MILKEN INSTITUTE

SUSTAINING CALIFORNIA'S INNOVATION ECONOMY THROUGH INVESTMENT IN R&D

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EXECUTIVE SUMMARY

In 2015, the Milken Institute surveyed California's economy and provided a series of policy recommendations for sustaining innovation-fueled growth. Among other ideas, that report modeled the potential effects of an increase in the state's research and development (R&D) tax credit on research spending, GDP growth, and job creation. It also noted that, in the absence of policy incentives such as the tax credit, the state's high tax rates and costs of doing business could make it more difficult to attract local investment in R&D and sustain innovation-fueled growth.

This new report builds on prior research by documenting more recent trends in private-sector R&D investment and their positive impact on employment and wages across the state. California has historically enjoyed a comparative advantage in innovation-fueled growth relative to other US states, but this advantage is closely tied to the presence of dedicated policies supporting local investment in R&D. Recent changes to those policies could make it more difficult to attract R&D that supports high-tech, high-wage industries and jobs. A reduction in R&D investment could reduce the number of new high-tech, high-wage jobs, hampering the state's short-term recovery from the COVID-19 pandemic as well as its long-term growth prospects.

This report aims to respond to changes to California's R&D tax credit instituted in 2020 by encouraging state leaders to consider the impact of these changes on the state's growth trajectory. Rather than relying on its historic advantages in attracting innovation, California should instead take new steps to sustain its innovation-based economy by supporting a more inclusive growth agenda and ensuring that the benefits of R&D investment are available to a broader range of state residents. Policies worthy of additional consideration include incentives for place-based R&D investment in specific communities, refundable R&D tax credits for small businesses and startups, and an exemption from new limits on R&D tax credits for collaboration between industry actors and institutions of higher education.

INTRODUCTION

Innovation plays a crucial role in generating opportunities for economic growth and is key to defining California's economic identity. Local research and development (R&D) activity across a range of high-tech, high-wage industries is a huge part of the state's competitive advantage, particularly *vis-à-vis* other US states. Federal laboratories and state institutions of higher education have provided a source of unparalleled knowledge generation, sowing the seeds of technological breakthroughs across numerous industries from information technology to life sciences to arts and entertainment. However, the continued success of California's high-tech industries—and the creation of high-wage jobs across the state—has primarily relied on companies committing to substantial investments in the local performance of R&D.

California's innovation advantage, however, is not naturally maintained indefinitely. The high costs of living and of doing business, as well as finding talented workers, are already a constraint on the sustainable growth of the state's innovation economy. This has been seen through the number of companies leaving the state or choosing not to establish themselves here, preferring other states for their lower costs of living and doing business as well as specific tax incentives.[1] Because R&D activity is already expensive, time-consuming, and risky, many states—as well as the US federal government—use R&D tax credit programs to help reduce the costs of innovation for the private sector.

Since 1987, California's R&D tax credit has allowed companies to reduce their corporate income tax burden by 15 to 24 percent when they invest in three key areas. These include qualified research expenses, used to discover new technology or develop improved business components through experimentation; wages paid to those engaged in research or directly supervising or supporting research activities; and research supplies (other than land or land improvements). Companies filing R&D tax credit claims can deduct not only their own in-house research expenses but also the costs of contracting with another organization or working with outside partners.[2] A 2015 Milken Institute report on "California's Innovation-Based Economy" modeled the potential effects of an increase in the R&D tax credit from 15 percent to 30 percent, suggesting this could stimulate between $4.5 billion and $6.8 billion in additional research spending over 10 years, with further positive effects on GDP growth (between $7.7 billion and $10.5 billion) and job creation (between 60,000 and 80,000 jobs).[3]

However, instead of increasing the size of the R&D tax credit, the state has implemented limits on the size of claims available to local industries. As the COVID-19 pandemic escalated in the spring of 2020 and California faced a projected $54 billion budget deficit, Governor Gavin Newsom and the Legislature took several measures to confront this challenge.[4] A law passed in June 2020 (Assembly Bill No. 85, or AB 85) put a $5 million cap on business tax incentives and suspended net operating loss deductions for a three-year period.[5] This law significantly altered incentives for industry to invest in R&D and, perhaps more significantly, left firms considering local investments uncertain about expected returns under the new policy as well as the likelihood of further changes to the policy.

