ECONOMIC MOBILITY, WORKFORCE, AND INEQUALITY IN CALIFORNIA

PRODUCTIVITY AND POLARIZATION

WORKING PAPER:
An In-Depth Analysis of the Facts, Origins and Trends of Economic Mobility, Workforce, and Inequality in California

CALIFORNIA
VISION & STRATEGY FOR THE NEXT CENTURY
ABOUT CALIFORNIA 100

The California 100 Initiative envisions a future that is innovative, sustainable, and equitable for all. Our mission is to strengthen California’s ability to collectively solve problems and shape our long-term future over the next 100 years.

California 100 is organized around 15 policy domains and driven by interrelated stages of work: research, policy innovation and engagement with Californians. California 100’s work is guided by an expert and intergenerational Commission. Through various projects and activities, California 100 seeks to move California towards an aspirational vision—changing policies and practices, attitudes and mindsets, to inspire a more vibrant future.

This California 100 Report on Policies and Future Scenarios was produced as part of California 100’s research stream of work, in partnership with 20 research institutions across the state. California 100 sponsored grants for data-driven and future-oriented research focused on understanding today and planning for tomorrow. This research, anchored in California 100’s 15 core policy domains, forms the foundation for the initiative’s subsequent work by considering how California has gotten to where it is and by exploring scenarios and policy alternatives for what California can become over the next 100 years.

The California 100 initiative is incubated through the University of California and Stanford.

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For additional background information, read the related Facts-Origins-Trends report at California100.org. The Facts-Origins-Trends report contains all of the references and citations to support the content of this report.

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THE FUTURE OF ECONOMIC MOBILITY, WORKFORCE, AND INEQUALITY

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FOREWORD

“As California Goes, So Goes the Nation, Alas.” That was a headline from a Los Angeles Times opinion column on April 30, 1989, which noted that, even though “Californians have long considered their state the cutting edge of social and political change... [it] no longer seems the vanguard of political innovation. Other states rarely look to California for policy initiatives.”

Fast-forward to 2022, and few would proclaim that California lacks in policy innovation. Quite the contrary. The state has enacted a variety of policies ranging from expansions in immigrant rights and voting rights to health care and higher education, and from large-scale experiments in guaranteed income to ambitious moves towards net-zero emissions in a variety of sectors. And despite the periodic waves of “doom and gloom” reporting about the state, California’s economic output over the last 25 years has grown faster than the national average, and on par with GDP growth for the state of Texas.

Even so, much remains to be done. The California Dream has always been marred by a high degree of racial exclusion, and it remains out of reach for millions in the state—whether measured by health outcomes, unaffordable housing, or massive disparities in income and wealth. California also recognizes that future progress depends on recognizing and correcting historical wrongs. Its Truth and Healing Council, for example, will provide recommendations aimed at prevention, restoration, and reparation involving California Native Americans and the State. If California’s racial diversity represents America’s demographic reality by 2100, our work is essential—not only for the long-term success of the state, but also for our country’s innovative and equitable future.

This future-focused work is especially pressing today. The COVID-19 pandemic has scrambled a state and nation already undergoing significant changes in economics, politics, and society. The harmful consequences of climate change are at our doorstep,
with forest fires and droughts that grow in frequency and intensity each year. The weakening of local media and the growth of disinformation threaten both our civic health and our public health. And staggering inequities in income and wealth, home-ownership and health, threaten the state’s reputation as a haven for migrants, domestic and international alike.

In addition to immediate threats that affect our long-term future, we also see plenty of opportunity. Record increases in federal and state spending mean that billions of additional dollars are flowing to state, local, and tribal governments in California. Many jurisdictions are looking to invest in infrastructure that meets the long-term needs of their communities. Philanthropic institutions and individual donors are also looking to make transformative investments that have enduring impact. We have an opportunity to inform and enrich all of these plans and conversations.

Most institutions and organizations in California are focused on immediate challenges, and don’t have the luxury of time, dedicated talent, and resources to focus on long-term futures. California 100 is grateful for the opportunity to provide added value at this critical time, with actionable research, demonstration projects, and compelling scenarios that help Californians—government agencies, stakeholder groups, and residents alike—to envision, strategize, and act collectively to build a more innovative and equitable future.

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Introduction: California is Productive, But Polarized

Residents and policymakers in California often cite an intriguing fact when discussing the state’s economy: California, if ranked as a nation, has the fifth largest economy in the world (U.S. BEA 2020), perhaps even larger when considering non-GDP metrics such as consumer surplus. What’s more, California’s culture of innovation and productivity places it in a position of economic leadership and influence in the United States. Startups in the Bay Area and beyond design and deploy cutting-edge technologies that take hold all around the world; the state’s agricultural valleys produce over half of the country’s vegetables, fruits, and nuts (Committee on Natural Resources 2014) and 13 percent of the nation’s cash farm receipts (CDFA 2020); domestic and international tourists drive a $145 billion travel industry (California Office of Tourism 2019); and the state is home to the two largest ports in North America (Morley 2019).

The size and stability of these industries places California among the largest contributors to the U.S. economy, teaming with New York and Texas to contribute 40 percent of the nation’s total GDP (U.S. BEA 2020) and serving as home base for over 10 percent of Fortune 1000 companies (Dempsey 2018). The combination of a strong workforce, dynamic organizations, increasing foreign investments, and embrace of new technologies generates an economy that shows few signs of easing its dominance, with productivity growing faster than all but three other states (BLS 2021a). The state’s resilience is evident even amidst the COVID-19 pandemic, with the operating budget surplus growing to a record $75 billion, revenue per employee reaching a record $1.5 million, and state GDP increasing 30 percent more than the increases in Texas and New York during 2021 (Winkler 2021).

But underneath these signs of prosperity, California is struggling with a pressing problem: The state exceeds all but three others in income inequality (Martin 2018). Well-publicized housing problems and strained social safety net programs provide evidence of this inequality’s consequences. Homelessness, for example, is worse in California than most of the country, with 41 unhoused Californians per 10,000 residents; 28 percent of all people experiencing homelessness in the U.S. experience it in California (HUD 2021). Employment data illustrates the problem as well, with 32 percent of Californians earning less than $15 per hour (UC Berkeley Labor Center 2018) despite living in metro areas that rank among the nation’s highest in cost-of-living. Wages among the highest earners (90th percentile) have steadily increased since 1979, but median (50th percentile) and low (10th percentile) have largely been stagnant over that same period (California Budget & Policy Center 2019). The wage scenario is compounded by the lack of quality of jobs available to median- and low-earners. Among all employed Californians, fewer than half report being in a “quality” job (CFWC, 2021).

How did a state with a strong and growing economy end up with a staggering level of inequality and a dearth of fulfilling jobs for workers? And what might we do about it? This report first outlines the conditions facing Californians and California policymakers with regard to jobs, economic mobility, and the future of work, focusing on the current polarization of jobs and wages. We then describe the historical elements—regional economic developments, demographic factors, and technological changes—that contributed to an unequal landscape.
Taking these factors into account, we review where the state is headed by pointing to the trends that suggest polarization is likely to continue in the absence of intervention. We also highlight the trends that offer “bright spots” in California’s future and introduce the combination of statistical techniques (e.g., Brynjolfsson and Mitchell 2017; Brynjolfsson, Mitchell, and Rock 2018) and qualitative work we will use to assess where the state’s jobs and workforce are headed under current policy and future technological development. The resulting Future of Work in California Data Dashboard is aimed at enabling California stakeholders—workers, educational institutions, businesses, and governments—to rethink common ideas about how to combat inequality and revive the middle class in California.
Facts: California’s Polarized Workforce

Any mention of jobs in California brings to mind Silicon Valley and the technology industry. A drive down Interstate 5, though, gives a more complete picture of the state’s economy: Farmland, factories and warehouses, universities, hospitals, state parks, and windmills dot the landscape. Aged school buses usher immigrant farm workers down the grove-lined highway from field to field, towing portable toilets. Big rigs move trailers and shipping containers between ports, railroad depots, and distribution centers. Commuter cars ranging from Mercedes-Benzes and Teslas to no-longer-produced Geo Trackers and Kia Spectras carry workers to and from their jobs and their recreation. In short, the California economy and its workforce are diverse, complex, and ever-changing.

California’s economy once benefitted from strong population growth, with immigration and domestic migration supplying a talented and diverse workforce. But by 2000, California’s population growth rate had slowed to the national average (0.9 percent) and continued declining—between 2015 and 2020, the population grew at just 0.2 percent, half of the national average of 0.5 percent (Johnson, McGhee, and Cuellar Mejia 2021). According to Duggan and Olmstead (2021), these declines resulted in part from a 55 percent reduction in immigrants to the U.S. and a tripling of net migration away from the state between 2015 and 2020. The reasons for slowing population growth are likely even more complex and intertwined, with tax increases, federal immigration rates and policies, and the state’s cost-of-living contributing to the trend.

We argue that an additional factor may also be contributing to California’s slowing growth rate and, even if it is not, should be a primary focus in steering California’s future: increasing occupational, skill, and wage polarization. In this report, we focus on polarization as the key obstacle for California policymakers, organizations, and educational institutions to address when considering how to promote economic mobility, equality, and a thriving workforce. Scholars of work and employment define polarization in a number of different ways.

The skill- and occupation-based definitions highlight the presence of a gap between the set of skills required for entry-level, low-paying jobs and the skills need to perform in higher-paying, higher-quality jobs in upper levels of an organization (Acemoglu 1999; Autor, Levy, and Murnane 2003; Goos and Manning 2007). This body of research shows that workers struggle to achieve mobility between these two occupational “poles” (Alabdulkareem et al. 2018) because workers cannot readily acquire necessary skills by doing entry-level work. In other words, polarization makes it difficult to climb the ladder of a given occupation without formal, resource-intensive education or training. The skills present in entry-level warehouse work, for example, do not translate well to a career in warehouse robotics; likewise, customer service skills do not align with the skills needed to change industries altogether and become a backend software engineer. Advancement out of entry-level jobs, then, is increasingly difficult as jobs polarize.

