2016 STATE TECHNOLOGY AND SCIENCE INDEX: CALIFORNIA PERSPECTIVES

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MILKEN INSTITUTE

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The Milken Institute is a nonprofit, nonpartisan think tank determined to increase global prosperity by advancing collaborative solutions that widen access to capital, create jobs, and improve health. We do this through independent, data-driven research, action-oriented meetings, and meaningful policy initiatives.

1. Introduction

The Milken Institute's State Technology and Science Index (STSI) series benchmarks states on their science and technology capacity. It also assesses states' broader ecosystems for innovation, development, and commercialization that translate into companies, high-value jobs, and overall economic vitality. California, home to Silicon Valley, has long been a leader in this space, and on the 2016 STSI it ranks fourth. Science-and-technology-related sectors are key pillars of the California economy, and it is most useful to compare the state with other similarly focused state economies. This avoids comparing mature tech hubs with states experiencing rapid growth from a low base, recognizing that different strategies and policy levers are available in these different situations. To this end, we used a cluster analysis on our 2016 STSI results to understand which states are most like California, and in this paper we explore areas where California must focus attention in order to maintain or improve its position, highlighting lessons from peer states where available.

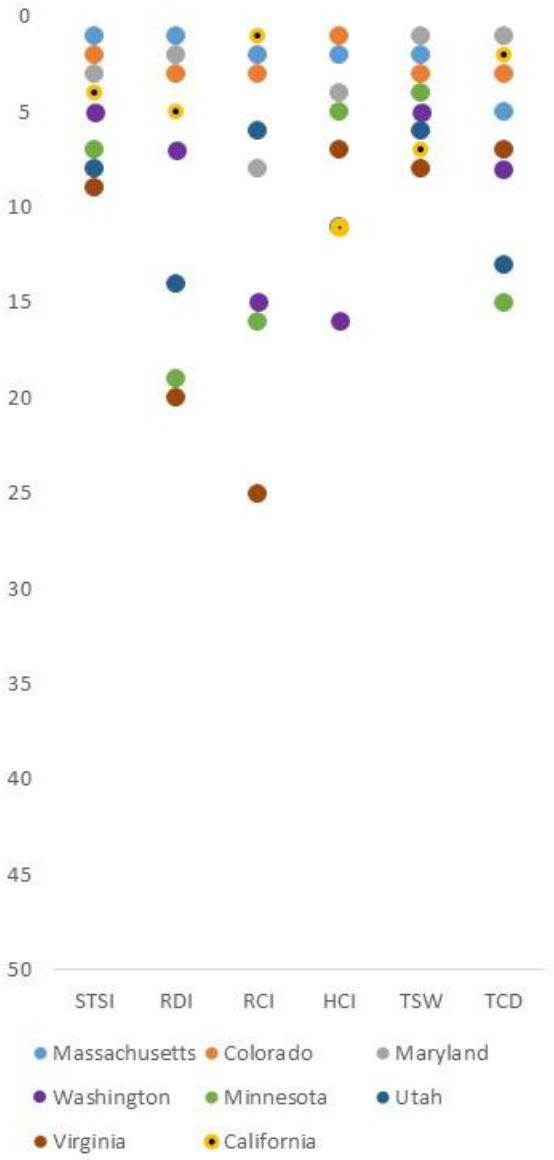

Figure 1. State Technology and Science Index 2016: California and peer state rankings

Based on our analysis of the data collected for the STSI 2016, California's peer states were Colorado, Maryland, Massachusetts, Minnesota, Utah, Virginia, and Washington. Unsurprisingly, these states joined California in the top 10 of the overall STSI, but Connecticut (ranked sixth) and Delaware (ranked 10th) were grouped with different states. (See the appendix for a complete list of groupings.) The rankings of the eight states in the group including California for the 2016 STSI and its composite indexes can be seen in Figure 1. While the overall results and the technology and science workforce (TSW) composite index are closely aligned, there is more variation in the rankings for the research and development inputs (RDI), risk capital and entrepreneurial infrastructure (RCI), human capital investment (HCI), and technology concentration and dynamism (TCD) composite indexes.

California's top-tier status in the science and technology sphere is bulwarked by the sector's concentration and dynamism. For California to remain on the leading edge, it must maintain existing platforms that allow people to improve their economic conditions. More importantly, it must build new and more inclusive platforms that can benefit a larger share of the population. California's higher education system has recently undergone changes, with the community college system offering four-year degrees with much lower tuition costs than the traditional four-year institutions in the state. While

these programs were designed to avoid duplicating existing programs, thereby reducing any competitive pressure on either cost or curriculum, they could serve as a useful alternative model and provide more room for innovative approaches if successful. As in many other states, declines in direct funding for California's higher education system have created a number of difficult trade-offs—for example, between admitting more lucrative overseas students and educating residents and between investing in equipment needed for science, technology, engineering, and mathematics (STEM) courses and serving the largest number of students.

California leads the nation in the entrepreneurial environment, ranking first on the risk capital and entrepreneurial infrastructure index this year. Private industry's ability to provide capital access for science and technology still works in tandem with the government to provide a solid base for commercialization. Companies in California have been able to move through the funding phases of the Small Business Innovation Research (SBIR) program better than any other state. By combining this with superior access to private-sector capital, California has been able to put the massive amounts of money spent on research and development from all sources to economic use. The development of new technologies that disrupt the science and technology landscape repeatedly upend the process and allow for growth. This creates a need to retain talent flexible enough to adapt to every new phase of innovation. By investing in career technical education (CTE), community colleges, and higher education, California can address its skills gap and create a workforce that is much better equipped to retool and remain relevant in a sector whose greatest strength is change.

