Washington Center for Equitable Growth

PHOTO BY NASA

Equitable Growth and Southern California's Aerospace Industry

November 2015 Matthew H. Hersch

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The J-2 engine, used on Saturn rockets and the Space Shuttle was designed and produced by Rocketdyne, located in the western San Fernando Valley of suburban Los Angeles.

BY MARSHALL SPACE FLIGHT CENTER/NASA, VIA WIKIMEDIA COMMONS

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Explaining the "History of Technology" Series and Equitable Growth

By Jonathan D. Moreno

"Let me recite what history teaches," wrote the 20th century American novelist Gertrude Stein. "History teaches."

Does history teach? In particular, does history teach about job destruction and creation? Can the study of history, both in case studies and in the broad strokes of trends, help us understand how structural changes in the U.S. economy have affected growth and inequality in the past? Can they give clues about what we can expect in the future?

The Washington Center for Equitable Growth set out to answer those questions by establishing a Working Group on the History of Technology. In a Washington, D.C. policy environment dominated by economists and political scientists, we wanted to see if the tools and concepts of the history of technology can be deployed in ways that complement those other disciplines. After all, historical precedents are routinely cited in policy discussions, but rarely are they subjected to the close analysis that professional historians can bring to the conversation.

Our working group of technology historians seeks to answer the question of whether there are elements of previous mass technological shifts that may aid in the management of workforce disruptions brought about by the post-high-tech revolution. The group considered this question in light of the overarching mission of Equitable Growth to investigate whether and how economic inequality affects economic growth and stability. By casting an informed look back to previous technology-driven job upheavals, we may find shifts in inequality and growth—shifts that indicate whether these phenomena are linked. If so, then perhaps answers to today's growing income and wealth gaps will lie in some combination of spontaneous forces and active interventions by government or through public-private alliances.

We did not look for technological speculation or "futurism" in our work. But any technology that is or has been in operation for the last couple of hundred years

has been fair game for our group, from the steam engine and railroad to nanoengineering, synthetic biology and microchip production, as well as the workforces related to those endeavors. Otherwise, in charging our group of historians, we brought no preconceptions in this regard. Nor do we think that there will necessarily be a clear line from previous experience to the future. Some past events and concepts might be a dead end, but some might provide a foothold, however modest, on understanding what lies ahead.

Whatever the case, historical lessons are too important to be ignored in considering the future of job creation in a post-high-tech world. In the words of the 18th century Scottish philosopher David Hume—a decidedly less musical but no less nuanced writer than Gertrude Stein—the future tends to resemble the past. The challenge, we might add, is ascertaining which tendencies will turn out to matter in the years ahead.

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Overview

Farman III aeroplane flown by Louis Paulhan at the Dominguez International Air Meet, Los Angeles, January 10-20, 1910.

BY BAIN NEWS SERVICE, PUBLISHER, VIA WIKIMEDIA COMMONS

The unusual mix of circumstances that produced explosive job growth in the aerospace industry in southern California after 1910—inexpensive land in and around Los Angeles, splendid climate, the emergence of an entirely new transportation infrastructure, global warfare—is not fully reproducible, yet the story of economic rebirth in what had once been a modest agricultural zone may provide significant lessons in the creation and maintenance of equitable economic growth in the United States in the 21st century. What was so unusual about southern California's economic expansion in the 20th century—much of it resulting from military and commercial aviation, electronics, and space vehicle manufacturing—was the fact that so much of the wealth produced in that region took the form of relatively well-paying industrial and engineering jobs, accompanied by significant increases in the standards of living enjoyed by most of California's residents.

During World War II, southern California's factories employed 2 million people and produced 300,000 airplanes, or one every 15 minutes in some plants. Forty percent of southern California's wartime aviation workers were women, although in some plants as many as 87 percent of workers were women. The benefits of employment, though, were not limited to the workers themselves. The aerospace industry created not only new machines but also vibrant new communities boasting some of the most sophisticated transportation, recreation, artistic, and educational institutions in the United States. A thriving "spin-off" economy soon emerged that made California both an importer of energetic job-seekers and, more significantly, a culture exporter of entertainment and lifestyle products for the first time in its history. More recent economic troubles experienced by the economy of southern California do not detract from this story.

