

Investment and Policy

This policy brief reviews the impact of the industry's characteristics on the current investment landscape, takes a key set of challenges into account as part of the outlook for future investment, and concludes with a review of policy alternatives to support future growth.

The Investment Landscape establishes the particular value of life sciences R&D for supporting business formation and job creation in California, as well as the extent to which these characteristics make the state competitive in the context of the national economy. This section reviews a series of key indicators measuring the current status of the life sciences industry, including spending on R&D activities, as well as employment and incomes across a range of occupations.

- California accounts for an outsized proportion of the nation's total investment in life sciences R&D
- Life sciences R&D is not limited to laboratories or the pharmaceutical industry
- R&D generates a significant number of life sciences jobs that tend to pay relatively high wages

The **Investment Outlook** section reviews several key challenges to the future growth of the state's life sciences industry and the extent to which they may make California relatively less competitive as a location for investment. This section reviews a series of key indicators measuring the increase in competition for skilled workers, the high costs of doing business, and recent policy changes that have limited the incentives available for businesses to offset such costs.

- California is a key source of talent for the life sciences sector, but other states are generating more graduates
- High business operating costs and workers' cost of living present challenges in California
- Changes to the R&D tax credit introduce policy uncertainty, which could have long-term effects on investment in the industry

Policy Alternatives can help boost investment in life sciences R&D by enhancing coordination among firms, government agencies, and higher education institutions. Among policy alternatives considered in California are changes to the operation of the R&D tax credit and additional incentives to support firms' expanded investment in life sciences research.

- The state may reconsider modifications to the R&D tax credit in light of its budget outlook
- Additional support for life sciences startups could facilitate greater long-term job creation
- Industry-university partnerships provide a valuable framework for increasing place-based investment in regions of the state beyond existing R&D clusters

THE INVESTMENT LANDSCAPE

Business R&D in California

Businesses conducted $144 billion worth of R&D activity across all sectors in California in 2018, as shown in **Table 1**. The total accounted for almost one-third of business R&D activity at the national level and was nearly five times the amount performed in Washington, the state with the second-largest total of business R&D. California also ranked No. 15 nationally for the proportion of R&D funded by the company conducting the activity, which demonstrates the extent to which the state's investment landscape has favored businesses making long-term investments in the discovery of breakthrough technologies with the potential for market application.

TABLE 1: R&D PERFORMED BY PRIVATE-SECTOR FIRMS, ALL INDUSTRIES (USD BILLIONS)

STATE	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

Source: National Science Foundation—Business Enterprise Research and Development Survey (2018)

Among US states, California also stands out for the number of businesses engaged in conducting R&D activities. As of 2019, it had nearly three times the number of scientific R&D services firms found in Massachusetts, the No. 2 state, and almost four times as many as Texas, which ranked third in the nation. As shown in Table 2, the rate of R&D-supported business formation in California is also extremely high, ranking third in the nation over the past five years. Among states with large numbers of businesses performing R&D, only Massachusetts had a higher rate of new business growth during that span.

TABLE 2: SCIENTIFIC R&D SERVICE BUSINESSES, ALL INDUSTRIES

STATE	TOTAL R&D ESTABLISHMENTS	PERCENT GROWTH 2014–2019	PERCENT 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)

Life Sciences Research and Development

As for R&D specifically in the life sciences industry, much activity is also concentrated in California. The state's share of national business-funded R&D services in the physical and life sciences increased from just over one-quarter (26 percent) in 2014 to more than one-third (36 percent) in 2019, as shown in **Figure 1** and **Figure 2**, respectively. Even among other states with high levels of spending on R&D services in the life sciences industry, such as Arizona, Massachusetts, Pennsylvania, and Texas, none approached California's level of life and physical sciences R&D during that span.

FIGURES 1-2: INDUSTRY-FUNDED SCIENTIFIC R&D SERVICES, LIFE & PHYSICAL SCIENCES

FIG. 1

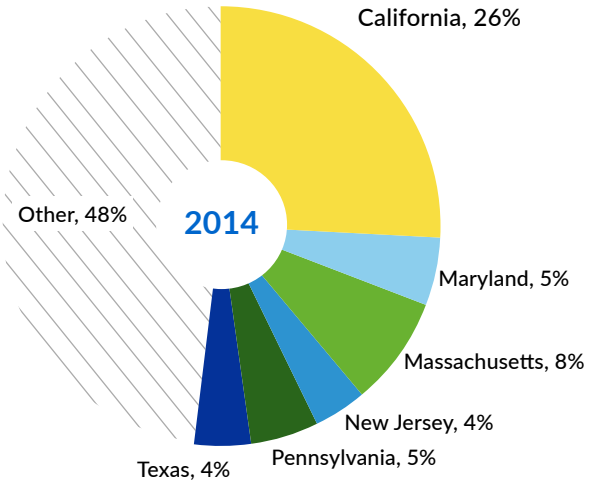
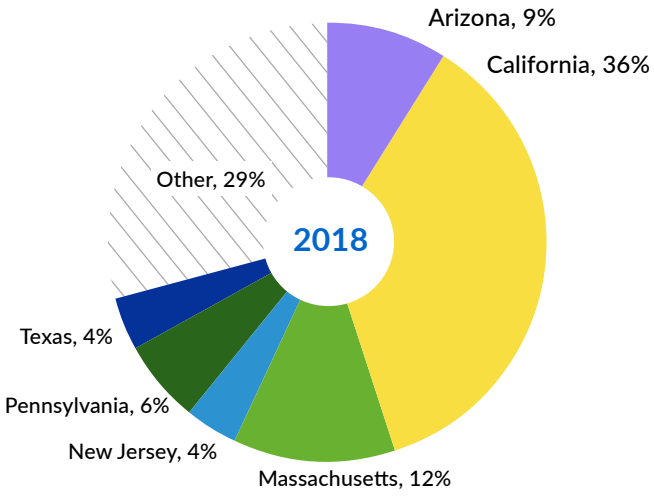