Although the state's budget scenario has changed remarkably since last year, with a projected $76 billion surplus in 2021, the terms of the tax credit have not been revised.[6] As California's once-dire budget situation improves, and as other states emerge as attractive targets for investment in R&D due to lower costs and similar access to talent, the Golden State may need to reconsider the value of specific policies—including the R&D tax credit—that harness the state's competitive advantages and nurture the innovation ecosystem sustained by industry-funded R&D. As the state considers policy strategies to sustain broad-based economic recovery, this report specifically considers the value of R&D in California's economy and presents a series of policy considerations to sustain those investments in response to the changes enacted in 2020.

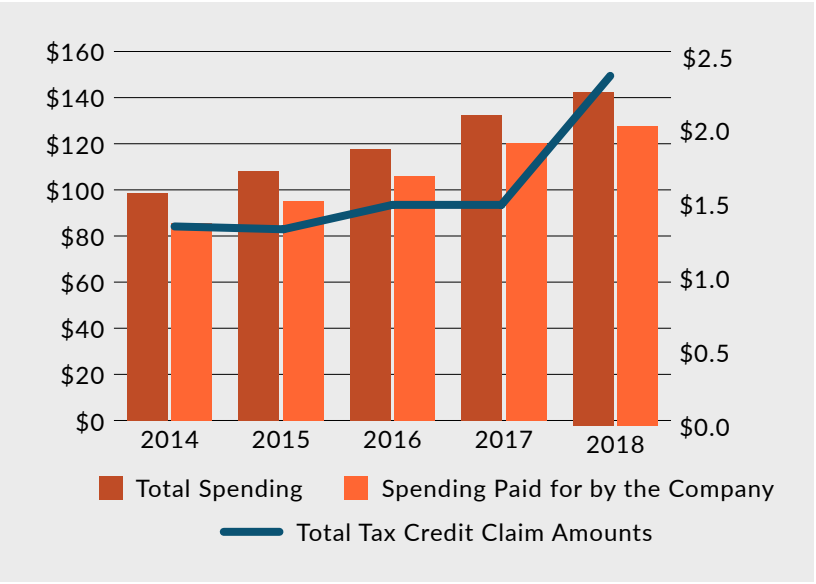
INDUSTRY R&D IN CALIFORNIA

HOW MUCH IS HAPPENING?

California stands out for its very high level of industry investment in local R&D activities. Industry actors performed more than $144.5 billion worth of R&D activities in California in 2018, nearly five times as much as the second-ranked state for industry investment in R&D. And four of the top US metro areas for R&D investment were all located in the state: San Jose-Sunnyvale-Santa Clara (No. 1), San Francisco-Oakland-Berkeley (No. 2), Los Angeles-Long Beach-Anaheim (No. 7), and San Diego-Chula Vista-Carlsbad (No. 8). Industry actors in California funded a slightly higher proportion of their own activities (89.7 percent) than the nationwide average (85.7 percent), with the state ranking No. 15 nationwide for the proportion of R&D paid for by the company performing the activities.[7]

One of the main factors influencing industry actors' decisions about spending on local R&D activities in California is the state's R&D tax credit. Over a five-year period preceding the COVID-19 pandemic, there was a strong correlation between the amount of total investment in R&D in California and the amount of tax credits claimed by local firms, as shown in **Figure 1**.

Figure 1: R&D Spending *(left)* and R&D Tax Credit Claims *(right)* (USD billions)



Source: National Science Foundation—Business and Industry R&D (2018)

Companies may file claims under the R&D tax credit for qualified research expenses, wages, or supplies. Qualified research expenses include investments in the discovery of new technology or development of an improved business component, must involve a process of experimentation, and may either include in-house spending or be paid to non-employees (e.g., contractors). Wages must be paid to employees spending at least 80 percent of their working hours on R&D. Supplies include tangible property other than land.