This obstacle to mobility has direct effects on workers’ income potential and ability to find fulfilling, meaningful work. Wage polarization, then, can reasonably be viewed as an outcome of skill and occupational polarization. But the growing distance between high and low wages
also reinforces skill and occupational polarization, as the necessary actions for traversing skill
poles (e.g., education, credentialing, and free time) are difficult to acquire when workers get
stuck in low-wage occupations. Throughout this report, we use “polarization” to refer to this
interconnected set of realities rather than examining each separately. We begin by identifying
the signs of polarization in California and exploring its potential causes and consequences.

EVIDENCE OF POLARIZATION, ITS CAUSES, AND ITS CONSEQUENCES

The diversity of California’s economy has supported robust job growth over the past 50 years. The
total number of jobs in California increased 174 percent from 1969 to 2019, from 9.03
million to 24.60 million (BLS 2021a). Job growth outpaced population growth over the same
period, with the total number of Californians growing about 100 percent from 19.71 million to
39.51 million (Johnson, McGhee, and Cuellar Mejia 2021). The availability of jobs reflects a
strong economy that, although sensitive to boom-and-bust cycles and recessions, has largely
been resilient post-World War II. California’s jobs numbers are currently struggling to bounce
back from the COVID-19 pandemic, but history indicates that a full recovery is likely on the
horizon.

Growth in the quantity of jobs, however, does not tell the entire story of California’s economic
and workforce health. The majority of job growth in recent decades, as demonstrated in
Milkman and Dwyer’s (2002) “Growing Apart,” occurred in what the authors define as low-
quality and high-quality jobs. The authors analyzed job quality data from the period of 1992 to
2000 and found that jobs in the bottom three and top three deciles grew at a much higher rate
than the middle deciles. In other words, California has done a very good job of creating high-
quality jobs, has performed less well in preventing the growth of low-quality jobs, and has done
poorly in creating middle-of-the-road jobs.

The results from Milkman and Dwyer regarding job quality in California align with analyses of
incomes and wages over longer periods of time than the decade the authors studied. Bohn and
Thorman (2019) estimated that from 1980 to 2019, “incomes for families in the 90th percentile
have increased by 60 percent, while incomes at the 50th percentile (median) and 10th
percentile have grown much less (24 percent and 20 percent higher in 2018 than 1980).” Data
from the University of California, Berkeley Labor Center paints an even worse picture than the
income analysis: When compared to 1979 levels, wages for the 90th percentile increased by 23
percent; median wages decreased by 11 percent; and wages in the 10th percentile declined 10
percent (see Figure 1). The core takeaway from all of these indicators is that incomes and
wages in California are on a trajectory of increasing polarization—a high proportion of workers
earning low- and high-wages, with little growth in the wage percentiles that represent middle-
class occupations.
While startling, these job quality and income data are not without optimistic counterparts. Growth in high quality jobs outpaced growth in low quality jobs (Milkman and Dwyer 2002), so the proportion of high-quality jobs relative to the total number of jobs is increasing. Likewise, the state’s performance on per capita income has remained above the national average for decades: in 1958, California's per capita personal income was around 125 percent of the national average; in 2020, it was about 118 percent of the national average (U.S. REAP 2021). Good performance on per capita income comes, of course, with the caveat that the cost-of-living is higher in California than other states in the country. But signs of promise and progress should be considered alongside the signs of struggle.

Progress is also being made on economic issues that intersect with social safety and health. Just 7.7 percent of Californians lack health insurance, for example, owing to a robust Medicaid and Medicare expansion at the federal and state levels. Furthermore, healthcare access expansion at the federal level did not have statistically-significant detrimental effects on the labor market, indicating that Americans continued working even as their healthcare decoupled from their employment (Duggan, Goda, and Jackson 2017). California’s labor force participation rate, as discussed later in this report, has shown signs of decline, but there is no indication that access to healthcare is a root cause. Widely-used measures of poverty also demonstrate some progress. California’s poverty rate, in part due to the expansion of social safety net programs, has declined from 12.7 percent in 2000 to 11.8 percent in 2019—a hopeful sign given that the national poverty rate increased over the same period (U.S. Census Bureau 2020a).
Wage and income polarization has nonetheless persisted as California made incremental progress in these areas. More work is needed to continue positive trends, reverse the trend of polarization, and revitalize the state’s middle class. We begin the process of targeting polarization’s root causes by identifying some of the phenomena that signal the growing distance between California’s top and lowest earners.

**Decoupling of Wages and Productivity**

Contextualizing the polarization of jobs and wages requires assessing whether these poles developed in response to productivity trends. Employers, in other words, may be keeping wages low for a substantial portion of the workforce to accommodate downward trends in their productivity. Recent analysis from Bloomberg, though, suggests that the last two and a half decades have seen a steady increase in revenue per employee in the state, maintaining a rate above the national average in the mid-2010s into the 2020s (see Figure 2). Likewise, Bureau of Labor Statistics data indicates that between 2007 and 2017, California’s labor productivity growth was fourth-best in the U.S. at 1.7 percent, while real hourly compensation grew by just 0.8 percent, good for 12th best in the country (BLS 2019b; see Appendix A for a state-by-state breakdown). It appears that wages in California, then, are decoupled from productivity, and/or that productivity gains are being reinvested into the top end of the workforce (e.g., by the creation of “superstar” firms - c.f. Autor et al. 2020). The latter explanation aligns with observations of high-quality, high-wage job growth outpacing middle and low-quality jobs.

**Figure 2. Productivity, U.S. and California, 1995-2021**

![Productivity Chart](chart.png)

Source: Bloomberg 2021
Additional research on the general trend of wage-productivity decoupling lists technological development and globalization as other possible causes (e.g., OECD 2018). Technological innovation tends to be skill-biased (c.f. Berman et al. 1998; Card and DiNardo 2002; Fernandez 2001), meaning that new production technologies increase the demand for educated, experienced labor over unskilled labor as cause and consequence of skilled workers’ technology-enabled productivity gains (and a greater share of work being done by technologies rather than low-skill labor). The globalization argument for wage-productivity decoupling suggests that the availability of low-wage labor and inputs at the global scale produces cost and productivity benefits that do not translate into higher wages locally. In reality, “The Great Decoupling” in California and the U.S. is likely the result of a combination of factors (c.f. Brynjolfsson and McAfee 2012).

No matter the cause of decoupling, it is essential to understand the additional factors that contribute to increasing polarization in the Californian job market. Causal mechanisms are difficult to test because each industry has its own sets of determining factors (e.g., labor markets, average profit margins, and regulatory environments). We can, however, assess some of the factors that are correlated with low and high wages to identify the levers policymakers and other stakeholders have available for narrowing income inequality and promoting a less polarized workforce.

Educational Disparities

The disparity between wages for college-educated workers and non-college-educated workers in California supports the above suggestion that productivity increases find their way to high-wage workers to the detriment of mid- and low-wage workers. College degree holders in California saw wages increase 30 percent since 1980 and non-degree holders saw a slight decrease, resulting in college degree holders earning $2.20 for every $1 that non-degree holders earn (PPIC 2018). Thus, education disparities provide further evidence of occupational polarization and lend insight into its causes.

Organizations’ preference for paying college-educated workers more than workers without college degrees is evident in the composition of the most common high-earning jobs in California. Computer hardware engineers, compensation and benefit managers, professional medical workers (e.g., dentists, psychiatrists, and surgeons), financial managers, architectural and engineering managers, and information technology professionals rank among the highest-paid workers in the state. The lowest earners include frontline food service workers, merchandise handlers and shipping clerks (e.g., warehouse workers), agricultural graders and sorters, farmworkers, and frontline hospitality workers (e.g., hosts and ushers) (BLS 2019c)—jobs that require little to no education.

California’s K-12 system is also a source of polarization, both in the state’s general performance against other states and in its specific curricula to prepare students for jobs of the future. In the general sense, research and the lived experiences of California’s families suggests that the 1978 passage of Proposition 13 was a watershed moment in the state’s K-12 spending. The
proposition had the effect of shifting the source of education funds from local property taxes (at the time making up about 60 percent of education budgets) to the overall state budget. Prior to its passage, California spent more per pupil than the national average. By 1983, however, spending per pupil had dipped below the national average as state officials made cuts to balance state budgets. Outperformance of other states in per-pupil spending never returned, with California now ranked 41st in the U.S. (Rancano 2018; California Budget & Policy Center 2017).

The relative decline in general education spending undoubtedly placed students at a disadvantage that likely carried over into their earning potential as adults. The situation has been aggravated by a lack of success in educating California’s students toward in-demand skills, particularly in computer science. Take, for example, the state’s computer science offerings in public schools from a recent analysis by the Kapor Center: Despite being a leader in technological innovation, California performs worse than the national average, with just 42 percent of high schools offering at least one computer science course (compared to 47 percent nationally) (Koshy et al. 2021). The schools hardest hit by limited computer science offerings are those in low-income areas (34 percent vs. 69 percent for high-income schools), those with high numbers of Black, Indigenous, Latino, and Pacific Islander populations (34 percent vs. 52 percent in schools with low B/I/L/PI), and those in rural areas (24 percent vs. 43 percent in urban districts). According to Koshy et al. (2021:7), “Students in low income communities were over two times less likely to have access to computer science courses than their counterparts in high income communities.”

Race, ethnicity, community characteristics, and socioeconomic status factor into educational outcomes far beyond computer science, too. A 2017 study by nonprofit GreatSchools found that in California, “African American and Hispanic students are 11 times less likely than white and Asian students to attend a school with strong results for their student group. Only 2% of African American students and 6% of Hispanic students attend a high performing and high opportunity school for their student group, compared with 59% of white and 73% of Asian students.” Unequal access to high-quality K-12 education impacts under-resourced students’ ability to gain admission to the state’s and country’s premier higher education institutions; given that college education is a strong predictor of high wages in California, these disparities thus have enduring impacts on the job prospects of California’s most disadvantaged students and communities.