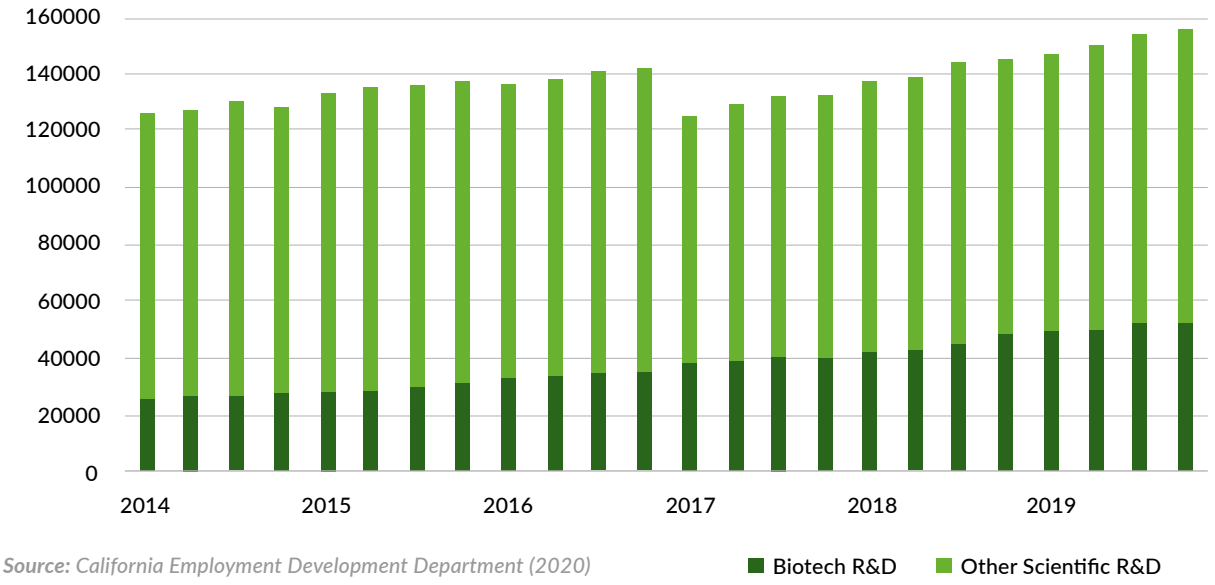
FIG. 2



Source: National Science Foundation—Business Enterprise Research and Development Survey (2014, 2018)

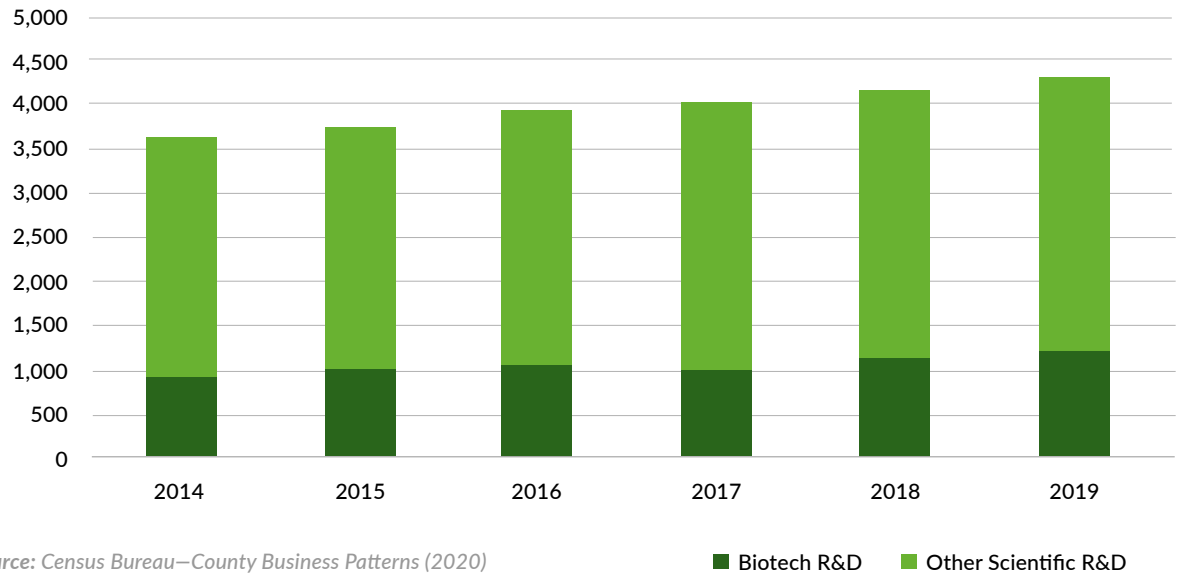
These high levels of industry spending on scientific R&D services have a clear impact on business formation and job creation in California, as shown by the growth of employment and new business establishment, shown in **Figure 3** and **Figure 4**, respectively. The specific growth rates in the number of biotech R&D jobs (105 percent) and biotech R&D businesses (33 percent) were also much higher than the rates of growth for other scientific R&D services jobs (3 percent) and businesses (25 percent), which illustrates the extent to which the overall growth of scientific R&D services has been concentrated specifically in biotech and life sciences.[1]