For California to have a science and technology industry that continues to thrive, both public and private interests must understand the strengths and flaws in the sector. The high-tech sector, like the overall economy, functions in tandem with every stage of development and needs similar support from all participants.

2. Research and Development Inputs

The Research and Development Inputs composite index examines the early stages of innovation—the generation of new knowledge through research and development. California ranks fifth in the nation and fourth among its peer states. On a per-capita basis, the Golden State ranks below most of its peers on federal R&D spending and academic R&D spending, but it outperforms all but two states on industry R&D spending. The latter—with its stronger ties to commercial value—is weighted more heavily in our STSI analysis and is a clear strength in California.

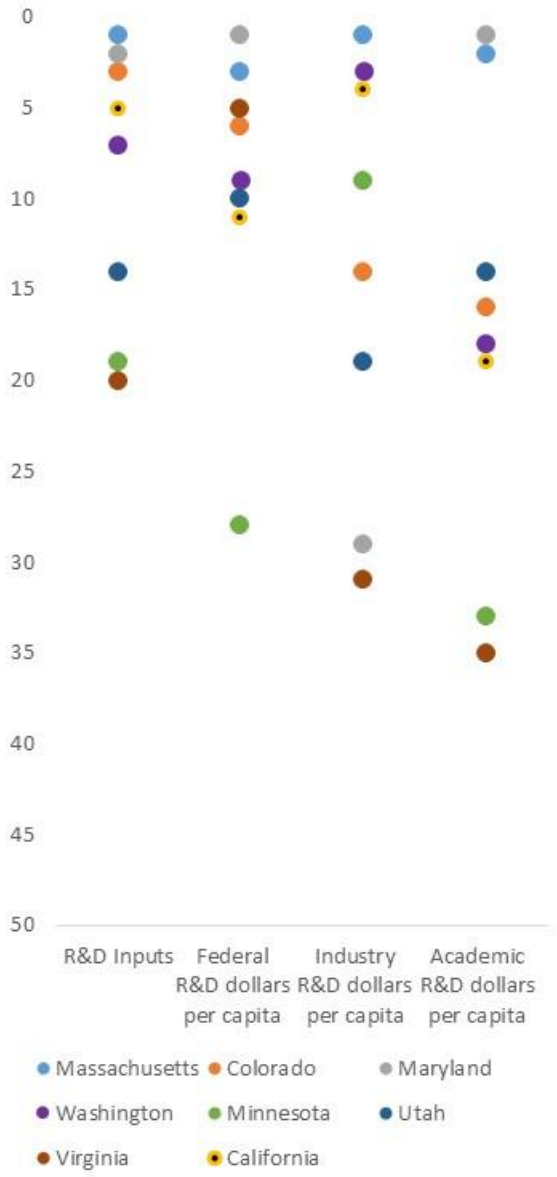

Figure 2. Research and Development Inputs 2016: California and peer state rankings

Recognizing the importance of industry R&D to regional economies across the state, DeVol et al. (2015) estimated and mapped regional research intensity using business location level data to apportion National Science Foundation industry R&D spending data.[1] As Figure 3 shows, industry R&D is geographically distributed well beyond Silicon Valley and represents a sizable contribution to California's metropolitan economies.

California's research tax credit, which supplements the U.S. R&D credit, lowers the cost of incremental research spending by firms in California. This intervention in the market is motivated by a desire to increase private investment in R&D to the social optimum, since the social benefit of innovation and R&D is considered larger than the benefit that accrues to the individual company. Bloom et al. (2013) find that the knowledge spillovers resulting from R&D mean that the "gross social returns to R&D are at least twice as high as the private returns."[2] Following California's lead, some other states have also increased their R&D tax credits to attract and incentivize industrial R&D investments. While some of this additional activity stems from displacement from other states, some might be attracted to the U.S. from other countries, or the incentives might simply make an investment attractive that otherwise would not have been viable. Given its proven ability to attract world-class firms and talent to its innovation hubs, California is a strong contender for these investments, but its overall business climate and high cost of living can be an impediment and lead firms to look elsewhere. To remain competitive, California must stay ahead of the pack, nationally and internationally, by improving the business climate (through regulatory reform), addressing cost issues (by building more housing, for example), and ensuring that the California research credit is competitive with peer states and nations.