While the R&D tax credit appears to influence industry decisions to undertake research, hire workers, or obtain supplies in California, other factors also influence their investment strategies, including access to researchers and innovative technologies, local costs of operation, and specific business opportunities. Nonetheless, the overall trend in California appears to illustrate that the R&D tax credit has had a positive impact on local performance of R&D. And when compared with the size of other business tax credits claimed by firms in the state—such as the California Competes tax credit, the Enterprise Zone tax credit, and the Motion Picture and Television tax credit—the R&D tax credit stands out for the frequency with which local firms have used it to help offset their operating costs. From 2014 to 2018, the R&D tax credit accounted for by far the largest proportion of total business tax credit claims, with that proportion increasing from just under 70 percent to just over 80 percent over those five years.[8]

WHAT ARE THE BENEFITS?

Investment in R&D supports job creation across a variety of industries that benefit from new technologies. Because R&D does not include just the initial development of ideas or basic research but also innovation throughout the value chain, process and production improvements are also key targets of investment. In 2018, manufacturing activities accounted for 52 percent of overall R&D spending statewide.[9]

Four industries with a large presence in California stand out for the close ties between investment in R&D activities and job creation across a range of different occupations: computers and mathematics (i.e., information technology); architecture and engineering; life and physical sciences; and arts, design, and media (including entertainment). While computers and mathematics jobs are the state's single largest industry workforce supported by R&D, the level of job concentration (the size of the industry workforce relative to the state's economy as a whole) is highest in arts, design, and media, as shown in **Table 1**.

Table 1: Employment and Wages in R&D-Supported Industries

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

**Job concentration measured by Location Quotient (LQ). If LQ > 1, industry has a larger relative share of area employment than it does nationwide.*

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

In addition to their large presence, these R&D-supported industries are also experiencing rapid job growth, particularly in highly paid occupations. California's Employment Development Department (EDD) projects that jobs tied to R&D—not just those directly engaged in research—in industries such as arts, design and media, and computers and mathematics, pay the highest wages among the state's fastest-growing occupations,[10] as shown in **Table 2**. Although much of the analysis of California's prospects for economic recovery has focused on job creation in customer-oriented service industries,[11] it is also important for California to consider how it can create more high-wage jobs that are supported by investment in R&D.

Table 2: Fastest-Growing Occupations in California (2020-2022 Projections)

Occupation	Percentage Change in Total Jobs	Occupational Median Income ($)
Food Preparation & Serving	+ 29.7	28,018
Personal Care & Service	+ 15.9	30,408
Healthcare Support	+ 15.4	29,779
Sales	+ 14.9	34,374
Transportation & Material Moving	+ 14.6	34,260
Arts, Design, & Media	+ 13.2	62,666
Farming, Fishing, & Forestry	+ 11.1	26,475
Construction & Extraction	+ 10.9	58,399
Management	+ 10.1	124,283
Installation, Maintenance, & Repair	+ 10.0	52,758
Building & Grounds Maintenance	+ 9.8	33,590
Computers & Mathematics	+ 9.5	109,142

Source: California Employment Development Department (2021)

Table 3: Fastest Growing Occupations in California Requiring Associate's Degree (2020-2022 Projections)

Occupation	Percentage Change in Total Jobs	Occupational Median Income ($)
Dental Hygienists	+ 59.4	n/a
Veterinary Technologists & Technicians	+ 19.5	42,594
Web Developers	+ 11.7	n/a
Life, Physical, & Social Science Technicians	+ 11.1	57,783
Preschool Teachers, except Special Education	+ 9.1	35,751
Human Resources Assistants, except Payroll	+ 8.4	44,401
Respiratory Therapists	+ 8.1	84,178
Computer Network Support Specialists	+ 7.3	n/a
Diagnostic Medical Sonographers	+ 7.2	100,174
Paralegals and Legal Assistants	+ 6.6	59,356

Source: California Employment Development Department (2021)