FIGURE 3: CALIFORNIA EMPLOYMENT IN SCIENTIFIC R&D SERVICES (QUARTERLY)



Source: California Employment Development Department (2020)

FIGURE 4: CALIFORNIA ESTABLISHMENTS IN SCIENTIFIC R&D SERVICES (ANNUAL)



Source: Census Bureau—County Business Patterns (2020)

In addition to providing scientific R&D services, California's life sciences industry also accounts for a substantial amount of business R&D spending through manufacturing activity. And in contrast to many other states where life sciences manufacturing is primarily concentrated in human health (particularly the production of pharmaceuticals and medical equipment), the amounts of R&D spending in California's agricultural and food processing sectors are also among the highest in the nation, as shown in **Table 3**.

TABLE 3: BUSINESS R&D SPENDING IN LIFE SCIENCES MANUFACTURING SECTORS (USD MILLIONS)

STATE	FOOD	BEVERAGE AND TOBACCO PRODUCTS	PESTICIDE, FERTILIZER, AG. CHEMICALS	PHARMACEUTICALS AND MEDICINES	MEDICAL EQUIPMENT AND SUPPLIES
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	N/A	N/A	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	N/A	1	1,238	209

Source: National Science Foundation—Business Enterprise Research and Development Survey (2018)

Life Sciences Employment and Incomes

Because the life sciences industry supports such a high level of R&D activity across multiple sectors, California has one of the highest overall concentrations of life sciences industry employment in the nation. The Milken Institute State Technology and Science Index 2020 ranked the state No. 5 for job concentration in its technology and science workforce, which includes a broad range of life sciences industry occupations.[2] As shown in **Table 4**, the state ranked in the top 10 nationwide for

the concentration of jobs in pharmaceutical manufacturing, medical equipment manufacturing, and scientific R&D services; it also ranked in the top 14 for the concentration of jobs in medical and diagnostic laboratories.

TABLE 4: CALIFORNIA LIFE SCIENCES INDUSTRY JOB CONCENTRATION

	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 and life sciences)	1.81	1.74	1.80	1.81
Medical and diagnostic labs	1.09	1.10	1.09	1.13

Note: Job concentration based on location quotient (LQ). If LQ > 1, local job concentration is higher than the national level.
Source: Bureau of Labor Statistics—Occupational Employment Statistics (2019)

The diversity of California's life sciences industry also generates job opportunities in numerous occupations with various requirements for skills and education: from R&D services that require doctoral degrees to manufacturing and technical jobs (including equipment operation and maintenance) that require fewer post-secondary credentials. Nonetheless, as **Table 5** shows, for all types of skilled life sciences workers, California faces stiff competition from states—including Maryland, Massachusetts, and New Jersey—that need to fill even higher concentrations of specialized jobs among their expanding life sciences industries.

TABLE 5: CALIFORNIA LIFE SCIENCES INDUSTRY WORKFORCE

OCCUPATION	CALIFORNIA JOBS	CALIFORNIA JOBS PER 100K	TOP STATE	TOP JOBS PER 100K
Biochemists, biophysicists	5,610	32	NJ	178
Microbiologists	3,470	20	MD	71
Biological scientists	10,650	61	MD	151
Medical scientists	23,460	135	MA	466
Life scientists	1,300	8	ND	25
Biological technicians	9,740	56	MA	174

Source: Bureau of Labor Statistics—Occupational Employment Statistics (2019)

Most life sciences employees in California also earn annual incomes that are significantly higher than the national average for their occupations, as shown in **Table 6**. On the one hand, high salaries may help attract talented employees to firms in California (or help firms keep them once they've been hired), enabling the state to collect a substantial amount in income taxes from highly paid industry employees. On the other hand, these salaries also contribute to the high costs of operating a life sciences business in California, potentially leading firms to consider locating their operations in states where employees can be attracted—or retained—with relatively lower remuneration.

TABLE 6: CALIFORNIA LIFE SCIENCES INDUSTRY AVERAGE ANNUAL INCOMES (USD)

OCCUPATION	CALIFORNIA AVG. INCOME	TOP STATE	TOP AVG. INCOME	NATIONAL AVG. INCOME
Biochemists, biophysicists	107,830	IL	114,300	108,180
Microbiologists	104,960	MD	105,840	82,760
Biological scientists	96,640	MD	106,030	87,590
Medical scientists	109,350	ME	130,310	98,770
Life scientists	100,310	NC	100,440	85,890
Biological technicians	53,740	CT	69,260	49,110

Source: Bureau of Labor Statistics—Occupational Employment Statistics (2019)

Based on the characteristics of life sciences R&D activity, employment, and incomes in California, it is clear that the Golden State's investment landscape has made it quite competitive with peer states. However, as outlined in the next section, the state also has a number of characteristics that could impede the industry's growth if they are not addressed through adjustments to existing policy.