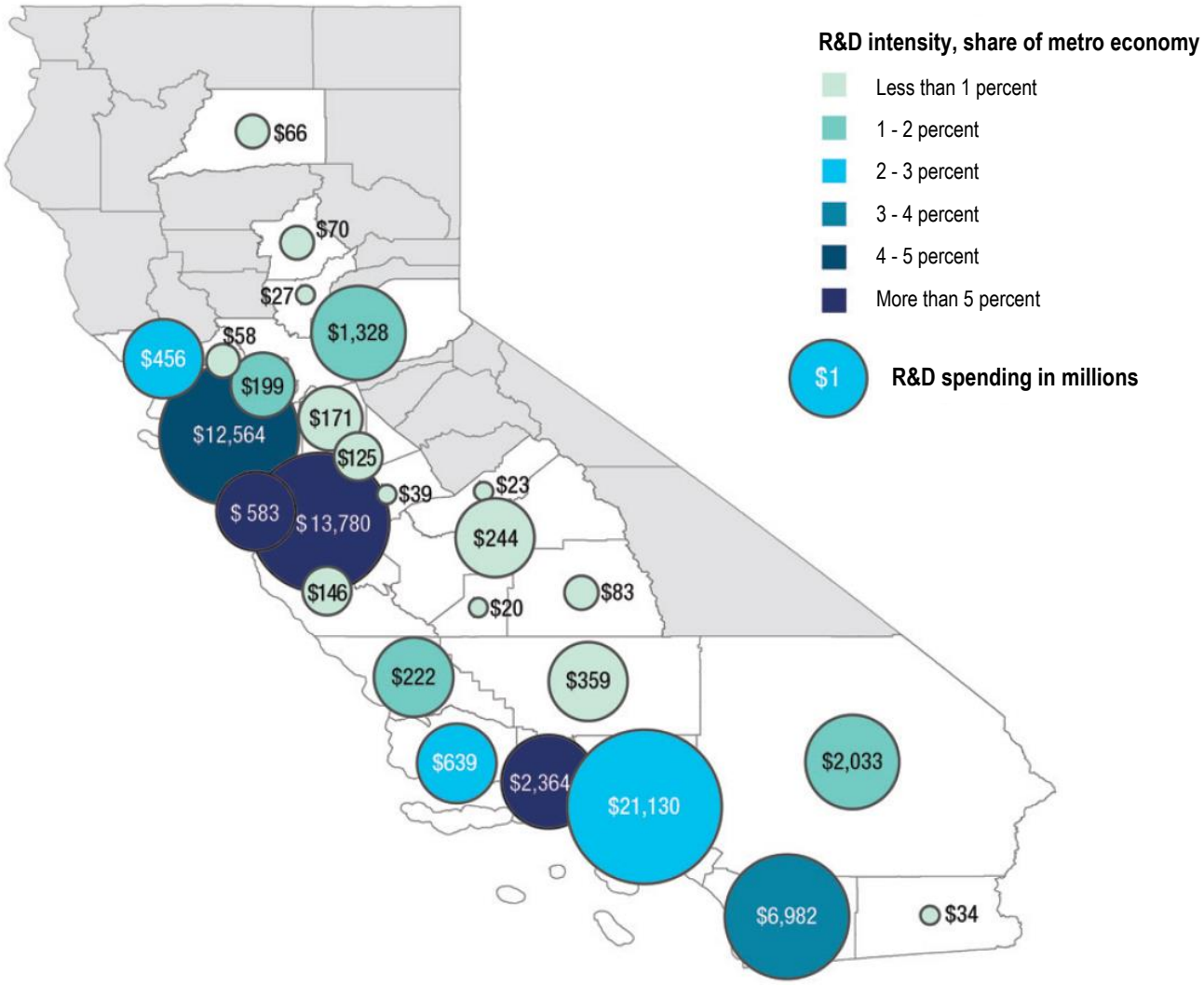

Figure 3. R&D spending and intensity in California metropolitan statistical areas
Source: Milken Institute (2015), "California's Innovation-Based Economy: Policies to Maintain and Expand It"

At 11th overall, California lags its peers on per-capita federal funding for R&D in California, with only Minnesota ranking lower. While some of its peer states benefit from their proximity to Washington, D.C., this is not true for Colorado, for example, which attracted just under $270 more per capita than California.[3] Unlike California and Washington, Colorado received more funding from the National Science Foundation (NSF) than the National Institutes of Health (NIH). The funding from the NSF includes funds for the management and operation of the National Center for Atmospheric Research, which has four locations in Colorado.

Strong research institutions in California attract significant academic R&D funding to the state and fuel fundamental research that generates the basis for future innovation in products and processes. These institutions can also act as beacons for high-tech businesses and skilled workers, helping to create a knowledge economy more robust than could be created through tech transfer out of universities alone. Despite the many world-class research institutions in the University of California system and at private

institutions like the California Institute of Technology (Caltech) and Stanford University, California ranks only 19th for academic R&D dollars per capita, spending slightly over the national average. In fiscal year 2015, the University of Washington (UW) attracted more funding from both the NSF[4] and NIH[5] than the University of California, Los Angeles, for example, despite having similar enrollment. However, California saw many other institutions successfully attracting substantial funding from both agencies, including the University of California, Berkeley and the University of California, San Francisco.

One policy that could help channel more funding to academic R&D would be increasing the California research tax credit for qualifying institutions funding university research. Currently set at 24 percent of a private firm's incremental spending on qualifying academic research, the credit, if set at a higher percentage, could help leverage more private-sector funding for research. As many California businesses invest in R&D to keep ahead of competitors in fast-changing industries, their increased involvement in funding basic research could also help direct more research funding toward ideas that are perceived to have market value.

Continuing to monitor the competitive landscape with regard to R&D tax credits, improving the tax and regulatory climate, and addressing the high cost of living and doing business in coastal California are also key to the state's future.

3. Growth Measures from Technology Concentration and Dynamism and Risk Capital and Entrepreneurial Infrastructure

California has been a center for innovation and technology for decades, with large sections of the state's growth heavily dependent on being the latest and greatest. The 2016 State Technology and Science Index's Risk Capital and Entrepreneurial Infrastructure index ranks California at No. 1. The early days of explosive growth have given way to steady lower growth. California's science and technology industries are based on life sciences, advanced engineering, and information technology. The financing and commercialization of new concepts is an area in which California excels. As the effects of the Great Recession recede, we must look at how the dynamic of public versus private interests has shaped today's high-tech sectors.