Although not surprising at first glance, these higher education and K-12 realities are not indicative of California’s lack of commitment to education overall. The 1960 Master Plan for Higher Education and subsequent investments into the expansion of state colleges and universities provide a glowing example of the state’s excellence in providing options once students graduate from high school. The state currently spends $16.6 billion annually on higher education from its general fund, which accounts for 8.2 percent of the total state budget. Education overall is the state’s second largest expense, trailing only the essential social services and income maintenance categories. California also boasts the lowest average tuition in the nation at community colleges; places 1.96 million students in public institutions (compared to 262,566 in private institutions); and outperforms the national average in college completion.
California is well-positioned to take advantage of its positioning in higher education to reduce polarization, especially if combined with targeted reforms to the K-12 system.

Unions and Collective Bargaining

Another commonly-cited reason for increasing polarization is an overall reduction in collective bargaining power of California workers. Union membership in California steadily declined from 40 percent in the 1950s to 24 percent in 1980 to 15 percent in 2018 (Glass 2015; CFWC 2021). Declining union membership is linked to polarization in a number of ways. Probability of low wage employment, for example, is reduced by 39 percent with union membership, compared to a 33 percent reduction among college degree holders (CFWC 2021). Aside from negotiating higher pay and better benefits, unions also play a critical role in retraining workers when economic cycles or technological change interrupt the normal operation of a given occupation. Likewise, unions have driven changes to pregnancy and parental leave regulations, working hours and conditions, unemployment insurance, and wrongful termination laws, each of which supports workers’ ability to transition into and out of jobs with less risk to meeting basic needs.

The decline in California union membership represents a departure from the state’s deep history of labor organizing—César Chávez and Dolores Huerta’s work to establish the National Farm Workers Association, for example, is a critical part of state and national history. Such efforts resulted in California being an international leader in cementing workers’ rights into policies and legislation.

Despite the decline in union membership in previous decades, California is showing signs of a labor organizing revival. Recent developments in the technology industry, for example, demonstrate Californians’ willingness to reengage their collective bargaining power. The formation of the Alphabet Workers Union, a group of Google engineers and other workers who organized to gain some control over the company’s global influence, suggests that the reemergence of unions may not be relegated to blue-collar labor (Conger 2021). Similarly, the 2020 vote on Proposition 22 prompted discussion about the need for collective action among workers in gig economy contract positions (Hiltzik 2021).

Union membership data from the past two years add support to the anecdotal examples listed above. California’s union membership increased for the first time in many years in both 2019 and 2020, rising by 99,000 in 2019 and 139,000 in 2020 to a rate of 16.5 percent of the labor force (BLS 2021c). While still well off of the membership numbers from decades past, these numbers give reason to pay close attention to labor organizing and its potential impact on polarization in the near future.
Geographic Distribution of Jobs and Wages

Collective action at the state level has perhaps been difficult to achieve because of a practical reality: California is the third largest state by total area in the nation. Accordingly, local economies drastically differ by region. This geographic diversity provides both data to substantiate the polarization of jobs and wages in the state and a target for identifying polarization’s root causes. Aligning with common refrains about the “coastal elite,” wage and income data suggest that high-wage jobs do tend to be concentrated in coastal MSAs and low-wage jobs tend to be concentrated inland (see Figure 3).

The Bay Area, for example, has the lowest percentage of workers earning less than $15 per hour, due at least in part to the rapid growth of the technology industry. Workers in Fresno, just a few hours drive from the Bay Area, suffer from the highest percentage of workers with low wages—40 percent earn less than $15 hour, likely due to the concentration of agriculture and e-commerce jobs that have characterized the economy in recent history. Regions where agriculture, logging, mining, and other local sources of revenue have declined—discussed further in Section 3—suffer even more from regional disparities in wages than those that have either managed to maintain these outputs or have successfully diversified their local economy.

Figure 3. Average Weekly Wage by County, Fourth Quarter 2020
Lower cost of living in the inland areas compared to coastal areas helps to make up some of the wage differences, but state-specific poverty tools like the California Poverty Measure suggest that some areas remain in a disadvantageous position even when cost of living is factored out. The unequal geographic distribution of wages is therefore a pressing issue in need of creative solutions. Geographic disparities are not only critical to address because of the wages themselves, but also because of the divergent characteristics in the mix of jobs in each area. The San Joaquin valley, for example, is home to oil fields, farms, prisons, and warehouses. Workers in entry-level positions in these industries may have less of an internal ladder to climb. Likewise, workers cannot readily transition to careers in industries with higher quantities of well-paying jobs, such as technology or finance centers in the Bay Area and Los Angeles, without uprooting their families and other aspects of their lives (e.g., finding housing or transferring children’s schools). In other words, California’s geographic diversity of jobs reduces workers’ ability to easily transition into industries with higher-earning occupations, exacerbating polarization.

**Stagnation in Job-to-Job Hires**

Additional data suggests that geographic diversity is not the only limitation on Californians’ ability to transition to higher-paying jobs. Figure 4 illustrates the stagnation workers on the whole face in navigating the job market: The quantity of workers who get hired from one job to another is relatively flat, and we know from existing research that career transitions are a primary way that workers attain higher pay (Topel and Ward 1992).

**Figure 4. Hiring and job transitions, California, 2000-2020 Q2 series**

![Graph showing stagnation in job-to-job hires](source: U.S. Census Bureau 2021)
To be sure, career changes can also lead to income loss. According to Wiczer (2016), 48 percent of workers who change jobs lose income. Ensuring that career changes are both attainable and beneficial is a key challenge for California policymakers in addressing polarization, and one that will require careful consideration of the geographic and other factors that limit individual ability to transition. The COVID-19 pandemic undoubtedly generated new research on the potential of remote education and work to help alleviate this issue, which we discuss in the Scenarios and Policies report.

**Working Poverty**

The polarization of jobs and wages is perhaps most evident in the number of Californians who report living in poverty while holding jobs. According to the California Future of Work Commission (2021), “nearly 45% of 7 million Californians living in poverty reported living in a family with at least one family member working full-time.” Working poverty is a difficult issue to address via traditional mechanisms because of the limitations on working people’s time and energy. Higher education, for example, is further out of reach for the working poor than those without jobs even when financial assistance is readily available. Californians working in poverty therefore rely upon large social safety net programs to meet basic needs. The Public Policy Institute of California (2020) estimated that without these programs, 6.6 percent more Californians would live in poverty.

Various social safety net programs have been effective in combatting working poverty. The federal Earned Income Tax Credit and Child Tax Credit combined with state programs such as CalFresh, CalWORKs, California EITC, the Young Child Tax Credit, and General Assistance lowered poverty by over 5 percentage points (PPIC 2021). The effects of these programs are largest in the most impoverished regions of California, such as the inland regions and the Sierras. It stands to reason, then, that social safety net programs should be regionally targeted to reduced poverty.

Addressing working poverty and poverty in general will be central to the state’s efforts to create equal opportunities and outcomes for racial and ethnic demographic groups. 21.4 percent of Latino Californians, 17.4 percent of African Americans/Black Californians, and 14.5 percent of Asian American/Pacific Islander Californians experience poverty compared to 12.1 percent of white Californians (PPIC 2021). And while California has long prided itself on welcoming immigrants, poverty rates among those moving here is much higher than average: 21.6 percent of immigrants are in poverty compared to 14.4 percent for non-immigrants, with the number jumping to 35.7 percent for undocumented Californians.

Navigating social safety net programs—completing applications, gathering required documentation, enduring long wait times, and balancing need with the uncertainty of outcomes—is likely harder for people working full-time while in poverty, even harder for Californians who are victimized by racial or ethnic discrimination, and harder still for undocumented residents. Furthermore, recent reporting on the operational challenges posed by California’s unemployment insurance systems amidst the COVID-19 pandemic illustrated one
of the many reasons social safety net programs are difficult for any Californian to use to their designed potential (Bartik et al. 2020; Sojourner and Goldsmith-Pinkham 2020). California’s unemployment insurance system was unable to accommodate the surge of claims as millions of our workers lost their jobs. Because of this, the state’s Employment Development Department had to shut down for two weeks and turn away any new claims while they caught up with a large backlog. Relatedly, the state was especially prone to fraud with billions of dollars paid to ineligible individuals who outsmarted the state’s antiquated information systems (Hepler 2021).

These developments call for renewed attention to the outdated underlying systems government agencies and programs use to meet the needs of California’s residents. Even for those who are able to navigate unemployment and other social safety net programs, outcomes can be varied and point to a need for reassessment of how the program is administered. California, as noted throughout this document, is among the richest and most productive states in the nation, yet unemployment payouts lag behind many other states. Analysis from Stanford’s Institute for Economic Policy Research found that California’s top weekly state unemployment pay hovers around the national average, outpaced by comparable states such as Texas and Washington (see Figure 5 and Appendix B for observed numbers). Duggan, Guo, and Johnston (2020) noted that laid-off Californians receive 50% of their most recent earnings, but the weekly payout is capped at $450 for a maximum of 26 weeks. This system creates a disparity between what a high-wage worker and low-wage worker receive in unemployment insurance even though “the UI tax cost to the employer is identical” regardless of wage.

**Figure 5. Top weekly unemployment comparison by state, 2020**

![Top weekly state unemployment pay](source: Stanford Institute for Economic Policy Research)
Augmenting unemployment benefits and improving programs’ ease-of-use will be a crucial component of reducing inequality and promoting economic mobility. Taken together with each of the topical facts presented above, we have identified several signs and potential causes of polarization and resultant economic inequality among California’s workforce. These realities serve as both barriers and opportunities for policymakers and others in considering potential avenues for improving economic and workforce health. In designing solutions, stakeholders should also consider California’s unique historical features—its economic development into a global powerhouse, its work and labor policies and legislation, and its ever-changing workplace technologies.
Origins: Historical Contributors to Job Polarization

As with any societal-level trend, the polarization of jobs and wages in California is the result of a complex interaction between policy, technological change, demographic change, natural history, national and international economic change, and other factors. No single factor is more important than the other; however, given the aims of the California 100 Initiative and the expertise on our authorship team, we focus here on broad economic shifts, work policy, and technological change in California and narrow the scope of the analysis to the period between 1979 and 2021.