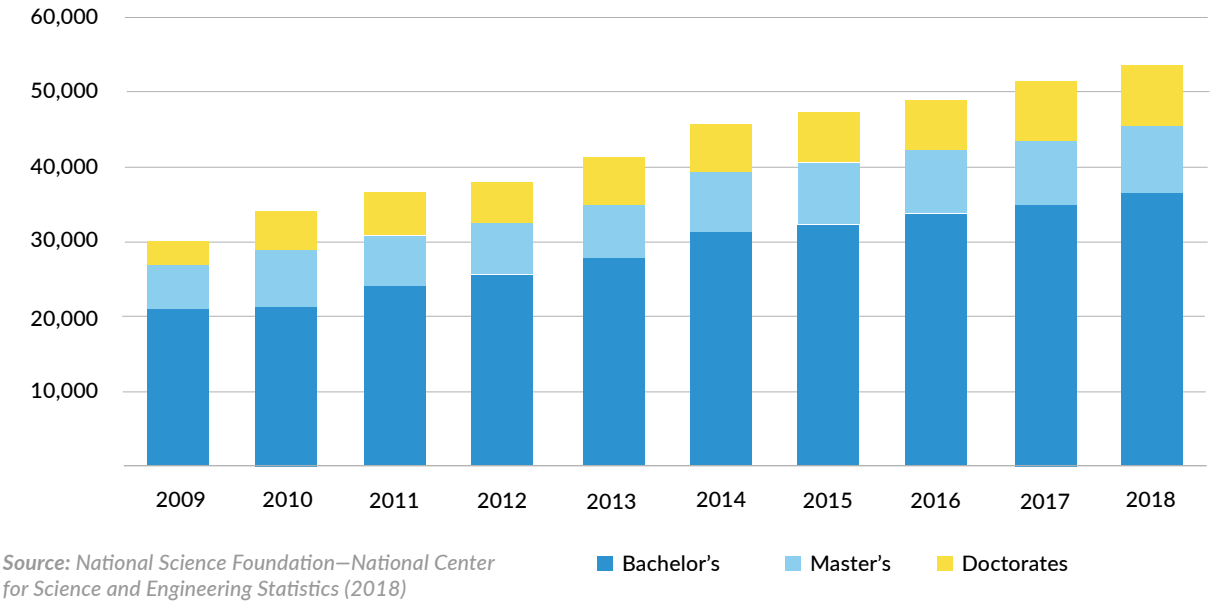
THE INVESTMENT OUTLOOK

California remains a center of dynamic research and innovation with a wide range of links to the global economy; however, the business environment presents some particularly challenging elements. California faces increased competition for investment from other states that are providing more skilled workers and talented researchers than ever before. And the horizons of industry growth are also clouded by the high costs of living and working in California. These costs have risen over time for various reasons, from expenditures for office space and housing to a substantial tax burden and a relatively limited number of tax incentives—particularly for new establishments.

Competing to Provide Talent

In 2018, California awarded more than 36,000 bachelor's degrees in life sciences, more than 9,000 master's degrees, and nearly 8,000 doctoral degrees. As shown in **Figure 5**, this represented a 77 percent increase over the total number of life sciences degrees awarded at the end of the previous decade.

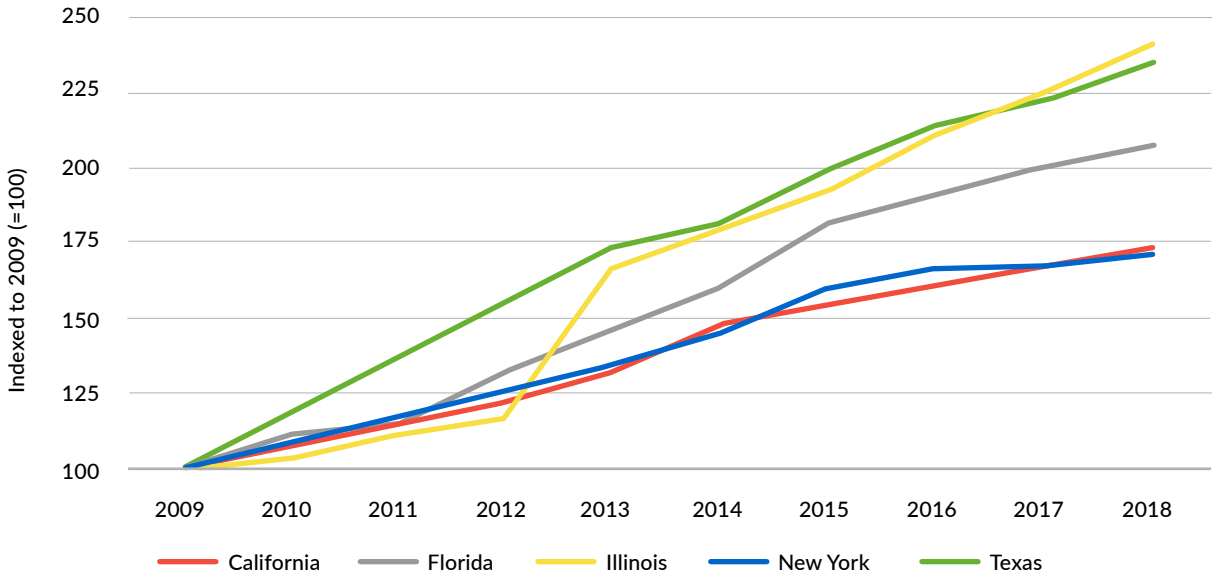
FIGURE 5: CALIFORNIA LIFE SCIENCES DEGREES AWARDED



Source: National Science Foundation—National Center for Science and Engineering Statistics (2018)

Despite this increase in the number of degrees awarded, the next four highest-ranking states (Texas, New York, Florida, and Illinois) saw much more significant growth in the number of undergraduate degrees awarded in the life sciences, as shown in **Figure 6**. Whereas California awarded 75 percent more total degrees in 2018 than it had in 2009, the number of degrees awarded in Florida, Illinois, and Texas each increased more than 100 percent.