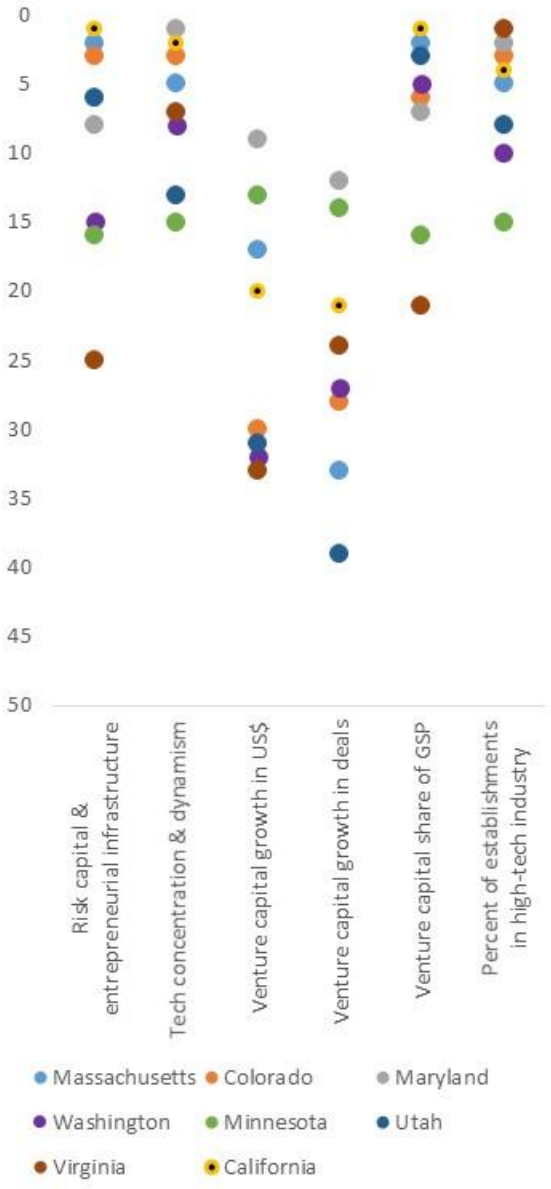

Figure 4. Risk Capital and Entrepreneurial Infrastructure and Technology Concentration and Dynamism: California and peer state rankings

The State Technology and Science Index offers insight into states' relative economic performance in the high-tech sector. In bad economic conditions, the high-tech sectors in California, Colorado, Maryland, and Virginia were able to withstand downward pressures more effectively than their peers. Colorado scores well in the risk capital indicators, and what the state lacks on the private-sector side is supplemented by funding from the public sector. The same can be said about Maryland and Virginia, but in a much more lopsided way. Colorado has developed a high-tech sector in a mold similar to California's, based on public support for private investment. This can be seen in the differences between the stock and the growth measures of the four states. Maryland and Virginia see higher rates of growth in venture capital (VC) as the stock measures are at lower levels. Colorado looks much more like a state still growing its high-tech sector but taking a path similar to California's. The two funding models are distinguished by how heavily they rely on public or private funding sources, and represent approaches that favor stability or adaptability.

California's high-tech economy has become much more diverse because of the state's funding sources. Of the four states examined, California has by far the largest section of its economy involved in the finance sector, which represents 9.5 percent of real gross state product (GSP). California's established and growing high-tech sector has benefited from the expert knowledge from the finance industry in the

state, manifesting in VC investment equivalent to 0.30 percent of GSP. From 2008 to 2012, the average annual growth of VC in the state has been 7.1 percent. Given that California is the largest market for VC funding in the country, this growth indicates a robust industry that is able to weather economic headwinds. Maryland and Virginia have 1.6 percent and 1.8 percent of their GSP generated by the financial sector, respectively. The scale of VC activity in these states is commensurately smaller; in Maryland it is equivalent to 0.06 percent of GSP and in Virginia it is equivalent to 0.02 percent of GSP. These measures show that from the perspective of private-sector participation in the high-tech sector, Maryland and Virginia would be lagging in their ability to have a dynamic high-tech sector. However, when we look at the percent of business in the high-tech sector, we see Virginia at 8.7 percent and Maryland at 8.0 percent, representing the two highest concentrations in the nation. The leadership in the concentration of high-tech businesses of these states is driven by their proximity to Washington, D.C.

Maryland and Virginia's economic stability comes in part from their engagement with the federal government. The outcome is a concentration of funding based on the federal government's needs. This has crowded out funding from the private sector that is forward-looking rather than a reaction to government needs. This is explicit in the types of policies that Maryland and Virginia have adopted. Maryland supports cyber security through tax breaks and Virginia offers tax breaks for increasing high-tech employment. Maryland has been in the top five states in the State Technology and Science Index since 2002. Virginia similarly has been in the top 10 since 2002. The stability that these two states' natural advantage brings comes at the price of innovation and diversification. The diversification of California's high-tech sector can be seen where concentrations of major high-tech industries are located. Prime examples of this are NASA's Jet Propulsion Laboratory just north of Los Angeles and SpaceX's choice to locate in Hawthorne. The natural consequence is that Maryland and Virginia are being outperformed by other states in the crucial area of commercialization.

Colorado's tech sector has been supported by a venture capital network that is equivalent to 0.06 percent of GSP despite having a financial sector that makes up only 1.4 percent of GSP. Colorado's venture capital market has grown by 19 percent since 2008, showing that Colorado is competing in the tech sector against established high-tech clusters. This is reinforced when looking at SBIR funds—Colorado receives 4.3 awards per 100,000 people, more than either Virginia or Maryland. In the process of commercialization, Colorado also is competitive with Maryland and Virginia by getting businesses through the different phases of the SBIR program. It is a state that has growing private-sector high-tech financing and is able to fill in the gaps with public-sector support that focuses on private-sector involvement.