BRIEF HISTORY OF ECONOMIC SHIFTS IN CALIFORNIA’S REGIONS

Economic shifts in California are deeply tied to the state’s geographic and demographic diversity. At least as far back as the Gold Rush, people from across the U.S. and world have flocked to California to pursue economic opportunity and contribute to the state’s culture of innovation. We focus here on the period from 1979 to 2021 for the following reasons: (1) California’s history is not easily-divisible into eras of economic development; (2) the period contains several boom-and-bust cycles in the state and national economy; and (3) technological development in computing and related industries during this period has played a major role in producing the economic mobility, workforce, and inequality issues we see today. Likewise, by 1980, California’s economy had become the eighth largest in the world, prompting a need for workers and a spike in the total population. These changes differed by region, each with its own elements of occupational polarization.

San Diego – From Defense to Biotechnology

San Diego, like other coastal parts of California, developed much of its economy around its deepwater port. Early development of the port intended to enable U.S. military installations to design and deploy submarines and other naval technologies, a historical thread with implications for the regional economy we see today. By 2008, 35,000 Navy servicepeople, Department of Defense civilian employees, and contractors worked in the area, with 5 percent of all civilian jobs, 22 percent of total jobs, and 15,000 businesses working in the defense industry (Dyer 2019; Plumb 2012; SDMAC 2020). The port, over time, also became a center for international trade: By 2019, trade through the port eclipsed $7 billion annually, owing in part to its designation as a Federal Trade Zone in 1988 (FTZs facilitate expedited import and transport of goods via reduced customs controls). The port later contributed to growth in the area’s tourism industry by way of cruise ships, creating a portion of the estimated 160,000 jobs (13 percent of all jobs in San Diego County) in tourism (SDTA 2013).

The economy in San Diego has gradually diversified, driven by variations in defense investments post-World War II and post-Cold War. To be sure, the port, military, international trade, and tourism continue to have a sustained impact on the regional economy. But diversification was a conscious and intentional decision on the part of policymakers and developers to expand the
area’s revenue streams as military spending fluctuated across times of conflict and peace (Milken Institute 2015). Business-friendly policies created an environment in which companies that originated their business under defense contracts could commercialize their technologies and services (e.g., Qualcomm, founded 1985 after a military communications contract, remains a top 10 employer in the area).

Complementarity of certain industries to the region’s history and infrastructures has, in recent decades, attracted small businesses and startups. The area’s biotechnology startup growth, for example, was facilitated by strong life sciences education programs, robust hospital systems, and proximity to major ports for imported components. Companies such as Illumina and a heavy share of contract research organizations placed San Diego among largest biotechnology hub in the country by 2013. The region also benefits from California’s robust life sciences industries on the whole: The state boasted a $633 million public research and development budget in 2018. Beyond public funding, 18 percent of the state’s corporate locations are research and development facilities, “a ratio that easily beats the U.S. overall (11%), China (15%), U.K. (14%) and Japan (10%). Only Germany, at 19%, has a higher rate … The percentage of Texas facilities for R&D is less than half California’s at 8.2%” (Winkler 2021).

The growth of San Diego’s research, development, and technology industries has contributed, at least in part, to the area’s polarization of jobs and wages. As of 2018, 27.3 percent of San Diego residents were defined as being in economic hardship; between 2007 and 2018, total income declined by 9.73 percent for the bottom fifth of earners and increased 3.64 percent for the top fifth (CPI 2020). Low incomes among the top industries in San Diego are concentrated in retail trade and hospitality/food service, while the region’s science and technology and public administration earn the highest median incomes (see Table 1).

### Table 1. 2018 Median Earnings for San Diego County’s 10 Largest Industries

<table>
<thead>
<tr>
<th>10 Largest Industries in San Diego County</th>
<th>Number of county residents employed</th>
<th>Median earnings, full-time year-round work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional, scientific, and technical services</td>
<td>170,038</td>
<td>$73,334</td>
</tr>
<tr>
<td>Public administration</td>
<td>78,550</td>
<td>$63,349</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>146,907</td>
<td>$57,831</td>
</tr>
<tr>
<td>Educational services</td>
<td>131,793</td>
<td>$42,704</td>
</tr>
<tr>
<td>Healthcare and social assistance</td>
<td>207,362</td>
<td>$41,171</td>
</tr>
<tr>
<td>Construction</td>
<td>102,866</td>
<td>$41,050</td>
</tr>
<tr>
<td>Administrative and support and waste management services</td>
<td>73,892</td>
<td>$27,356</td>
</tr>
<tr>
<td>Retail trade</td>
<td>164,758</td>
<td>$26,899</td>
</tr>
</tbody>
</table>
South Coast – From Aerospace to Agglomeration

Los Angeles has become a focal point for research and commentary on economic inequality in California. The Public Policy Institute of California and the Stanford Center on Poverty and Inequality, for example, released an augmented poverty measure that accounts for a region’s cost of living (e.g., housing and food prices) in 2013. LA’s poverty rate exceeded all other areas of California on this measure: 25.6 percent of residents fell into the economic distress category (Danielson et al. 2013). The other two counties in the region perform much better on income measures than LA, particularly in median income. As of 2018, Orange County ranked seventh in the state with a median income of $85,398 and Ventura ranked tenth at $84,017 (2018 dollars) (BLS 2018).

The region’s economic history lends some insight into how poverty and inequality have persisted in LA despite success in other counties of the region. The South Coast was, at the outset of the time period under study, a national leader in the aerospace industry: Over a quarter million residents in Los Angeles County alone worked in aerospace each year in the 1980s, including 1 in 3 manufacturing workers. The South Coast was likewise home to a third of the nation’s aerospace engineers (Westwick 2012). Companies such as Lockheed and Northrop benefitted from large federal defense contracts (e.g., $18 billion total in 1988) (Law, Wolch, and Takahashi 1993) and, in turn, provided well-paying manufacturing, production, and engineering jobs at all levels of the wage scale. In other words, the industry was less polarized than what we see in today’s job market: 17 percent of aerospace jobs were in highly-skilled occupations compared to LA County’s 10 percent in all jobs; 34 percent of aerospace jobs were in low-skilled occupations compared to LA County’s 44 percent; and specialist white-collar jobs made up 25 percent of the aerospace total compared to around 8 percent in the somewhat comparable automobile industry (Law et al. 1993).

Average pay in the aerospace industry likewise held above 100 percent of comparable jobs in other industries in all occupational groups (Law et al. 1993). Growth in aerospace—and its impact on the incomes of South Coast residents—made the region a financial leader in the state and enabled the revitalization of neighborhoods and infrastructure, a renewed international prominence (e.g., the 1984 Olympic Games), and the expansion of international trade via the Port of Los Angeles and the Port of Long Beach (Walters 2017).

But the dependence on one industry to provide a large portion of the economic opportunities available to a large swath of the region’s residents left the South Coast susceptible to rapid downturn. The end of the Cold War in the early 1990s saw aerospace workers face cuts of 68,700 jobs between 1987 and 1991 (Law et al. 1993), and by 1996, the number of aerospace jobs had been cut in half of mid-1980s levels (Schoeni et al. 1996). Declining government defense contracts led to fewer well-paying jobs in the industry. The reduction in such jobs took
place during a severe statewide recession, leaving workers with few opportunities to move to equal or better paying jobs. According to Walters (2017), this scenario contributed to an outflow of more than a million people from California to other states. Immigration from Mexico and other countries made up much of the population loss, with L.A.’s Latino population increasing from 18 percent of total residents to 47 percent between 1970 and 2000 (Friedersdorf 2021). But the well-paying manufacturing and production jobs never returned, contributing to the region and state’s current overrepresentation of Latino workers in low-wage jobs.

Instead, the region has diversified while maintaining some manufacturing presence (particularly light manufacturing such as fabricated metal, computing components, and transportation equipment) (NAM 2020). These industries now employ under 500,000 workers in the Los Angeles-Long Beach-Anaheim area, a figure that has been steadily declining since 1990 (see Figure 6) (FRED 2021a). The remaining manufacturing jobs require varying degrees of skill and command a range of wages, but the industries that have absorbed much of the manufacturing labor pool are thick with low-skill and low-wage jobs. An additional 1 million employees, for example, now work in transportation jobs compared to the 1980s. Leisure and hospitality businesses account for 660,100 of the region’s workers. Jobs with higher wages and benefits than the aforementioned industries include professional and business services, which account for 932,100 South Coast residents, and government jobs, which employ 704,800 residents (BLS 2021d).

**Figure 6. Decline in Manufacturing Employment in Los Angeles Area**

![Manufacturing Employment in Los Angeles-Long Beach-Anaheim, 1990-2020](source: FRED 2021a)
Inland Empire – From Agriculture to Warehousing

The Inland Empire is consistently ranked among the fastest-growing metropolitan areas in the country (Downs 2005). The area is perhaps best known by historians for its Valencia orange fruit, which played a major role in the area’s nineteenth century economic development. Desertification and the growth of national and global agricultural production sent the agricultural industry into decline. The region is currently home to nearly 4.6 million people, or 11.7 percent of the total California population (Husing, 2020), but farms now account for just a small fraction of employment in the region. Suburban sprawl out of the Los Angeles and San Diego areas has also been central to the reduction of the agricultural industry in San Bernardino and Riverside Counties (Johnson, Reed, and Hayes 2008), but so too has been a major shift toward warehousing and logistics.

The Inland Empire’s warehouses are mostly concentrated along Interstate 15, with construction originating in Ontario in the late 1970s and 1980s (Mayorquin 2021) and accelerating around the time of the housing market downturn in 2008 (Bluffstone and Oudekirk 2008; Torres 2021). The combination of major highway access, railways, cheap land, and proximity to the Los Angeles and Long Beach ports made the Inland Empire an ideal landing place for logistics firms who sought to capitalize on increased flows of goods from Asian and Latin American countries. In short, limited ability to expand logistical capacity close to Southern California’s ports led to warehouse development in the region, driven largely by organized interests such as the Pacific Merchant Shipping Association (De Lara 2009). Highway construction coincided with this push of imported goods through the Inland Empire. Warehouse construction then continued eastward throughout the 1990s and 2000s, partially due to labor availability in immigrant communities that originally brought their families to the region for affordable housing (Mayorquin 2021). For reference, Amazon—which only began opening warehouses in California around 2012—now operates 14 facilities in the region and has become the area’s largest employer with at least 20,000 employees (Mayorquin 2021).