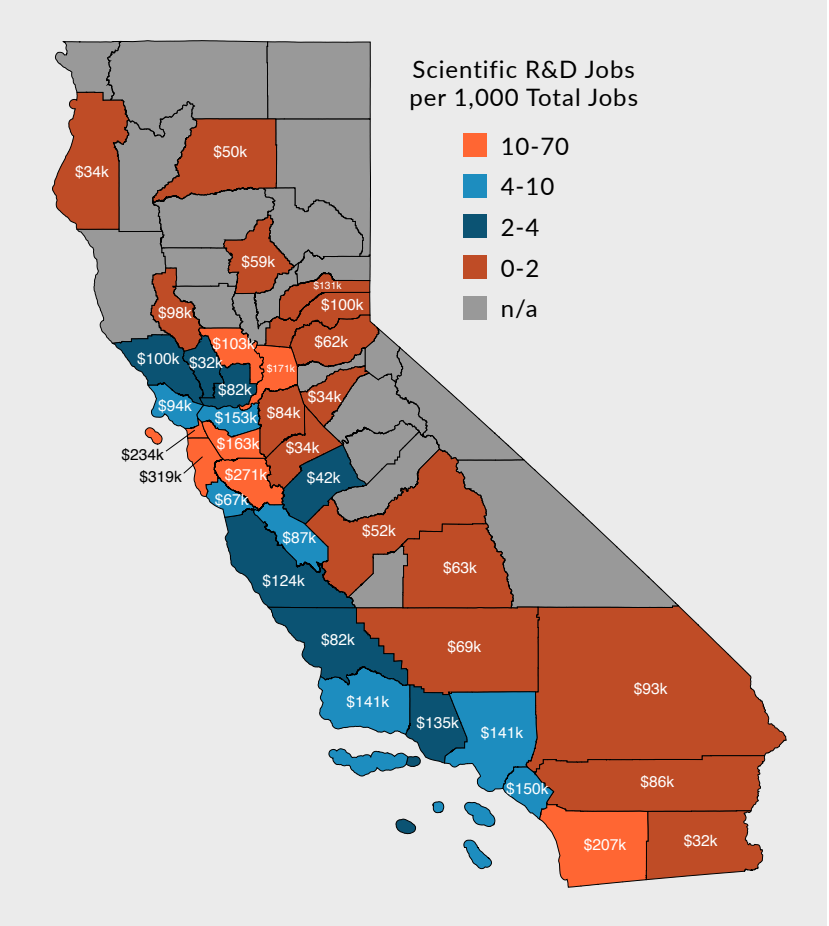
Because R&D supports job creation across a broad variety of activities, investments in R&D don't just generate jobs for people with advanced degrees who are directly engaged in research activities (including analysts, engineers, and lab technicians). These investments also create opportunities for residents with different academic credentials, levels of experience, and industry affiliations, including jobs indirectly related to research outcomes (such as maintenance technicians, marketing and advertising professionals, office managers, and sales associates). Among the occupations requiring an associate's degree that are projected to grow fastest by the Employment Development Department (EDD), several are directly supported by R&D investments, including web developers, network support specialists, and technicians in health care and the life sciences, as shown in **Table 3**.

WHERE IS IT FOUND?

Since the Milken Institute's prior assessment of California's innovation economy, the geographical distribution of R&D activities across the state has remained somewhat uneven. The state's largest coastal cities still host a large majority of R&D investment in the state, due largely to technology clusters that facilitate greater knowledge-sharing through formal and informal networks.[12] Consequently, much of the conversation around R&D investment in California has focused on the Bay Area (a hub for both the information technology and life sciences industries) and San Diego (with a large life sciences cluster) without acknowledging the role of other regions of the state in the innovation economy.

Figure 2 shows the concentration of scientific R&D employment across California, as well as average wages for the scientific R&D workforce in each county. As the map shows, there is a noticeable divide between coastal and inland California, with most of the state's high-paid R&D workforce concentrated on the coast and many inland areas demonstrating a lower R&D employment concentration and lower average salaries.

Figure 2: Scientific R&D Employment Concentration and Average Annual Incomes



Source: Bureau of Labor Statistics—Quarterly Census of Employment and Wages (2020)

Nonetheless, a notable proportion of the workforce in other California metros, including several large inland cities, hosts a large industry presence supported by R&D, as shown in **Table 4**. For example, architecture and engineering have a sizeable presence in Bakersfield due to the energy industry—both fossil fuels and renewables—while Sacramento's agricultural industry includes substantial employment in the life sciences.