As Colorado grows and its tech sector matures, we will see a hub of innovation that will be increasingly dynamic, while Maryland and Virginia have less of a culture of entrepreneurship and remain more reactive. We see this in the target industries chosen, with Maryland focusing on cyber security and Virginia on data centers. The pathway that Colorado is developing will be able to create proactive changes. Colorado has been able to generate 68 patents per 100,000 people, where Virginia and Maryland combined have 61 patents per 100,000 people. The level of innovation that takes place in a state is all well and good, but without opportunity, innovation may not provide a return. California excels in the commercialization of concepts, which is a fundamental part of innovation. California's ability to commercialize ideas is something Colorado is well on its way to replicating.

California's innovation pipeline has hinged on opportunity and willingness to take risks. The diversification and robustness of the high-tech clusters have given California the ability to lead not just the nation but the world in the broader high-tech sector. Its financial sector has generated expert knowledge for the high-tech sector to benefit from. Private equity, venture capital, IPOs, and other financial activity knowledge have successfully transferred to the high-tech sector. The risk capital and entrepreneurial infrastructure that California has developed allows the high-tech sector to maintain diversification and remain proactive.

The development of an infrastructure that supports risk and is fueled by creative destruction is what gives sectors the ability to be forward-looking. The path leading there is not always the same. There are ways to foster the necessary knowledge transfer and opportunities. The increase in growth opportunities draws in venture capital and higher-risk investors. There are public programs that can define these routes and provide options to support this development. The SBIR program and the Small Business Investment Companies (SBIC) program of the Small Business Administration (SBA) are options for developing the necessary risk capitalization infrastructure. SBIR provides seed funding through various governmental agencies that focus on developing new technologies. One of the important aspects of this program is the support of private-sector development. The grants provided by the SBA give entrepreneurs valuable experience dealing with finance. Support for entrepreneurs needs to exist at all phases of the SBIR process to facilitate commercialization. This program can also drive industry diversification because it is a platform for people without other means or opportunity. The other side is SBIC. This provides two alternatives allowing for the risk capitalization infrastructure to develop. One gives people the chance to develop direct investing experience. This not only develops expertise in funding higher-risk businesses but provides transferable skills to other funding sources in the high-tech sector. The second provides capital to entrepreneurs who are seeking funding through the development of financing expertise and allowing entrepreneurs space in which to operate. The need for capital support for the high-tech sector allows opportunity and growth to occur. States that wish to develop a high-tech sector need to develop a dynamic risk capital and entrepreneurial infrastructure for ideas to be commercialized. Together these programs represent important support from the government for science and technology.

California's ability to commercialize innovation has been supported by knowledge transfers from other sectors. Developing the platform from which entrepreneurial activity can operate is something that takes a combination of knowledge, time, and willingness to take risks. To promote development of expert knowledge, states should focus on programs that directly promote the entrepreneurial and financial skills needed in the tech sector. SBICs create this platform for all parties involved to gain experience financing science and technology ventures. SBIR funds allow for commercialization of innovation through phased funding, creating incentives for entrepreneurs to develop financial acuity. Both can contribute to entrepreneurs becoming more financially savvy and financiers gaining expert knowledge of the high-tech sector. The use of public programs to support these activities can provide the platform for the private sector to take over.

4. Higher Education Degrees in Science, Engineering, and Health

California is host to one of the best higher education systems in the United States. Home to six of the top 10 public universities in the nation,[6] the state boasts top 15 rankings in overall Ph.D.s (11th), higher education appropriations (ninth), and percent of residents with advanced degrees (14th) in this year's STSI update. And while there is much to be proud of regarding the state's university system, there is still significant room for improvement.

California has seen some of the highest tuition increases in the country over the last eight years.[7] And while the impact of those increases are mitigated by a significant amount of student aid, resulting in one of the lowest family-share percentages of tuition costs in the country,[8] those costs are passed on to the California taxpayer. Proposition 30, which imposed a tax on wealthy state residents to increase education funding, has succeeded somewhat in stemming the tide of tuition increases, but there are only so many tax increases Californians can accept.

Unfortunately, when it comes to producing degrees necessary to fill the jobs of the future, California is lagging behind peer states. States such as Maryland and Massachusetts are longtime mainstays of (STEM) degree production through top-tier universities, including MIT and Johns Hopkins. New risers, like Colorado and Utah, benefit from government-funded projects such as the National Center for Atmospheric Research.