FIGURE 6: BACHELOR'S DEGREES AWARDED IN LIFE SCIENCES



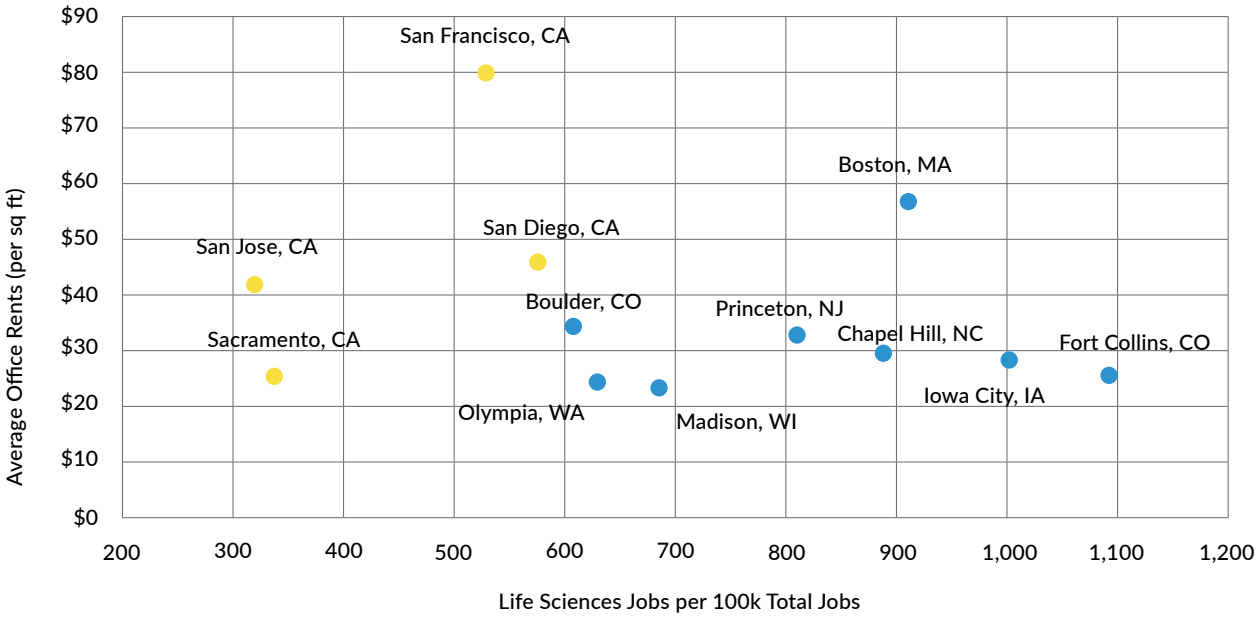
Source: National Science Foundation—National Center for Science and Engineering Statistics (2018)

Because other states have been educating their skilled workers at a faster rate than California, the state is now facing—and will continue to face—strong competition for life sciences R&D investment from other states that can offer access to similar sources of talent.

Addressing Local Costs

California also faces competition from other states for life sciences industry investment based on the relatively high costs of doing business in the state. For example, several of the state's major metro areas—including San Diego, San Francisco, Sacramento, and San Jose—had high levels of local job concentration in the life sciences industry in 2019, as shown in **Figure 7**. But among similar metros with a cluster of life sciences employees, only firms in Boston faced average office rents above $40 per square foot. And among California metros, only Sacramento had average office rents that were competitive with other centers of the life sciences industry.

FIGURE 7: COSTS OF OFFICE SPACE AND LIFE SCIENCES JOB CONCENTRATION



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)

Workers in high-tech industries such as the life sciences also face high costs of living in California. Several of the state's largest metros ranked outside the top tier of the Milken Institute Best-Performing Cities Index 2021 (BPC) partly because of high housing costs, as well as the impact of short-term job losses during the COVID-19 pandemic.[3] San Francisco, the top-ranked city in BPC 2020, fell to No. 24 in 2021, while San Jose fell from No. 5 to No. 22, as shown in **Table 7**. Among large California metros in the BPC 2021 index, most ranked high for the concentration of local economic activity in high-tech industries, including the life sciences. However, these metros all ranked in the bottom 25 percent of the index for housing affordability. The challenge of finding affordable housing in California remains particularly acute due to a housing shortage that has been exacerbated by local opposition to the construction of new units in many communities.

TABLE 7: BEST-PERFORMING CITIES INDEX 2021 RANKINGS (OUT OF 200 LARGE METRO AREAS)

METRO AREA	2021 OVERALL	2020 OVERALL	1-YEAR HIGH-TECH CONCENTRATION[4]	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

Source: Milken Institute analysis of American Community Survey 1-Year (2019) and 5-Year (2014-18) Estimates

Businesses in California also bear substantial tax burdens. California ranked No. 49 in the Tax Foundation 2021 State Business Tax Climate Index due to its high corporate, income, and sales tax rates.[5] Its 8.84 percent corporate tax rate is the eighth highest nationwide, after New Jersey (11.5 percent), Pennsylvania (9.99 percent), Iowa (9.8 percent), Minnesota (9.8 percent), Illinois (9.5 percent), Alaska (9.4 percent) and Maine (8.93 percent). In contrast, several states with large numbers of life sciences graduates, as outlined previously, have significantly lower corporate tax rates: Florida (4.45 percent), New York (6.5 percent), and Texas (0.75 percent).[6]

As a consequence of the tax burden on companies in California, several of the state's existing tax credit programs significantly impact companies' investment decisions—including the localization of activities that support the discovery, production, and commercialization of groundbreaking technologies in the life sciences. These programs include the state's R&D Tax Credit and a sales tax exemption for companies purchasing equipment to produce and/or use clean energy. The Governor's Office of Business and Economic Development (GO-Biz) also administers the California Competes Tax Credit, which defers tax liabilities for companies providing full-time jobs in the state.