By 2013, 45 percent of U.S. imports from China and Asia traveled through the I.E. (Patterson 2015). Warehousing organizations have therefore become the predominant job provider, originating with the developments above and continuing alongside the rise of e-commerce at the national and global scale. Since the 1980s, the area developed over 1.5 billion square feet of warehouse space, including companies such as Amazon, Home Depot, and Nordstrom. From 2010 to 2019, the logistics sector accounted for 26.2 percent of the region’s new jobs. Furthermore, BLS data indicate that the transportation and material moving sector employs 15% of the region’s workers, largely concentrated in entry level-jobs such as stockers, order fillers, and material movers (BLS 2021d).

These figures do not include a substantial number of temporary laborers—many of whom bounce between warehouses, customer service positions, and fruit packing houses and other remaining agricultural jobs. Temporary workers accounted for about 60 percent of all warehouse workers in 2013 (UC Riverside 2013, as cited in Kirkham 2015), leading to the temporary staffing industry growing 575 percent between 1990 and 2007 (De Lara 2009). Each of these sets of jobs pays somewhere around the minimum wage (Kirkham 2015). The growth in temporary employment coincided with the rapid growth of the warehousing industry,
indicating the industry’s dependence on on-demand staffing (see Figure 7). How the growth of temporary labor arrangements impacts occupational polarization seems obvious, but further research is needed to assess whether these arrangements ultimately lead to full-time, permanent work positions. Qualitative work seeking to understand the employment prospects of temporary laborers is underway; preliminary findings suggest that temporary warehouse jobs offer little opportunity for advancement because job tasks are designed to be learned in a day or less (i.e., skill-building is unlikely to occur when working in a job designed to be temporary).

Likewise, job availability and composition in the Inland Empire’s temporary staffing industry itself is ripe for analysis. The region is undoubtedly home to latent talent currently making ends meet via temporary jobs, talent that could be deployed for targeted economic development programs. In developing such programs, California policymakers and businesses should counteract the temporary employment trap many Inland Empire workers find themselves in. Incentivizing the development of internal labor markets with a range of wages and a set of transparent, realistic qualifications for advancement, for example, would provide avenues for temporary laborers to attain full-time employment. This consideration is particularly important when developing economic equality policies for the region’s warehouse workers, who work in an industry moving toward external incentives (e.g., sign-on bonuses, tuition benefits) in place of internal advancement opportunities (e.g., full-time work, promotions).

Figure 7. Increase in Inland Empire Logistics and Temporary Employment

Source: De Lara 2009
The Inland Empire has the state’s lowest 90/10 income ratio in California, suggesting that it is among the least polarized areas in California (PPIC 2020). This statistic, though, does not account for temporary workers, nor does it account for the globalized nature of the warehouses that scatter the region. In other words, warehouse workers are contracted by staffing agencies on behalf of national and multi-national logistics corporations headquartered and/or operated in other states and countries, so actual wage disparities within organizations are difficult to calculate. Educational attainment also indicates the potential for income inequality to widen: Residents with an Associate’s degree or higher accounted for just 31.2 percent of the I.E.’s population (Campaign for College Opportunity 2019). Meanwhile, technical skills are an important avenue for advancement out of entry-level jobs in the warehousing and logistics industry, as information technologies and automation (e.g., robots) handle an increasing share of warehouse operational and managerial tasks.

Central Coast – From Farming and Fisheries to Space Flight

The Central Coast is perhaps best known for its natural beauty, attracting tourists from other California regions and the rest of the world. Tourists come to visit Big Sur or drive down the scenic stretches of the Pacific Coast Highway, where farmland and the ocean sit next to one another. These natural amenities have historically been drivers of the region’s economy via agriculture, fisheries, and tourism.

The “Salad Bowl Strikes” of the early 1970s were an early example of the region’s contentious economic and labor history that continues into the present day. Driven by farmworkers’ desire for better pay and better working conditions, strikes by the United Farm Workers and the subsequent reactions of Teamsters who packed and transported the region’s produce ultimately turned violent. The events prompted the passage of the California Agricultural Labors Relations Act in 1975 (Ferris, Sandoval, and Hembree 1998), which provided some safeguards for unionized farmworkers. But large-scale immigration in the 1980s and 1990s and the election of union-critical governor George Deukmejian in 1982 brought about a rapid decline of organized farm labor, rendering the legislation ineffective. Likewise, the UFW rapidly lost its members in the following decades—by 2019, farmworker membership stood at just a few thousand workers nationwide (U.S. Census Bureau 2020c).

The loss of farmworker union power and the influx of immigrants put many of the Central Coast’s residents in a precarious economic situation. The region’s continued economic impact has not translated into prosperity for its residents, with California Poverty Measure rates at staggering levels (see Table 2).
Table 2. Central Coast Poverty Rates, California Poverty Measure, 2020

<table>
<thead>
<tr>
<th>County</th>
<th>CPM Poverty Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monterey and San Benito</td>
<td>17.3</td>
</tr>
<tr>
<td>San Luis Obispo</td>
<td>20.7</td>
</tr>
<tr>
<td>Santa Barbara</td>
<td>20.7</td>
</tr>
<tr>
<td>Santa Cruz</td>
<td>17.0</td>
</tr>
</tbody>
</table>

Source: PPIC 2021

These figures stand in stark contrast to the region’s contributions to the state: Salinas, for example, is home to under 160,000 residents, but contributes an estimated $8 billion economic impact from the production of staple crops like lettuce, celery, broccoli, and strawberries (City of Salinas 2021; Farm Bureau Monterey 2021). The popularity of using temporary labor agencies to fill labor needs may be partially to blame, with temp agencies occupying at least five of the top 20 spots on the list of largest employers in Monterey County (California Employment Development Department 2021). These agencies provide cheap alternatives to full-time workers—often via the use of H-2A visas—to farms for crop management, harvesting, and packing.

The Central Coast has opportunities to improve its economic conditions on the horizon. The region is perhaps least known, at least in the public sphere, for its growing role in the state’s technology industry. Several counties are now hotspots for the development of at least two types of technology that appear critical to California’s future: agricultural technology (AgTech) and aerospace. Both industries benefit from the region’s proximity to the Bay Area and its bustling startup economy, yet the proximity itself introduces challenges for attracting technology companies to locate in the Central Coast towns in which they deploy their products.

The Central Coast is so critical to AgTech that Forbes holds its annual AgTech Summit in the region each year. The region is also home to three city-sponsored AgTech startup incubators—the THRIVE AgTech Initiative, the Western Growers Center for Innovation and Technology, and the THIVE Innovation Foundation. Similarly, Vandenberg Space Force Base, formerly the Vandenberg Air Force Base, is now a major driver of the Central Coast’s economy: The base provides roughly 16,000 jobs in Santa Barbara and San Luis Obispo Counties (Leslie 2021), a figure that research from the California Polytechnic Institute (2021) projects will grow by over 1,700 jobs per year in the coming decade. The base has become a launchpad for private aerospace companies such as SpaceX.

Interestingly, startup companies that have found markets for their technologies along the Central Coast are headquartered elsewhere, including nearby San Francisco (e.g., ripe.io, FarmWise), Los Angeles (e.g., SpaceX), east coast cities like Boston (e.g., Soft Robotics) and New York City (example), and European countries like Ireland (e.g., MagGrow). Attracting such
companies could spur needed economic development of the Central Coast, but California policymakers and businesses must take care to ensure that the workers who preceded and enabled technological development are not excluded from the potential boom. The Bay Area’s staggering inequality serves as a cautionary tale in this regard; so too do other regions who are experiencing cutting-edge technological development in industries made up of low-wage workers (e.g., robotics in the Inland Empire’s warehousing industry; early aerospace manufacturing in LA). A revival of the Central Coast’s rich history of labor organizing could provide avenues for agricultural workers’ involvement and equity in AgTech and aerospace outcomes, even in the absence of unions. Likewise, continued public-private models of space exploration funding may avert some of the negative consequences that typically surround Department of Defense contract boom-and-bust cycles.

San Joaquin Valley – From Agriculture and Oil to Prisons and Real Estate

The San Joaquin Valley runs through the geographic center of California and is home to roughly 4.3 million people (U.S. Census Bureau 2019). Agriculture has been the region’s primary industry in the time period of focus, as indicated by the region’s land use: 60 percent of the 8.4 million acres is farmland, with just 6 percent qualifying as urban centers (Ayres et al. 2021). The area produces more than half of California’s agricultural output (Hanak et al. 2019); by extension, the San Joaquin Valley is a substantial contributor to the nation’s total output. Farms in the SJV historically focused on produce such as grapes, nuts, stone fruits, citrus, garlic, and tomatoes, bringing in one-fifth of the region’s $160 billion in GDP and providing one-fifth of its jobs (Hanak et al. 2019).

Several shifts have changed the area’s outputs, including the movement of cattle and dairy farmers out of the Los Angeles region into the SJV Valley amidst rising land costs. More recently, land availability for farming of any kind has decreased and placed pressure on the region’s economy. Intense drought paired with urban and suburban development beginning at least as early as the 1990s were the primary drivers of land use disruption in the farming industry (American Farmland Trust 2007). Most of California’s critically overdrafted basins, according to a 2021 Public Policy Institute of California analysis of Department of Water Resources data, are in the SJV, creating a contentious issue between the region’s farmers and managers of urban and suburban development. These challenges, combined with the passage of the Sustainable Groundwater Management Act, are projected to reduce the amount of land used for farming by at least 535,000 acres, or one-tenth of agricultural land in the region (Ayres et al. 2021).

The SJV’s economy has also been partially dependent on oil production. The area’s reserves helped place California 6th in the nation in crude oil production as of 2018 (U.S. EIA 2018). Kern County, in particular, traditionally leads the state: In 2008, it accounted for 68 percent of the oil produced in California, 10 percent of the entire United States production, and close to 1 percent of the total world oil production (U.S. EIA 2021); production has since declined from a high of 250+ million barrels to just over 150 million. Renewed interest in oil production emerged in 2009 upon Occidental Petroleum’s discovery of substantial oil and gas reserves, but
California’s environmental protection programs have limited the economic impact of the discovery.