Southern California represents a rich test case for prospective studies of economic growth as it has historically enjoyed the participation of an ethnically diverse population, with large Latino, African American, Asian American, and Native American communities as well as a significant number of foreign-born job-seekers. To be sure, Los Angeles was not without ethnic unrest during its boom years: Anti-Asian discrimination marred the city's early years, and wartime intern-

ment of Japanese Americans marred its later ones. Similarly, violence directed at Mexican Americans during the 1943 Zoot Suit Riots and the racial violence of the Watts Riots in 1965 demonstrated that the process of creating economic opportunity free of discrimination was a rocky one. By the late 1960s, though, southern California had moved effectively to resolve many of its most pressing diversity issues, and southern California fared better than other regions in accommodating a diverse population as its economy underwent subsequent transformations.[1]

The aerospace industry in southern California has been the subject of considerable scholarly and policy attention.[2] The most important examination of the southern California aerospace industry was conducted by Dr. Peter Westwick's Aerospace History Project, a National Science Foundation-supported program within Professor William Deverell's Huntington-USC Institute on California and the West (in which the author of the present study participated as a Postdoctoral Research Fellow during 2010–2011).[3] This research examined the rise of Los Angeles as a locus of aerospace research and manufacturing, beginning with the Los Angeles Aviation Meet of 1910 and extending through the first decade of the 21st century. The study concluded that a variety of factors—local boosterism, excellent weather, a vibrant energy industry, a large educational infrastructure—enabled exponential growth in the region's wealth and population density.

Rather than recapitulating this body of research, the present analysis examines issues of equity and sustainability in economic growth, attempting to ascertain how, exactly, Californians avoided concentrating the wealth from the region's mid-century aerospace boom into the hands of a small number of individuals. Ultimately, the region's aerospace manufacturing—greatly facilitated by private philanthropy and state and federal government spending—succeeded in recasting the economy of southern California by complementing and reinforcing the development of a diverse, creative business environment in which no one firm or industry remained dominant for long.

Southern California's legacy may suggest several exportable policy techniques to encourage equitable growth. At the very least, it undermines a number of popular beliefs about the sources of economic development. Protected markets, subsidized education, and federal contracts appear to be effective tools of equitable growth. Efforts to suppress labor activism or reduce wages do not. At no point in California's development did the state look to a single industry to bolster or restore the region's economic vitality; the state's largest period of prosperity did not require that it reach a corrupt bargain with large employers, abandon environmental protections, eliminate minimum-wage standards, or forgo tax revenue. A well-regulated economy encouraged private investment and did not regard untaxed profits as a source of job creation but as money wasted as personal enrichment.

A panoramic view of downtown Los Angeles.

BY MATTHEW FIELD - HTTP://WWW.PHOTOGRAPHY.MATTFIELD.COM, VIA WIKIMEDIA COMMONS

Creating modern California

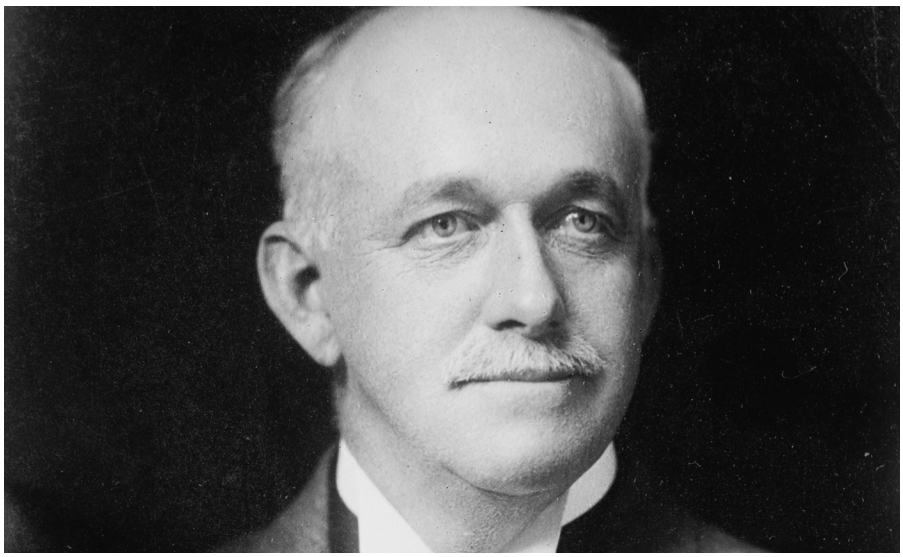
California's prosperity through the early 20th century would not be described by historians as equitable in any sense of the word. As Carey McWilliams described in his now-classic 1949 account *California: The Great Exception*, California's gold rush and accompanying mineral industry, and its rise as a site of wheat, fruit, and vegetable production, made fortunes as well as paupers. Agricultural work, in particular, required a huge number of temporary pickers who were likely to be vulnerable immigrants, while California's earliest factory workers faced some of the strictest anti-union legislation in the country.[4] Whether in exploiting field workers, suppressing union activity, or undermining the Native American population, 19th-century California businesses often enriched themselves on the backs of an agricultural and industrial underclass that was barred from organizing by law and terrorized by extrajudicial violence.