Providing a Stable Policy Environment

California instituted its R&D Tax Credit in 1987.[7] The program has been recognized as one of the most significant commitments to attracting and retaining local R&D by any state government in the nation.[8] Before 2020, the tax credit was available to firms conducting qualified research activities in California at a 15 percent rate for qualified expenses and 24 percent of basic research payments. Qualified expenses included spending on the discovery of new technology or the development of improved business components that involved experimentation. This included wages for employees engaging in or supervising and/or supporting research and the purchase or rental of supplies used in research activities.[9]

Under this system, the rates of R&D-supported business formation and job creation in California conformed to earlier research findings on state R&D tax credits, showing strong positive effects on local rates of entrepreneurship.[10] Structured interviews conducted by the Milken Institute found that the tax incentive was an important tool for firms to reduce operating costs. Though its impact on specific investments in the life sciences industry R&D could not be easily quantified, multiple firms cited the availability of the tax credit as a strong influence on their local investment planning.

However, the enactment of California Assembly Bill No. 85 in June 2020[11] introduced significant uncertainty regarding the continued benefits of the tax credit for business formation and job creation. The law limited business incentive tax credit claims (including R&D) to a total of $5 million in tax liability per year and disallowed a net operating loss deduction for taxable years from 2020 to 2022. A core rationale offered for the legislation was a projected $54 billion state budget deficit caused by the COVID-19 pandemic, including a significant decline in General Fund revenues and a substantial increase in the costs of government services.[12] Despite subsequent revisions to the budget projection in 2021, based on an increase in tax revenue[13] and the addition of federal stimulus funds, the restrictions on the R&D Tax credit remain in place.

The effects of these restrictions on life sciences industry investment in local R&D activities will not become clear until more data have been collected. Nonetheless, because most firms plan their R&D investments on longer cycles (often upwards of five years and frequently two years at minimum), the limits on their ability to claim qualified expenses—and thus offset the high costs of doing business in California—for the next two years are likely to have significant longer-term effects. All life sciences firms interviewed by the Milken Institute indicated that they were currently reviewing the effects of the new measure for their planning beyond 2022, and several indicated their openness to relocating R&D activities or making new investments outside California based on access to talent or business incentives. If investment in California life sciences R&D (including biotech) faces a sustained slowdown or notable cuts, it could lead to a reduced rate of growth—or even a decline—in the number of high-paying jobs available to state residents.[14]

POLICY ALTERNATIVES

Discussions about economic recovery from the COVID-19 pandemic also offer an inflection point for considering new strategies to promote growth in the life science industry across the state. During the previous decade, California's recovery from the Great Recession was characterized by growing inequality among regions of the state. Consequently, political leaders can and should do more to address these gaps if they want California to maintain its innovation advantages. As other states become more attractive targets for life sciences investment by providing more talent, lower costs, and a more stable policy environment, California may also need to reconsider the value of more targeted investment incentives that leverage the state's potential advantages, such as its strong culture of entrepreneurship and the quality of its institutions of higher education.[15]

Supporting Life Sciences Startups

Much of the life sciences industry has remained concentrated in a small number of regions across the state, including the Bay Area and Southern California, whereas other regions currently have a much more limited local industry presence, as indicated in **Table 8**. Several of these regions that have recorded relatively high rates of new biotech business formation over the previous five years could benefit from a refundable R&D tax credit for small businesses and startups.

TABLE 8: BIOTECH R&D ESTABLISHMENTS BY CALIFORNIA METRO

METRO AREA	BIOTECH ESTABLISHMENTS	PERCENT GROWTH 2014–2019
San Francisco–Oakland–Hayward	407.0	42.3
San Diego–Carlsbad	341.0	35.9
Los Angeles–Long Beach–Anaheim	218.0	39.7
San Jose–Sunnyvale–Santa Clara	155.0	20.2
Sacramento–Roseville–Arden-Arcade	30.0	15.4
Oxnard–Thousand Oaks–Ventura	20.0	53.8
Riverside–San Bernardino–Ontario	18.0	38.5
Santa Cruz–Watsonville	8.0	0
Santa Maria–Santa Barbara	8.0	100.0
San Luis Obispo–Paso Robles–Arroyo Grande	3.0	0

Source: Census Bureau—County Business Patterns (2019)

Despite the potential benefits of R&D tax credits for innovative firms, many small businesses cannot take full advantage of these benefits during years in which they face little to no tax burden, particularly at the pre-revenue stage. Targeted policies to refund a percentage of unused research credits could encourage more investment with the potential to generate jobs and tax revenues. And in regions of the state with fewer firms, a refundable credit for small businesses and startups could facilitate the long-term development of more industry clusters.

Leveraging Research at Institutions of Higher Education

In some regions with smaller life sciences clusters—such as the Central Valley, Inland Empire, and Sacramento Valley— the University of California and California State University systems can serve as extremely valuable assets to support additional industry growth via expanded R&D tax credits for funding university research. As shown in **Table 9**, the life sciences already account for the majority of R&D spending at several institutions.