Table 4: Percent of California Metro Area Workforce in R&D-Supported Industries

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
Los Angeles-Longbeach-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

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

INCENTIVES TO INVEST IN R&D

Because of the relatively high costs of living and doing business in California, it is important to consider how the state continues to attract industry investment in R&D that supports local job creation and the extent to which specific policies and incentives support R&D investment.

As mentioned previously, there is evidence that the state's R&D tax credit has been a valuable incentive for securing commitments from companies to invest in R&D. However, the changes to the R&D tax credit instituted by AB 85 cast reasonable doubt on its continued effectiveness because they introduced a high degree of uncertainty into the policy environment. A predictable policy environment is important for businesses that are confronting decisions about whether to invest in R&D, particularly as their investments will not necessarily yield immediate profits and may require long periods of time to generate new products and services that support additional job creation.

The policy changes that were instituted in 2020 may not have an immediate impact on industry R&D investments. Still, as businesses begin to make planning decisions for subsequent investment cycles, they will be doing so in an environment where they cannot claim net operating losses or face a cap on the amount of available business incentive tax credits (including the R&D tax credit). These changes could not only affect the largest firms making R&D investments but could also have a particularly significant impact on startups that relied on the net operating loss provision.

HOW DOES CALIFORNIA COMPARE WITH OTHER STATES?

Other states are also competing for industry R&D investments that support local job creation. Around 35 states currently have their own state-level R&D tax credits, and as the select list of states in **Table 5** shows, these programs have a wide range of characteristics. And though some states with high levels of R&D spending no longer provide R&D tax credits—Michigan's expired in 2012 and Washington's in 2014—others have provisions designed to attract specific industries or types of businesses.

Several states specifically make it easier for small businesses to participate:

- **Connecticut** provides partly refundable credits for businesses with no tax liability and gross income not exceeding $70 million.
- **Maryland** allows small businesses to refund unused tax credits.
- **New Mexico's** R&D tax credit is specifically for small businesses.
- **Delaware** and **Pennsylvania** offer higher tax credit rates for small businesses.

Some states have refundable or transferable credits that provide incentives for businesses not turning a profit:

- **Georgia, New Jersey,** and **Pennsylvania** all have types of transferable credits.
- **North Dakota** allows primary-sector businesses with gross revenues under $750,000 to sell a portion of their tax credits.
- **Arizona, Connecticut, Hawaii, Iowa, Nebraska,** and **Virginia** have partly or fully refundable credits.

Other states have additional provisions or requirements to encourage investment in specific industries or areas:

- **Colorado** requires R&D to take place within designated areas.
- **Kentucky** provides credits for the construction of research facilities and includes only tangible depreciable property.
- **New York** has industry-specific requirements for total investment and number of jobs created.
- **Wisconsin** applies a higher tax credit rate for R&D relating to internal combustion engines, energy-efficient lighting systems, building automation and control, and automotive batteries.

Table 5: Details on Select State-Level R&D Tax Credits

State	Credit Rate	Limit	Carry Forward
California	15% above base amount; 24% of basic research payments	$5 million	n/a
Colorado	3% of increase over prior two years	None	Unlimited
Delaware	Standard: 10% over base amount or 50% of federal tax credit; SME: 20% over base amount or 100% of federal tax credit	50% of federal credit *($5 million cap removed in 2019)*	15 years
Maryland	Basic: 3% under base amount; growth: 10% over base amount	Basic prorated over $5.5 million; growth over $6.5 million	20 years
Massachusetts	10% above base amount; 15% of basic research payments	75% of claim over $25,000	15 years over $25,000
Michigan	Expired in 2012	n/a	n/a
Minnesota	10% up to $2 million; 2.5% above $2 million	None	15 years
New Jersey	10% above base amount; 10% of basic research payments	$15 million (lifetime)	7-15 years
Pennsylvania	Standard: 10%; SME: 20%	Total $55 million ($11 million of total set aside for SME)	15 years
Rhode Island	22.5% up to $111,111; 16.9% above $111,111	None	7 years
Texas	5% above base amount; 3.125% of total if no R&D in one or more of three years	50% of franchise tax	20 years
Washington	Expired in 2014	n/a	n/a

Source: Milken Institute analysis (2021)

POLICY CONSIDERATIONS

As this brief shows, investment in R&D supports the creation of jobs (particularly higher-wage jobs) across a range of industries and occupations in California. However, state leaders must think strategically about how to preserve the state's ability to attract this investment—as well as how to ensure that the benefits of R&D investment reach the widest possible range of state residents. Considering how the recent changes to the R&D tax credit have limited the incentives available for industry actors to offset the local costs of doing business, this is a valuable inflection point for state leaders to consider how policy can help sustain—and expand—industry investments in R&D.