Yet only half a century later, California looked very different: Its population was larger and wealthier and its economy more equitable. Once an educational backwater, the state was home to some of the finest private and public institutions of higher education in the country, including the University of Southern California (1880), the California Institute of Technology in Pasadena (1891), and the University of California, Los Angeles (established in 1882, and as a state institution in 1919). These institutions eventually served as centers both of education and of research and entrepreneurship in the region. Between 1929 and 1945, California's population swelled by nearly 40 percent, yet this population achieved the greatest per-capita economic growth in the nation, with average incomes 40 percent higher by 1945 than the national average.

Aviation based in the dry-sun-drenched southern part of the state accounted for much of this expansion, but not all of it. Southern California's industrial growth after 1910 owed principally to cultural factors that privileged novelty and risk as well as a geographic remoteness. Tourism, extractive drilling and mining, entertainment, and aviation industries intended to produce goods and services for a

national market brought considerable wealth into the state. And California's growing population and geographic isolation made it a thriving, semi-protected market for smaller industries catering to local needs.[5]

Among the critical requirements for the development of these industries were cheap land and the increased availability, after 1910, of energy—in the form of renewable hydroelectric power and large amounts of petroleum. In 1891, southern California opened its first hydroelectric plant and soon became one of the largest electricity producers in the country.[6] With power abundant, transportation magnate and philanthropist Henry Huntington could profitably blanket the growing Los Angeles metropolitan region with electric railways that facilitated the creation of a metropolis that expanded outward instead of upward, as had been common in Eastern cities. Inexpensive land on the city's outskirts suited factory construction, as manufacturing plants could be made more cheaply as large single-story structures than as the multi-story buildings common in the East.[7] Oil, meanwhile, had been seeping to the surface in southern California for millennia before Europeans arrived in the region. Prospectors discovered significant quantities of recoverable oil in southern California in 1892, and within a decade, California became the nation's chief oil-producing state.



Southern California business leader Henry E. Huntington.

BY BAIN NEWS SERVICE, PUBLISHER, VIA WIKIMEDIA COMMONS

A group of pilots that attended the Dominguez International Air Meet, Los Angeles, January 10-20, 1910.

BY UNKNOWN AUTHOR, VIA WIKIMEDIA COMMONS

Aviation as an industry

The history of heavier-than-air flying machines parallels that of industrialization in numerous ways. A cottage industry of the 19th century utilizing amateur labor and organic materials, aviation was transformed by metal, petroleum, and the scale and scope of 20th century manufacturing. At the same time, the size and complexity of air and space vehicles and their often small production runs has made their creation resistant to automated manufacturing and assembly line practices, and more reliant upon skilled labor than many industries. The first flights that humans experienced occurred in balloons first constructed in France toward the end of the 18th century; creating machines heavier than air that could lift people required the mastery of a different set of technologies, including the construction of light internal combustion engines and airframes capable of generating lift.