TABLE 9: R&D SPENDING AT INSTITUTIONS OF HIGHER EDUCATION (USD MILLIONS)

UNIVERSITY	METRO AREA	TOTAL R&D SPENDING	LIFE SCIENCES R&D SPENDING	LIFE SCI R&D AS % OF TOTAL
UC Davis	Sacramento	789.0	588.0	74.6
CSU Stanislaus	Modesto	1.4	1.0	73.7
CSU Monterey Bay	Salinas	5.8	3.7	63.3
Fresno State	Fresno	9.0	4.7	52.5
UC Riverside	Riverside–San Bernardino	168.0	85.0	50.7
Humboldt State	Eureka	15.0	7.5	50.2
CSU Chico	Chico	2.4	1.2	47.7
Cal Poly San Luis Obispo	San Luis Obispo	16.0	6.3	38.7
UC Merced	Merced	38.0	7.7	20.2
CSU San Bernardino	Riverside–San Bernardino	17.0	1.9	11.4
CSU Bakersfield	Bakersfield	5.6	0.4	7.7
Sacramento State	Sacramento	21.4	1.3	6.4

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

Because basic research conducted at or with higher education institutions may take longer to bear fruit commercially, public-private partnerships can further defray the costs of this work. By expanding access to capital for researchers on campus and startup companies in university incubators, this policy approach could help more breakthrough technologies cross the so-called "valley of death" that exists between the discovery of a new opportunity and the development of a new product.[16] In the long term, enhancing the value of tax credits available to support this investment can generate additional firm spinoffs from university laboratories that have the potential to sustain the industry's growth and create more jobs.

FINAL CONSIDERATIONS

California is a prime location for investment in life sciences R&D, given its favorable conditions for knowledge-based economic growth and a strong public commitment to innovation. This was highlighted by the passage of Proposition 14 in 2020, which expanded public funding for stem cell research.[17] Nonetheless, key aspects of the state's business environment may still present significant obstacles to further industry growth and the creation of additional high-income jobs. California's R&D Tax Credit, therefore, remains a crucial part of the state's innovation toolkit, supporting the generation of new products and improving production methods. It is also an important incentive for life sciences firms to retain and expand their local operations, even as other communities across the nation foster emergent industry clusters.

Supporting the growth of California's life sciences industry will require innovation policies that benefit a range of different firms, from pre-revenue startups attempting to traverse the valley of death to established firms that face rising operating costs as they expand their workforce. The policy alternatives outlined here can help ensure that the Golden State is prepared for the future of work and continues to support the industry's growth.

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ENDNOTES

1. The change in the overall level of Scientific R&D Services Employment in 2017 may be attributed to a change in the North American Industry Classification System (NAICS) occupation codes that had previously been used since 2012. NAICS codes are reviewed every five years for potential revisions to keep pace with changes in the broader economy. Specific changes to the NAICS Code 5417 in 2017 involved the classification of multiple occupations in the category of scientific R&D services. "Changes from 2012 to 2017 NAICS Structures," NAICS Association, April 17, 2017, https://www.naics.com/changes-from-2012-2017-naics-structures-highlights-highlights.

2. Kevin Klowden, Aaron Melaas, Charlotte Kesteven, and Sam Hanigan, "State Technology and Science Index 2020" (Milken Institute, November 2020), https://statetechandscience.org/State-Technology-and-Science-Index-2020.pdf.

3. Misael Galdamez, Charlotte Kesteven, and Aaron Melaas, "Best-Performing Cities 2021: Foundations for Growth and Recovery" (Milken Institute, February 2021), https://milkeninstitute.org/sites/default/files/reports-pdf/Best-Performing-Cities-2021.pdf.

4. High-tech concentration measures the GDP of local high-tech industries (including but not limited to the life sciences industry) as a percentage of total metro area GDP.

5. Jared Walczak and Janelle Cammenga, "2021 State Business Tax Climate Index" (Tax Foundation, October 21, 2020), https://taxfoundation.org/2021-state-business-tax-climate-index.

6. Texas does not have a corporate income tax but does have a gross receipts tax. Jared Walczak, Katherine Loughead, Ulrik Boesen, and Janelle Cammenga, "Location Matters 2021: The State Tax Costs of Doing Business" (Tax Foundation, May 5, 2021), https://taxfoundation.org/state-tax-costs-of-doing-business-2021/.

7. "An Overview of California's Research and Development Tax Credit," Legislative Analyst's Office, November 2003, https://lao.ca.gov/2003/randd_credit/113003_research_development.html.

8. As of 2020, 36 US states provided R&D tax credits to corporations operating locally.

9. "California research," Franchise Tax Board – Business Credits, Accessed May 21, 2021, https://www.ftb.ca.gov/file/business/credits/california-research.html.

10. Catherine Fazio, Jorge Guzman, and Scott Stern, "The Impact of State-Level Research and Development Tax Credits on the Quantity and Quality of Entrepreneurship," Economic Development Quarterly, Volume 34, Issue 2, May 2020, https://journals.sagepub.com/doi/abs/10.1177/0891242420920926?journalCode=edqa.

11. "Assembly Bill No. 85, Committee on Budget. State Taxes and Charges," California State Legislature, June 30, 2020, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB85.

12. "California Enacts 3-Year NOL Suspension and Business Tax Credit Limit" (Deloitte, June 30, 2020), https://www2.deloitte.com/content/dam/Deloitte/us/Documents/Tax/us-tax-multistate-california-enacts-three-year-nol-suspension-and-business-tax-credit-limit.pdf.

13. Matt Phillips, "California Is Awash in Cash, Thanks to a Booming Market," The New York Times, April 28, 2021, https://www.nytimes.com/2021/04/28/business/california-budget-stock-market.html.