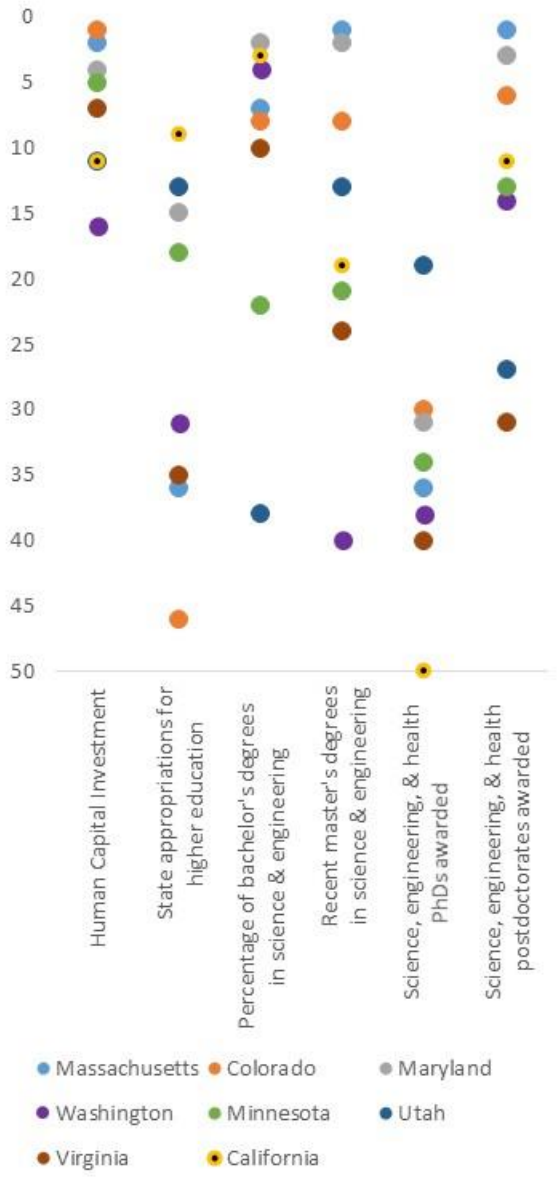

Figure 5. Human Capital Investment 2016: California and peer state rankings

California must adjust to the new technological world in which it finds itself through ground-up reforms in its education system. By adding requirements to K-12 education, policymakers can guarantee exposure to STEM concepts and ideas and help identify students who show an interest from a young age. Similar training programs should be available for K-12 teachers to ensure maximum use of technology in the classroom. These reforms will funnel more students into STEM degree programs in the state's higher education institutions.

Preliminary results of a report designed to study the likelihood of a child whose early educational experience includes STEM experiences to go on to study STEM majors indicate that research and mentorship programs designed to teach K-12 students about the importance of technology increase the

chances of those students attaining a postsecondary degree in science or engineering and moving on to similar specialties in postgraduate work.

While California has a high ranking in science and engineering bachelor's degrees (third), it does struggle in some respects against some peer states in postgraduate work. This may be due in large part to rising tuitions in California.

The implementation of Prop. 30 was not without controversy. But its passage was generally credited for a tuition freeze in the University of California system shortly after the proposition's passage. However, even with Prop. 30 in place, California still ranks 42nd in state appropriations for higher education per capita, far below peer states. An extension of Prop. 30 is slated for the November 2016 ballot.[9]

In addition, STEM-specific tuition assistance programs like the Commonwealth Covenant Fund, which provides scholarship opportunities for students in Massachusetts who stay to complete postgraduate work in a STEM field,[10] are worth examining for application in California. Gov. Andrew Cuomo of New York announced a similar performance-based scholarship for STEM students that offers free tuition at the State University of New York or the City University of New York.[11]

While these recommendations speak to an increase in the overall production of science, engineering, and health (SEH) degrees in the state's university system, this is only the first part of the problem. A large percentage of STEM degree students at California universities are from other countries. Once they complete their programs, many of these students return to their home countries rather than seeking employment in the United States. In fact, according to a Kauffman Foundation study, less than half of all foreign-born STEM students in the U.S. planned to stay in the States after they graduated. The rest either intended to leave or were unsure of their plans.[12] While many of these issues can be addressed at the national immigration level, programs must be developed at the state level to engage these students with job opportunity counseling in order to encourage them to remain in the state after graduating from California schools.

There is also an inexorable link between a state's workforce development and its business climate. Peer states such as Virginia and Washington consistently outperform California in indexes that rank the business friendliness of states, with varying factors like tax structure, access to capital, and regulatory environment the primary considerations. California's failure to address these flaws, despite years of high-income population decline and increasing burdens to new business, has had a negative impact on the state's ability to meet the needs of the tech jobs that are being created. The shift in the state's economy from manufacturing to technology and services has created a skills gap that has yet to be addressed. The result is a workforce that is unprepared to fill the job openings of tomorrow.

5. Technology and Science Workforce

The skills and expertise of a state's workforce are critical to its ability to support science-and-technology-related industries. This year, California and its peer states occupy the top eight spots on the composite index that captures performance in this area. On the overall Technology and Science Workforce index, California ranks seventh, but despite the tech leadership of the San Jose and San Francisco regions, the Golden State as a whole places only 13th on the computer and mathematics workforce intensity measures. California ranks 15th in intensity of engineering-related occupations, but it performs better relative to its peers on the life sciences workforce intensity measure, ranking sixth.

In our 2016 State Technology and Science Index, we expanded the list of science-and-technology-related occupations to include more technical occupations that did not require an advanced degree.[13] This more inclusive definition, reflecting the increasing involvement in the knowledge economy of workers of varying academic qualifications, contributed to California's lower rank—and highlights an area where the state can make improvements.