The impending declines of agriculture and oil place the San Joaquin Valley in a precarious position, one that exacerbates existing issues: Every county in the region, for example, outpaces the state’s poverty rate, with Merced, Madera, Fresno, Tulare, and Kings counties each exceeding 20 percent of residents living in poverty on the California Poverty Measure (PPIC 2021). High school and college graduation rates likewise lag behind California’s rate in all counties. Just one county in the region, San Joaquin, performs above 80 percent in high school graduations. Fresno County similarly is the only county above 20 percent in Bachelor’s degrees or higher completion rate (Alesi Perez, Johnson, and Hsieh 2021). These metrics demonstrate the difficulty of reinventing the SJV’s economy with jobs of the future, particularly those in technology and other education-dependent industries.

In line with the region’s history of capitalizing on expansive open space, recent economic growth has instead been driven by private and public real estate development. Similar to the Inland Empire, warehouse and transportation jobs have been a major source of job growth (e.g., 22,500 jobs added in San Joaquin County alone between 2009 and 2019) (San Joaquin County Index 2020). Sub-division and other single-family housing development growth in the early 2000s, and somewhat continuing today, provided workers who are remote or who are willing to endure mega-commutes to the Bay Area with affordable housing. Both warehouse development and housing development are discussed elsewhere in this report, so we focus here on a different source of jobs and economic growth in the region: The state government’s construction of prisons.

Beginning in the 1980s, the San Joaquin Valley underwent a surprising rate of prison development. The counties included in the area are home to a total of 13 correctional facilities, owing in part to a vast amount of space and relative isolation. Prison growth in the San Joaquin Valley is relatively recent: it is home to 11 of the 23 prisons built in California since 1980 and 6 of the 10 newest facilities in the state. The prisons housed over 46,000 inmates as of January 2020 (CDCR 2020), a figure that is roughly 1 percent of the population of all eight counties in the SJV combined. These prisons provide the region with a substantial portion of its jobs, particularly in small towns like Susanville and Chowchilla. California has the fifth highest proportion of correctional officers and jailers per thousand jobs (2.30) and is the highest-paying state for these occupations (BLS 2020d). These numbers are even more pronounced in the San Joaquin Valley—Stockton-Lodi, for example, employs 6.92 correctional officers and jailers per thousand jobs; Fresno stands at 4.24 (BLS 2020d).

At least two state-run prisons in the San Joaquin Valley are closing: the Deuel Vocational Institution (1,080 staff members) in Tracy and the California Correctional Center (CCC) in Susanville (1,100 staff members). The closures are part of a broader budget directive by Governor Gavin Newsom that intends to save the state $400 million per year (Sheeler 2020). While many of the employees will be eligible for transfers to other prisons, including those in the San Joaquin Valley, the closures will undoubtedly impact the local economy. Prison jobs are among the highest-paying in the region, with small towns like Susanville dependent upon these incomes because their closest cities are 80 or more miles away. Pre-closure, the CCC employed
45 percent of the workforce in Susanville with an average pay of $87,500—a figure rarely attainable for the 87 percent of residents without a Bachelor’s degree. The knock-on effects are equally challenging, such as funding for the area’s community colleges. Lassen Community College’s 1,500 students included 200 inmates at CCC during any given year; dairy farmers sold large quantities of milk and other goods to the prisons; and local laborers and contractors worked projects at the prison (Branson-Potts 2021).

The San Joaquin Valley now faces three economic challenges: Water for agriculture and residential use; below-average education; and impending closures of additional state prisons. California’s policymakers and businesses should consider the advantages the region offers when redirecting economic development away from these declining industries. First, the region is relatively underdeveloped, so creative uses of land are perhaps more possible here than in any other California region. Likewise, the region’s residents are experienced with rapid economic changes and therefore may be more amenable to top-down efforts to reskill and upskill the workforce. Efforts to redevelop the economy should hone in on these historical and cultural particularities while harnessing the resiliency of the San Joaquin Valley’s residents.

Bay Area – From (IT) Goods to (IT) Services

The Bay Area is home to roughly 20 percent of the state’s population (U.S. Census Bureau 2021). Its economic impact on California is equally substantial: In 2014, for example, Bay Area county tax returns accounted for 25 percent of the $1.5 trillion in total adjusted gross income (AGI) across the state. According to U.S. Census Bureau data, seven of the ten highest median household income counties in California are in the Bay Area, including the top two (Santa Clara at $124,055 and San Mateo County at $122,641). Given that California relies heavily upon income taxes for its budget, the Bay Area is a critical economic engine for the entire state. Since 2008, the Bay Area created nearly two-thirds of California’s 1.1 million additional jobs, resulting in nearly a quarter of all of California’s jobs being done in the region. Retail sales in the Bay Area also make up a quarter of the state’s total (Walters 2017).

The Bay Area’s economic inequality is as staggering as its economic contributions to the state. According to the Bay Area Council Economic Institute (2020), “median household income increased by nearly $250,000 (or 87%) among households in the top decile in the region and by only $4,000 (or 36%) among households in the bottom decile between 2010 and 2019.” These trends likely accelerated during the Covid-19 pandemic, as the Bay Area added 8,800 jobs in Scientific and Technical Services while losing 125,000 jobs in Accommodation and Food Services (BAC 2020). The division of labor in the region undoubtedly contributes to inequality, exacerbated by extremely high housing prices and other costs of living.

The story of how the Bay Area became an archetype for inequality has been told over and over again: Companies developing cutting-edge technologies moved into the region for proximity to one another and to top-tier universities such as the University of California, Berkeley and Stanford University. The trend accelerated upon the success of companies like Apple Computer, which attracted venture capital and a proliferation of technology firms (e.g., computer
hardware in the 1980s and 1990s, software and dotcom in the late 90s and early 2000s, and the
current wave of mobile apps, artificial intelligence, robotics, and related technologies). Indeed,
venture capital flowed into the region following Apple Computer’s $1.3 billion IPO in 1980 and
enabled rapid growth in high-wage occupations. By the late 1990s, around 30 percent of capital
ventured on startups in the U.S. went to Bay Area firms; by 2016, the total was near 40 percent
(Florida 2016).

Technology companies shifted from producing hardware and other computing components in
the late 1990s, but venture capital flows never receded. Instead, the technology industry and its
backers moved to technology service provision (e.g., software and analytics), reducing the
amount of low- and middle-skill occupations available to the region’s residents. The
Information industry category grew from 2.9 percent of total Bay Area jobs in 1990 to 5 percent
in 2017. Likewise, the Professional & Business Services industry grew from 13.6 percent to 19
percent. During the same period, the manufacturing category decreased from 15.5 percent to 9
percent. The share of jobs in the information technology industry is also indicative of the
ongoing shift toward services: In 1995, nearly 75 percent of all jobs in IT were manufacturing;
by 2006, the proportions had flipped, with over 60 percent of IT jobs in services and only 30
percent in manufacturing (Hsueh 2007). The decline in manufacturing jobs corresponded with
growth in Leisure & Hospitality as well as Education & Health Services, providing some insight
into where manufacturing jobs went upon the industry’s contraction (Hsueh 2007).

In the near term, policymakers’ and stakeholders’ focus on reducing inequality in the Bay Area
likely needs to shift from the already-developed counties, such as San Francisco, Santa Clara,
and San Mateo, to the growing communities in the East Bay. The East Bay is undergoing rapid
development that is, like San Francisco, moving business activity away from manufacturing and
into technology services. Startups are beginning to locate in cities like Hayward, Union City, and
Fremont, where real estate is slightly cheaper while maintaining proximity to San Francisco and
Oakland. Over $5.5 billion in venture capital flowed into the subregion in 2020 (East Bay
Economic Development Agency 2020), a trend that is likely to continue in the years to come.
Ensuring that these changes involve existing residents in essential to ensuring healthy growth.

Sacramento Metro – From Military and Trade to Government and Education

The Sacramento metropolitan area ranks fifth in California by population size. Like other
California regions, military investment and its economies of scale aided the early-20th century
development of Sacramento and surrounding counties. McClellan Air Force Base, in particular,
provided up to 26,000 jobs for the region’s residents at its peak (Farah 2019). The base’s
location capitalized on Sacramento’s status as a national hub for transportation networks: The
Port of Sacramento and robust railroad development enabled military goods to be routed
through Northern California much earlier than other cities in the country. The base’s closure in
2001 cost the region 11,000 jobs and an estimated $1.5 billion in annual revenue (Farah 2019),
but its infrastructure—so robust that it has its own zip code—enabled the development of a
business park that today houses hundreds of companies.
Agricultural producers in outlying counties likewise benefitted from Sacramento’s hub status and maintain a current workforce of over 33,000 across the four counties (EDD 2020). The complementarities between the defense, transportation, and agriculture industries prompted the growth of specialized universities and businesses—UC Davis, for example, is a global leader in agricultural science and provides services to aerospace enterprises such as SpaceX and NASA. The university’s continuous adaptation to changes in the local economy routinely place it among the top employers in the region.

The development of the Port of Stockton and the growing complexity of trade routes moved Sacramento away from some of its core industries in the 1990s. The state’s overall growth helped accommodate job stability in the region, particularly in government administration. Over 76,000 people work in state government, over 11,000 work for the county government, and another 5,700 work for the City of Sacramento (BLS 2020b). K-12 school systems, universities, and healthcare organizations make up the rest of the top 10 employers in Sacramento County (BLS 2020).

The complementarity approach Sacramento adopted and the stability of government jobs have helped keep inequality in check in the Sacramento region for much of the last two decades. But suburban sprawl and relocations from the Bay Area have had surprising effects on the region’s suburban population: The Arden Arcade community, for example, has the highest level of income inequality in the state by the Gini index. The bottom-fifth of Arden Arcade earners, as of 2016, held just 2.1 percent of the community’s income. The top fifth held 58.2 percent of income (Reese 2021). Likewise, statewide racial inequalities are sharper in the Sacramento region than elsewhere in California, owing largely to the exclusion of Black residents from growing areas of the economy (e.g., the emerging AgTech industry) (Steinhauer 2020).