14. As of May 2021, the California State Legislature is considering a proposal that would exempt companies that conduct biotechnology R&D from the limits on the tax credit introduced in 2020. "Assembly Bill No. 593, Income Taxes: Net Operating Losses: Tax Credits: Research, Development, and Testing for Diseases," California State Legislature, February 11, 2021, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB593.

15. Ross DeVol, Kristen Harris, and Minoli Ratnatunga, "California's Innovation-Based Economy: Policies to Maintain and Enhance It" (Milken Institute, December 2015), https://milkeninstitute.org/sites/default/files/reports-pdf/California%27s%20Innovation-Based%20Economy-Policies%20to%20Maintain%20and%20Enhance%20It.pdf.

16. Joannes Barend Klitsie, Rebecca Anne Price, and Christine Stefanie Heleen De Lille, "Overcoming the Valley of Death: A Design Innovation Perspective," Design Management Journal, Volume 14, Issue 1, October 2019, https://onlinelibrary.wiley.com/doi/full/10.1111/dmj.12052.

17. Proposition 14 was approved by a 51-49 percent margin as part of the 2020 general election. It authorized $5.5 billion in new research funding for the California Institute for Regenerative Medicine (CIRM) to provide grant funding for stem cell research studies and clinical trials. CIRM had been established via a $3 billion bond measure in 2004 to provide grants, establish laboratories, and organize training programs, but unallocated funds expired in 2019. Melody Gutierrez, "Proposition 14 to Fund State Stem Cell Research Approved by California Voters," The Los Angeles Times, November 12, 2020, https://www.latimes.com/california/story/2020-11-12/prop-14-stem-cell-research-final-results

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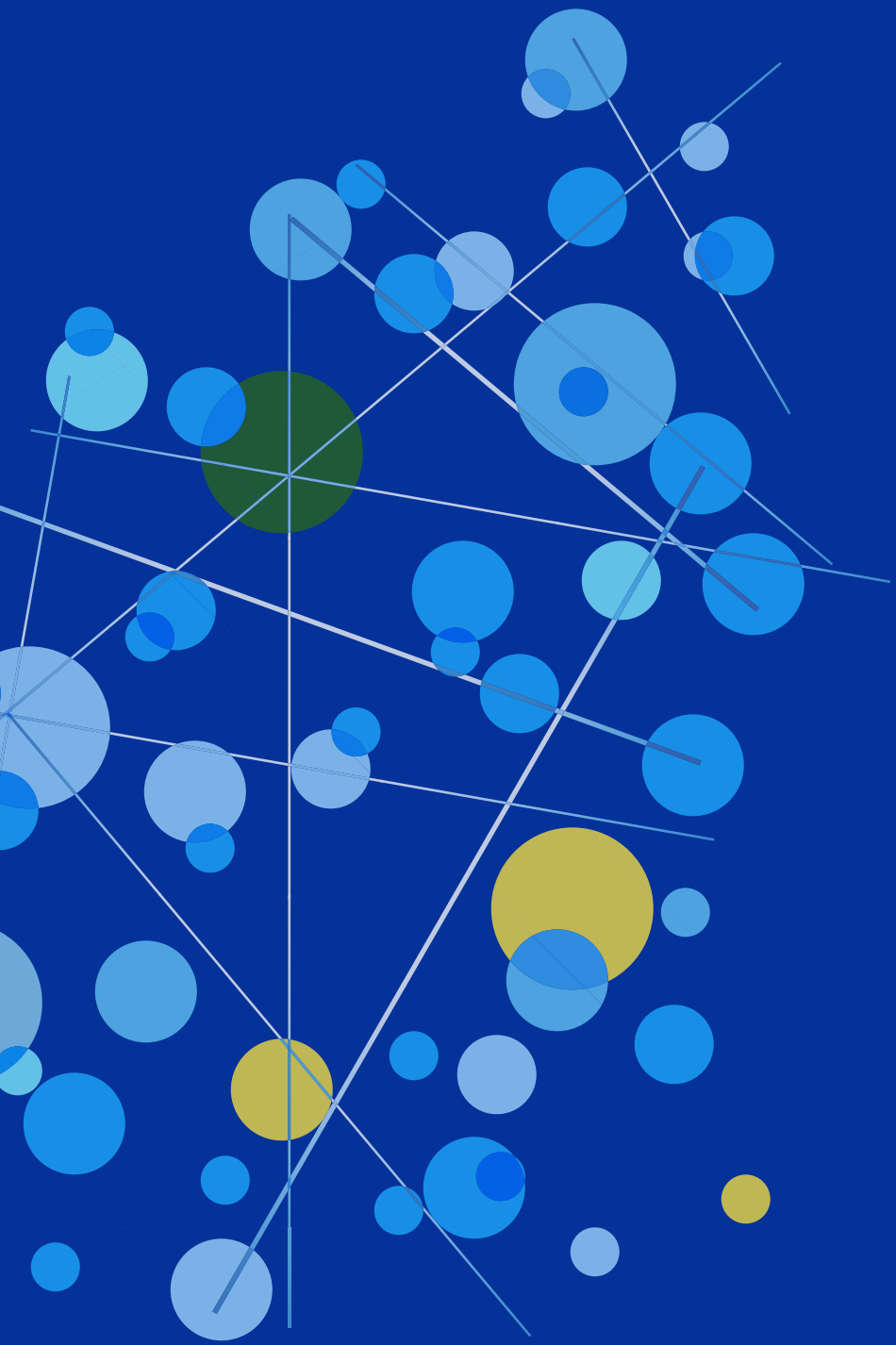

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