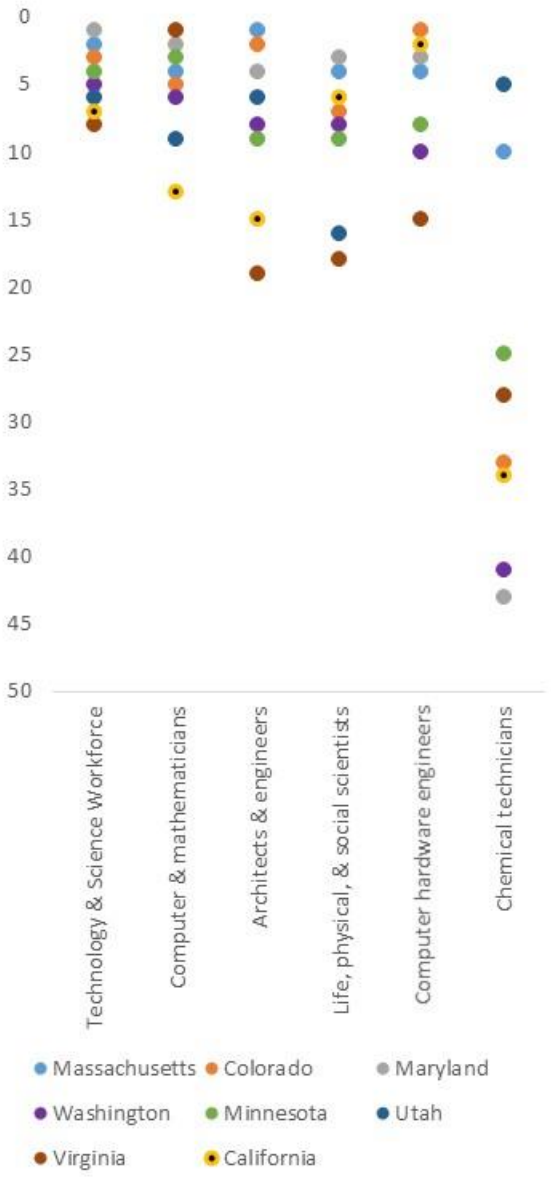

Figure 6. Technology and Science Workforce 2016: California and peer state rankings

Projections based on current trends suggest that by 2030, 65 percent of job openings in California will require more than a high school diploma, and just under half of those positions (30 percent of the total) will require postsecondary education but less than a four-year degree.[14] These middle-skills jobs could help provide well-paying jobs to Californians who are currently missing out on the direct benefits of the technology boom in the San Francisco Bay Area. In order to make these jobs accessible, California needs to invest in its career technical education (CTE) programs at its community colleges. When developed in partnership with regional industries to align curriculum and facilitate hiring, CTE can provide the career pathways that can guide Californians of all backgrounds to acquire the skills, credentials, and certifications they need to join the science and technology workforce. Employers clearly value CTE credentials; the premium for workers with CTE credentials over those with a high school diploma or less has increased,[15] and five years after completion, the earnings gap between general education associate degrees and CTE associate degrees indicates a more than 70 percent annual earnings premium for CTE degrees.[16]

The Technology and Science Workforce index now evaluates each state's relative concentration in 47 occupations. California fares particularly well in concentration of computer hardware engineers (second in the nation) and microbiologists (third-highest), and it ranks fourth in both medical scientists (excluding epidemiologists) and geoscientists (excluding hydrologists and geographers). These are all occupations where 70 to 100 percent of workers have at least a four-year degree.[17] Conversely, California compares poorly with its peers in concentration of chemical technicians, an occupation where 50 percent of workers have an associate degree;[18] it ranks 34th while Utah ranks fifth. To build on its chemical and pharmaceutical manufacturing industry, California would need to train more chemical technicians.

California is not alone in facing these challenges. In Massachusetts, concerns that retirements in the manufacturing industry in the next 10 years will create thousands of openings for which workers are not yet trained[19] spurred an initiative to change the funding formula for vocational training at community colleges.[20] Currently, thousands of students are on waiting lists for vocational courses, and supporters of a change argue that the current funding model underestimates the cost of providing vocational education and has exacerbated shortages. If the proposed funding increases are implemented in Massachusetts, California will face the risk of losing ground if it does not make the necessary changes to its own CTE funding program.

California already has many of the pieces in place to foster a more robust and sustainable CTE system, and recent work by the California Community Colleges Board of Governors will lead to meaningful improvements and updates. To deliver on the promise outlined in the recommendations, the funding mechanism for CTE needs to be changed to reflect the higher costs and benefits associated with these courses, and models for attracting more industry dollars either through tuition assistance or capital investments should be explored.

6. Conclusion

California has a robust high-tech economy, and its private sector is a major contributor to the state's success, as captured in the State Technology and Science Index 2016. The public sector also has an important role to play, facilitating the innovation, investment, and expansion of science-and-technology-related industries. One of the most essential contributions to the ongoing health of this sector is the training and education of the future researchers, entrepreneurs, and employees needed to translate new ideas into economic prosperity. Below are recommendations that can guide California in its endeavor to remain on the cutting edge.

Maintain the state's competitive position in **Research and Development Inputs** and its **Technology Concentration and Dynamism** by improving the business climate and addressing cost issues that affect the industries that invest in R&D and their employees. Policies that could supplement this include:

- Channeling more funding to academic R&D by increasing the California research tax credit for qualifying institutions funding university research
- Ensuring that the California research credit is competitive with peer states and nations in size and scope
- Providing support for businesses and entrepreneurs to obtain funding before and after all phases of the SBIR process to promote commercialization

Diversify California's robust foundation of **Risk Capital and Entrepreneurial Infrastructure** by facilitating the development of expert knowledge of financing small businesses by:

- Developing SBICs that provide funding for entrepreneurs directed by private-sector investors

Focus on **Human Capital Investment** by increasing the output of college and postgraduate students with higher education degrees in science, engineering, and health. This can be achieved through:

- Implementing programs to supplement tuition assistance for STEM students
- Engaging international students prior to graduation to help them find jobs in the state
- Addressing the state's burdensome tax and regulatory climate and facilitate job skills training programs that are more reflective of the state's tech-centric industries