Sierras and the Far North – From Timber and to Tourism and Conservation

The Sierras and Far North regions are critical for their natural resources: Rain and snow that fall in the regions account for over 60 percent of the state’s total precipitation and provide water for 23 million Californians (Water Education Foundation, n.d.). The regions’ economies have grown and contracted as the state’s relationship to its natural resources became increasingly complex. Both regions have struggled to develop their economies since the decline of the gold rush, the scale-back of the timber industry, and the diminishing centrality of the Central Pacific Railroad. As a result, the Sierras and Far North are home to many of the poorest counties in the state (Cart 2018).

In light of their declines, a contingent of residents in the Sierras and the Far North have begun to take political action in response to perceived injustices at the state level. The regions are commonly nicknamed “Jefferson” due to some residents’ desire to secede from California to become the “State of Jefferson”—a set of California and Oregon counties that, according to proponents, are underrepresented and misrepresented in the current system of government. Initiatives to secede have passed in local and county governments as late as 2016, but have not become law despite continuous lawsuits and other efforts.
Residents’ desire to be considered separate from the state is in no small part a direct result of state-level decisions that have deeply impacted county economies. California’s strict environmental regulations, for example, have all but shuttered the region’s logging industry. The gradual closure of timber mills as part of conservation efforts drove unemployment above the state average. Pre-pandemic unemployment ranged from 6 percent in Shasta County to 16.2 per cent in Colusa County (BLS 2019a). The Far North is also home to five of the 10 counties with the lowest average weekly wages in the state (BLS 2020b). In 2014, As of 2014, 13 of the 18 counties in the Far North had a combined state income tax assessment of $1 billion, compared with $4bn from San Francisco County alone.

While there is growing consensus that environmental protection and mitigation of climate change are critical to California’s long-term economic health, the concerns of vocal Sierra and Far North residents are not to be swept under the rug. The state has made some effort to revitalize the natural resource economy that once characterized the regions. At least ten conservancies, which reside within the state’s Natural Resources Agency, provide grants to local businesses to undertake projects that help to manage forests and watersheds (Cart 2018). Data on the quantity of jobs in the seven counties indicate that the economy has largely shifted, though, towards other opportunities offered by the dense forests, numerous waterfalls, and picturesque mountain ranges, such as accommodation and food services and retail services (BLS 2020b).

These industries are obviously characterized by low wages and seasonal unemployment, evident in the data presented above. But the region’s economic struggles are also evident in the usage of social safety net programs. Among the 18 counties, 31 percent of residents are insured by Medi-Cal, compared to 19 percent in the Bay Area and 28 percent in California. Medi-Cal participation and the region’s high median age—50.5 in Nevada County, 52.3 in Plumas County, 52.5 in Trinity County, and 54.8 in Sierra County, for example, compared to California’s 36.5 (FRED 2021b)—has driven demand for healthcare practitioners. The Employment Development Department projects fastest job growth for the region to occur in the healthcare occupations, specifically those that can staff clinics at a reasonable cost: Physicians Assistants, Interpreters and Translators, Home Health Aides, and Nurse Practitioners.

STATE-LEVEL WAGE AND LABOR POLICIES AND REGULATIONS IN CALIFORNIA

The above regional profiles demonstrate the vast diversity of California’s local economies as well as the challenges and opportunities such diversity offers. As with occupational and wage polarization, California’s local economies have unifying features in their histories. At the state level, California is known for its progressive labor regulations and worker right campaigns, the history of which is evident in the evolution of the state’s Labor Code. Events preceding the time period of focus in this report shaped the trajectory of work and employment throughout the state: The 1913 Workmen’s Compensation, Insurance, and Safety Act; protections for industrial workers in the late 1930s into the mid-1940s; the California Occupational Safety and Health Act of 1973; and the Alatorre-Zenovich-Dunlap-Berman Agricultural Labor Relations Act of 1975,
the first state law intended to protect farm labor rights. Much of the content of these early actions simply aimed to reduce death and serious injury on the job.

More recently, California’s work and labor policies have evolved to include regulations on wages, medical/sick day allowances, and paid family leave. The state’s annual adjustment of minimum wage, for example, is codified into law after initially being proposed as a potential ballot measure. Likewise, California’s cities are among the first in the nation to enact local minimum wage ordinances to account for differences in cost-of-living between regions (commonly referred to as a “living wage). Beyond these regulatory and legislative actions, the state routinely finds itself at the forefront of government, worker, and organization negotiations over the “gig economy” and contract worker rights.

November 4, 2003  
**San Francisco passes Minimum Wage Ordinance**

- Set local minimum wage and schedule of increases indexed to the Consumer Price Index
- Among the first in the nation to set local minimum wage above federal and state wage
- As of 2021, 38 cities and counties have instituted a local minimum or “living” wage (Alameda, Belmont, Berkeley, Burlingame, Cupertino, Daly City, East Palo Alto, El Cerrito, Emeryville, Fremont, Half Moon Bay, Hayward, Los Altos, Los Angeles and Los Angeles County, Malibu, Menlo Park, Milpitas, Mountain View, Novato, Oakland, Palo Alto, Pasadena, Petaluma, Redwood City, Richmond, San Carlos, San Diego, San Francisco, San Jose, San Leandro, San Mateo, Santa Clara, Santa Monica, Santa Rose, Sonoma, South San Francisco, and Sunnyvale)

September 2014  
**Sustainable Groundwater Management Act signed into law**

- Set new procedures and requirements for extracting groundwater for agricultural and other uses
- Likely to reduce agricultural land use by over 500,000 acres in the San Joaquin Valley

April 2016  
**CA SB 3 signed into law**

- Increased the minimum wage in California to $10/hr
- Set schedule to raise the minimum wage to $15/hr by 2022; reassessed annually by Department of Finance
- Expanded paid sick leave
September 2019

AB 5 ("gig worker bill") signed into law

- Extended employee classification to some gig workers
- Many businesses exempted under AB 2257 in Sept. 2020 and passage of Proposition 22 in 2020
Trends: Social and Technological Pressures on Polarization

The historical trajectories of economic development, work policy, and technological advancement trend toward the job and wage polarization described in the Facts and Origins sections. What might continue to drive these trends in the near future? And what should be the focus of policymakers, educational institutions, organizations, and workers in their efforts to revive middle class occupations and wages? We first examine the social and demographic conditions in favor of increasing polarization—stigmatization of social safety net programs, an aging population, and growth in California’s competitors for talent. We then turn to increasing automation capabilities and its potential to exacerbate polarization, noting that data-informed interventions will likely be necessary to trend in a middle class-building direction. In each section, review recent research and economic trends that could aid in devising solutions to combat polarization.

SOCIAL CONDITIONS AND POLARIZATION

Stigmatization of Social Safety Net Programs

As mentioned in the Facts section, working poverty is a pervasive issue facing Californians. The state’s social safety net programs are key mechanisms for addressing working poverty, yet the stigmatization of program usage persists and causes hesitancy among its potential beneficiaries. Unemployment programs raise questions about work ethic; food subsidies draw attention to beneficiaries’ spending habits; and work leave programs call into question the prioritization of work and family. Recent research has begun to destigmatize program usage by analyzing program enrollees and their work outcomes. With support, these research efforts could help to attract enrollment into the programs among those in working poverty. Likewise, destigmatization could help policymakers channel funding into the programs and design/revise programs to be better-suited to California’s working families.

The first step in destigmatizing social safety net programs centers around painting accurate and complete pictures of the programs’ current enrollees. A 2015 analysis of Medicaid, the Children’s Health Insurance Program (CHIP), and Temporary Assistance for Needy Families (TANF) found that 50 percent of California’s expenditures on the programs went to working families (Jacobs, Perry, and MacGillvary 2015, as reported in CFWC 2021). Bana, Bedard, and Rossin-Slater (2020) examined California’s first state-level paid family leave program to assess whether higher weekly benefit amounts (WBA) increased the duration of leave or led to unfavorable future participation in the labor market. The authors found that women who earned near the maximum benefit from the program did not take longer leaves nor did they reduce future participation in the labor force; to the contrary, women in the program had an increased likelihood of returning to their pre-leave job.

Finally, ongoing analyses of piloted Universal Basic Income programs are showing promising results with regard to labor market participation and overall ability to find better work. In Stockton, for example, an analysis of a 2019 pilot program found that around 43 percent of
participants in the program had a full or part-time job, and only 2 percent had suspended their search for a job (Lu 2020; Treisman 2021).

**Aging Population**

Transitioning into dissimilar jobs may be a reasonable expectation for early-career workers. For others, such as older workers, these transitions become more difficult and less likely to succeed. Supplementation of the labor force, however, may become necessary in the near future due to the aging of California’s population. Additional strain will be driven by demographic changes, including a reduction in birth rates. Previous research has documented that, for example, states with aging populations tend to reduce their support for K-12 and higher education (Poterba 1998). Projections from the state’s Department of Finance suggest that the population aged 65 and up will increase from 6.41 million in 2020 to 9.72 million in 2040 and 11.66 million by 2060. In contrast, the corresponding projections for the number aged 0 to 19 are 10.23 million, 9.27 million, and 9.03 million. In other words, while today there are 60 percent more Californians aged 0 to 19 than 65 and up, by 2060 there will be 23 percent fewer.

Labor force participation data illustrates the near-term impact of an aging demographic: California’s labor force participation rate began declining in the early 2000s and was at just 62 percent in 2020 (FRED 2021c). To be sure, economic shocks—including the 2008 recession and the Covid-19 pandemic—have had dramatic effects on labor force participation. But ongoing retirements from the Baby Boomer generation are likely to aggravate the effects of such shocks. The actual proportion of young to aging Californians and the labor force participation rate can of course change in response to changes in life expectancy, migration patterns, immigration policies, birth rates, and more. But these trends and the many uncertainties introduced by another economic downturn will require major changes in social and economic policies at the state and local level.