R&D policy requires a long-term outlook. Companies favor a more predictable policy environment. Research activities involve considerable investment, commitment of human and capital resources, time, and risk. Once a company chooses a location for its research activities, it may be locked into that investment for many years.

Other key policy considerations include the following:

- Make clear that recent changes were made in the face of extreme budget uncertainty.
- Establish a forum to discuss long-term innovation planning and R&D investment.
- Convince firms that they can depend on innovation policies to support long-term growth.

Startups face different incentives. Relatively newer firms—including startups at the pre-revenue stage as well as companies that have not yet turned a profit—don't generate income or face a large enough tax bill for the tax credit in its present form to provide a clear incentive for investment in R&D. Some states, such as New Jersey, offer a tradeable R&D tax credit that can help sustain the growth of high-tech companies.

Other options include the following:

- Reintroduce net operating loss provision for the R&D tax credit.
- Make only new tax credits (or a certain portion of total credits) tradeable to limit budget impact.

Small businesses are key job creators. Small businesses create a disproportionate share of new jobs and can be major sources of innovation and entrepreneurship. Some states, such as Maryland, have created programs that specifically encourage

research at small firms by allowing firms with assets below a certain level to receive a refund for any awarded R&D credits that exceed their tax liabilities.

Other options include the following:

- Offer refundable credits for small businesses (with a potential cap on total available credits).
- Make tradeable credits available to small businesses only.

Industry may need incentives to invest in basic research. Basic research conducted in universities can take longer to bear fruit commercially than applied research conducted by the private sector but is still a vital part of the state's innovation ecosystem. Some states, such as Arizona, make firms that fund basic research at a public university eligible for an additional tax credit (in this case, 10 percent). Creating incentives for private-sector actors to invest in basic research conducted at universities not only helps these institutions reduce their marginal research costs but also helps provide job opportunities for local graduates.

California has been—and is likely to remain—a prime location for investment in R&D because of its substantial knowledge assets and a strong public commitment to innovation. However, because the state's high costs of doing business present significant challenges to sustained job creation, policy incentives are key considerations for attracting, retaining, and supporting the expansion of R&D investment by local firms.

The ideas outlined here can help ensure that industry executives and policy leaders acknowledge the value of R&D investments in supporting the creation of high-wage jobs across the Golden State and encourage them to consider more creative approaches for supporting expanded industry commitments to R&D in the future.

ENDNOTES

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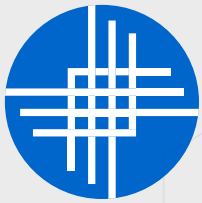
Matt Horton is a director in the Center for Regional Economics and California Center. Over the past 15 years, he has worked to identify best practices related to workforce, infrastructure, and housing development to illustrate the dynamic between governance and investment necessary to sustain resilient economics and promote equitable growth. Currently, at the Milken Institute, Horton has established dedicated programming focused on the dynamics shaping the future of work, not only to address the growing automation trends that are displacing an under-skilled and low paid workforce but also how local, regional, and state leaders can leverage investments in infrastructure that enhance upward mobility through coordinated place-based investments. Previously, Horton worked for the Southern California Association of Governments, the nation's largest metropolitan planning organization. In this capacity, he served as the primary point of contact for external affairs with elected officials as well as subregional, state, and federal stakeholders in Los Angeles and Orange counties, while helping leaders in Southern California overall develop plans to address growth and improve quality of life through infrastructure planning and development. Horton also currently sits on the Advisory Board of WorkingNation, Lift to Rise, and the Infrastructure Funding Alliance.



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