Improve California's **Technology and Science Workforce** by strengthening its CTE programs. Specific changes to consider include:

- Altering the funding mechanism for CTE to reflect the higher costs and benefits associated with these courses
- Exploring models for attracting more industry dollars either through tuition assistance or capital investments to CTE in California

7. Appendix

Cluster Analysis Methodology

The grouping technique used for this white paper is a hierarchical cluster analysis. This is the preferred cluster analysis for smaller sample sizes. This analysis aims to assign the 50 states into groups that display similar characteristics. We performed this analysis using the data from the 2014 and 2016 State Technology and Science Indices. The 2016 data was used to determine the appropriate number of groups into which to categorize the 2014 data.[21] This led us to use six groups. The group with California has only one new entrant, no exits, and California remained in the same group. This paper is focused on California, and the new entrant's movement only adds to the list of states from which we draw comparisons.

For this analysis, we have used the ranks from the Research and Development, Risk Capital and Entrepreneurial Infrastructure, Human Capital and Technological Concentration and Dynamism indexes. We have also used the subcomposite Technology and Science Workforce indexes. Aside from the ranks, we also used the associated scores for each of the composites mentioned. We have categorized the groups based on the averages of the ranks and score for each of the five groups over the two years to maintain the consistency of each cluster. For a more a technical look at this methodology, please see Sagynbekov and Lin (2016).

Cluster analysis results: State group assignments

States	2016 STSI rank
California	4
Colorado	2
Maryland	3
Massachusetts	1
Minnesota	7
Utah	8
Virginia	9
Washington	5

States	2016 STSI rank
Connecticut	6
Delaware	10
Illinois	16
New Hampshire	11
New Jersey	17
New York	20
North Carolina	12
Oregon	13
Rhode Island	15

States	2016 STSI rank
Arizona	23
Florida	41
Georgia	24
Kansas	31
Missouri	28
Nebraska	25
Texas	19
Vermont	26
Wisconsin	22

States	2016 STSI rank
Alaska	33
Hawaii	39
Idaho	32
Iowa	35
Montana	34
North Dakota	29
South Dakota	38
Wyoming	36

States	2016 STSI rank
Alabama	37
Indiana	30
Michigan	18
New Mexico	21
Ohio	27
Pennsylvania	14

States	2016 STSI rank
Arkansas	49
Kentucky	47
Louisiana	46
Maine	42
Mississippi	48
Nevada	45
Oklahoma	44
South Carolina	43
Tennessee	40
West Virginia	50

Data Sources

State Population, Bureau of Labor Statistics, Milken Institute, U.S. Census Bureau

Financial sector as a percent of GSP, Moody's Economy.com; Milken Institute

Venture capital as a percent of GSP, PricewaterhouseCoopers/National Venture Capital Association MoneyTree Report; Milken Institute

Venture capital growth, PricewaterhouseCoopers/National Venture Capital Association MoneyTree Report; Milken Institute

State Technology and Science Index, Milken Institute

Patents per 100,000 people, U.S. Patent and Trademark Office; Milken Institute

Number of high-tech business establishments, County Business Patterns; Milken Institute

Gross state product, Bureau of Economic Analysis

8. About the Authors

Jason Barrett is a senior public policy analyst at the Milken Institute. He monitors political activity in Sacramento and Washington, D.C., and analyzes its effects on economic, financial, and regulatory policies. Barrett seeks to provide decision-makers and Institute stakeholders with key information regarding relevant legislation and policies at the city, state, and national levels. Recent projects focus on identifying practices that could help California improve competitiveness and attract businesses, such as expanded access to government information through statewide open-data policies. Previously, Barrett worked for Congressional Quarterly, an organization that analyzes the latest legislative activity in Washington. He also worked in the Capitol Hill office of U.S. Sen. Bill Nelson. Barrett received a bachelor's degree in corporate communications and political science from Elon University and a master's degree in legislative affairs from The George Washington University.

Joe Lee is a research analyst with the Milken Institute on the regional economics team. He specializes in labor economics with a focus on human capital and economic development. Before joining the Institute, he was a lab instructor at California State University, Long Beach (CSULB) for its Department of Economics and was a part of Amazon's supply chain execution team in Seattle. Lee graduated from the Evergreen State College with a dual major in economics and finance, minoring in mathematics, and received his master's degree in economics from CSULB.

Minoli Ratnatunga is an economist and associate director of research at the Milken Institute and leads the Institute's regional economics research. With her team, she investigates the key economic development issues facing regions, including competitiveness, fostering innovation and entrepreneurship, and building human capital. Her publications include "California's Innovation-Based Economy: Policies to Maintain and Enhance It," "State Technology and Science Index 2016," "Regional Performance Over Time: Thriving and Reviving Amid Economic Challenges," and the "Best-Performing Cities" series. Before joining the Institute, she worked for eight years at the Allegheny Conference on Community Development, a regional economic development organization focused on improving the competitiveness of and quality of life in the Pittsburgh region. There Ratnatunga focused her research on energy policy, transportation and infrastructure funding, and state tax competitiveness, working with civic and business leaders to help key decision-makers make better policy choices. She also led the economic impact study practice, managing the production of research reports that captured the importance of strategic industries and projects to the Pennsylvania economy. Ratnatunga has a bachelor's degree in philosophy and economics from the London School of Economics and a master's degree in public policy and management from Carnegie Mellon University.

Endnotes

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