**California’s Diversity**

Recently-released U.S. Census data suggest the United States, as a whole, is becoming more diverse. Accordingly, California is positioned to be a bellwether for the economic challenges of increasing diversity: The state is routinely ranked as the most diverse in the nation, owing largely to its sizeable Asian and Hispanic populations (see Table 3). Race and economic inequality are not one of California’s bright spots, though—Black or African American and Latino and Hispanic or Latino Californians, for example, are overrepresented in low-income percentiles (PPIC 2021). The reasons for such disparities are likely rooted in educational inequalities, the geographic dispersion of jobs, incarceration rates, and discrimination on the job market. The race-based components of polarization are a critical challenge for California’s citizens, policymakers and organizations, and a topic we discuss further in the Scenarios section.
### Table 3. Diversity in California and the United States

<table>
<thead>
<tr>
<th>Race and Hispanic Origin</th>
<th>California</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic or Latino</td>
<td>39.4%</td>
<td>18.5%</td>
</tr>
<tr>
<td>White alone</td>
<td>71.9%</td>
<td>76.3%</td>
</tr>
<tr>
<td>Black or African American alone</td>
<td>6.5%</td>
<td>13.4%</td>
</tr>
<tr>
<td>American Indian and Alaska Native alone</td>
<td>1.6%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Asian alone</td>
<td>15.5%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Native Hawaiian and Other Pacific Islander alone</td>
<td>0.5%</td>
<td>0.2%</td>
</tr>
<tr>
<td>White alone, not Hispanic or Latino</td>
<td>36.5%</td>
<td>60.1%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau

### Growth of Competitors for Talent

Over the past year, journalists and other commentators have noted California’s first population decline of 182,000 people, speculated about the consequences of its loss of a seat in the House of Representatives, and cited the state’s high cost of living as one of many factors contributing to the loss. Likewise, the flight of companies such as Tesla, Oracle, Charles Schwab, and Hewlett-Packard to Texas add fuel to the speculation that California’s economy and workforce are trending in the wrong direction. The reduced population does not take into account the roughly 110,000 foreign citizen workers who were, at the federal level, denied work visas in the past two years (140,000-150,000 per year normally, down to 29,000 in 2020) (Duggan and Olmstead 2021); the trend does, however, call for consideration of the state’s competitive positioning for attracting businesses and workers.

California, though, remains at the cutting edge of emerging industries, so its grip on global talent is hardly in grave danger. The renewable energy sector provides a strong example: 26 California companies worth a total of $897 billion reported having reported 10 percent or more of their revenues derived from clean technology in 2021. Renewable energy firms saw shares appreciate “282% during the past 12 months and 1,003%, 1,140% and 9,330% over two, five and 10 years, respectively, with no comparable rivals anywhere in the world” (Winkler 2021). The growth of the industry directly impacted the state’s availability of jobs, as the 26 firms increased their workforce 35 percent since 2019, a rate nearly three times higher than the rest of the U.S. and four times higher than the global rate (Winkler 2021).
TECHNOLOGICAL CHANGE AND POLARIZATION

As outlined in the Origins section, California has long been both a developer and user of advanced technologies. Here, we argue that automation—a term that refers to an array of technologies that reduce the level of human activity needed to accomplish a task—is the foremost category of technology that will impact the future of work and workers. Increasing automation is already a reality across a range of occupations and industries and stands to impact economic mobility and inequality over the next few decades. A substantial body of previous research suggests that a key driving force behind the steady increase in inequality over the last 40 years in the U.S. has been skill-biased technological change (Goldin and Katz 2018; Autor 2014).

Automating Blue Collar Work: AI-enabled Robotics

Low-wage jobs are a frequent target for vendors of automation, largely due to the perceived simplicity and physically-taxing qualities of repetitive, manual work. Organizations seek to lower their labor costs while simultaneously improving productivity using a range of automation technologies—a trend that could drive further polarization of skill, wages, and income.

Industrial robots are one contemporary example of this phenomenon. The industrial robotics market had surged into a nearly $50 billion industry by 2017 (McKinsey 2017), with 9.4 percent of U.S. plants already adopting robots and 28.3 percent of all manufacturing workers being exposed to robots by 2018. In California, these numbers are below the national figure—4.8 percent of plants and 14.4 percent of workers exposed (Annual Survey of Manufactures 2018). The numbers in comparable states like Texas (4.6 percent, 14.9 percent) suggest that uptake has been slow relative to states with lower populations (e.g., Kentucky 18.7 percent, 43.9 percent) or less diverse manufacturing industries (e.g., Michigan 20.9 percent, 48.3 percent).

Ongoing research suggests that these robot uptake numbers will increase in California in elsewhere, particularly as robot capability improves in industries like manufacturing, logistics and warehousing, and agriculture (Oxford Economics 2019). Furthermore, vendors and businesses are settling on pricing and business models that work for both parties. Integration strategies for tying robots into existing infrastructures and workflows continue to improve. And the availability of connectivity (e.g., advancements in Internet of Things technology) is making it easier for companies to deploy robots across a variety of industries (c.f. Sanneman, Fourie, and Shah 2020).

The COVID-19 pandemic introduced additional pressures on companies to automate low-wage jobs. At first glance, the impetus comes from the ongoing worker shortage: In July 2021, the U.S. Labor Department reported the highest number of job openings in the 20 years it has been collecting data (Olson 2021). Whether or not the shortage is due to expanded emergency unemployment benefits—enabling would-be workers to remain home and search for better jobs—is a subject of debate, with some initial research suggesting that enhanced benefits are not the cause (e.g., Petrosky-Nadeau and Valetta 2021). No matter the reason, executives in
low-wage labor-intense industries reported renewed demand for robotic systems during the pandemic, specifically “plug-and-play” systems that are easier to integrate into existing processes than the most advanced systems available (Beane and Brynjolfsson 2020).

Automation in manufacturing and agriculture, in particular, is likely to increase in the years to come because of the maturation of the technology paired with the harsh realities of an aging demographic, population stagnation, and organizational interest in reducing their dependence on low-wage labor. Policymakers and stakeholders must pay close attention to the development of this market, perhaps more than any other state: California is number one in the nation for factory jobs; its GDP from manufacturing increased 13 percent over the past five years to $316 billion in 2020; and its rate of manufacturing growth outpaces all other states, with Texas seeing 9 percent growth over the same period (Winkler 2021).

Farm robots are an additional area of robotics applications to monitor given California’s prominence in the nation’s agriculture industry and the high concentration of workers from the most vulnerable demographic groups working in on farms. The maturation of agricultural automation is picking up speed, both within the state and at the national scale. Iron Ox, for example, a firm backed by Bill Gates’ Breakthrough Energy Ventures, is on the cusp on mass deployment. The company’s farm robots monitor and care for crops while reportedly consuming 90% less water than farms without the technology. Such technology can cut both ways for California’s future: Providing a partial solution to the state’s pressing water management issues while potentially displacing large swaths of low-wage workers with little opportunities or training to go elsewhere.

**Automating Office Jobs: Machine Learning**

Robotics uptake demonstrates the increasing automation of “blue collar” jobs. But other types of work are also increasingly susceptible to automation, primarily via artificial intelligence and machine learning. Recent research suggests that the impact of these cutting-edge technologies could exacerbate polarization and, by extension, inequality in California. Specifically, entry-level jobs—whether physical jobs or office jobs—are often the persistent target of automation implementations because the jobs are already broken down into the simplest and most repetitive tasks possible (e.g., so that the jobs can be done with minimal training and/or by temporary laborers). Such conditions can further narrow skill requirements of the remaining jobs, thereby increasing the practical distance between entry-level and more advanced positions (Fernandez 2001; Autor, Levy, and Murnane 2003).

Specifically, entry-level “white collar” jobs (e.g., legal clerking, data cleaning) are a persistent target of machine learning implementations because the jobs are already broken down into the simplest and most repetitive tasks possible. Automating these jobs, though, could remove a viable pathway to higher-paying professions: In contrast to workers in deskill blue-collar jobs, entry-level white-collar jobs can offer on-the-job learning that is applicable in jobs farther up the skill and wage ladder. Entry-level workers would instead handle small, rare exceptions in their work, a characteristic of both old and new forms of automation (Braverman 1974; Noble
1979; Gray and Suri 2019) and that limits transferrable skill-building. Without appropriate intervention, the rapid adoption and implementation of advanced technologies such as machine learning would solidify the link between technological change and deepening income inequality in California.

Some regions of California are more exposed to the deployment of machine learning based on the composition of jobs in the area. The Suitability for Machine Learning Rubric, developed by Brynjolfsson, Mitchell, and Rock (2017), could enable an early assessment of the likelihood each region of California to be affected by machine learning at a large scale. While all regions fall in a moderate suitability range based on currently available data—between 3.0 and 3.1 on a scale of 5—the scores for individual occupations vary much more. Two of California’s most common jobs—cashiers and personal care aides—score at 3.4 and 2.795, respectively. Policymakers and stakeholders might consider using such tools to evaluate economic development and technology regulation policies in each California region.
In sum, the gradual erosion of jobs in the mid-range of pay and skill in California has deepened wage differences along occupational lines. Likewise, the increasing polarization of work and employment stands to reduce workers’ avenues for advancement out of low-wage jobs. In the absence of the slack resources to pursue higher education, enroll in social safety net programs, and build transferrable skill, California workers rely on mid-range jobs with overlapping skill requirements as stepping stones into better work—a path that has been the target for tools such as the Federal Reserve’s Occupational Mobility Tool. As the number of such jobs dwindles, an increasing portion of workers seeking to advance out of low-wage work must transition into jobs that are dissimilar to what they currently do.

To aid policymakers and other stakeholders in designing ways to help workers out this bind, our research team is developing “The Future of Work in California” Data Dashboard. The dashboard will combine quantitative analysis of current occupations—job availability, growth, education and skill requirements, regional particularities, and employer characteristics—with qualitative, ethnographic interview data from the workers who currently make their living in California. Tools such as the Suitability for Machine Learning Rubric, which take an objective view of future occupational change, will be put in conversation with the lived experiences of California residents. Our hope is that the tool will provide both realistic assessments of what is possible under current conditions and creative solutions to some of the most perplexing barriers in the way of Californians’ economic mobility.
REFERENCES


## APPENDIX A: Productivity and Compensation Growth by State – BLS

### Experimental Data

<table>
<thead>
<tr>
<th>State</th>
<th>Labor productivity growth</th>
<th>Real hourly compensation growth</th>
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</thead>
<tbody>
<tr>
<td>North Dakota</td>
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<td>2.1</td>
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<tr>
<td>Montana</td>
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## APPENDIX B: Maximum Weekly Unemployment Pay by State

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