While Orville and Wilbur Wright flew the first practical flying machine, they formed part of a larger community experimenting with similar technology: canvas tarps stretched over wooden frames steered by handles and pulleys that altered the geometry of the wings and other flight surfaces, and powered by propellers and gasoline motors comparable to those found in the motorcycles of that period. World War I demonstrated the utility of these craft for transportation, reconnaissance, and combat, and aviation technology improved dramatically after the war in several countries. Aircraft made entirely of metal began to appear in significant numbers in the 1920s, while navigation and communications improvements made flight increasingly safe for average people. In the United States, the Kelly Act of 1925 awarded government contracts to private carriers to deliver mail by air, subsidizing the development of a robust commercial airline business.[8]

Aviation arrived in southern California as the result of affirmative steps by aviation pioneers and local boosters who hoped to capitalize on existing energy resources and create in the region the aeronautical equivalent of Detroit's thriving automotive industry.[9] In 1910, Los Angeles sports promoter Dick Ferris, newspaper magnates William Chandler and William Randolph Hearst, and local businesses

organized the Los Angeles Air Meet with the hope of attracting national interest in air racing and aviation technology. A booster for the region in addition to a transportation magnate, Huntington donated $50,000 to support the Meet, which he hoped would both attract business investment and create passengers for Huntington's regional rail system. (Rather than spurning a transportation technology that could someday replace his own, Huntington determined to develop and profit from it himself.)

The effort was a success. Nearly a quarter-million people attended the December exposition at Dominguez Field on the outskirts of Los Angeles. For 10 days, a total audience two-thirds of the size of the city's population watched aviators demonstrate their craft amid beautiful weather at a time when snow and cold weather blanketed much of the country.

Prior centers of aviation research—Washington, D.C., and Long Island in New York—offered better proximity to government and private capital, but southern California's burgeoning business community (especially in its newspaper, oil, and transportation sectors) recognized aviation as potential growth technology that leveraged California's existing strengths in land, weather, and energy. The leaders of these business interests also embraced the potential cultural role of aviation, hoping the appearance of modernity would be a powerful draw for out-of-state investors. The oil, rail, motion picture, and other industries also played a major role in the construction of airfields throughout in the region.[10] Aircraft featured prominently in early Hollywood films: Good weather and the co-location of airstrips and studios made these productions relatively easy to film all year-round. These fields soon became sites of airframe and aircraft engine design and production industry; by 1928, more than two dozen aviation manufacturers were operating in the region, including future giants Lockheed, Douglas, North American, Ryan, and Northrop.[11] Others would follow.

A poster of the 1910 International Air Meet, held at Dominguez Field in Los Angeles.

BY UNKNOWN AUTHOR, VIA WIKIMEDIA COMMONS

Most surprising about California's economic growth during the first half of the 20th century was the degree to which its benefits distributed widely among its citizens. A large number of working-age adults, the feasibility of year-round outdoor employment, and a large number of prosperous industries offering higher-paid work and high returns for the number of persons employed, kept wages relatively

high and produced a state of consumers rather than debt-laden subsistence farmers or penniless migrant workers. Because it tended to sprout near rural airstrips, the aviation industry brought well-paying manufacturing jobs out of the crowded Los Angeles downtown and into suburban neighborhoods that offered cheaper, better housing than that offered in the city's center.[12]

The USS Arizona during the Japanese attack on Pearl Harbor.

BY UNKNOWN AUTHOR, VIA WIKIMEDIA COMMONS

The explosive growth of the aviation industry during World War II accelerated population growth and economic development, but did not fundamentally alter an existing pattern. "War or no war," the historian McWilliams writes, "the expansion would have occurred."[13]

California in war and peace

During World War II, the C-47A Skytrain was built by, the Long Beach based, Douglas Aircraft Company.

BY ADRIAN PINGSTONE (ARPINGSTONE), VIA WIKIMEDIA COMMONS

Californians had effectively laid the foundations for the region's World War II-era industrial boom with the expansion of the energy and aviation industries, positioning the region both to take advantage of federal contracting dollars and to provide the infrastructure necessary to provide quality of life for thousands of new workers. Despite the hardships of the Great Depression of the 1930s, Los Angeles retained its status as California's foremost manufacturing center throughout the decade. On the strength of its factories, the city accounted for 41.5 percent of the state's total employment by 1940. By 1947, Los Angeles's manufacturing base was nearly double that of San Francisco's, but the growth had begun well before Pearl Harbor. "[W]artime expansion," McWilliams remarks, "merely accelerated a long-term trend."[14]

War in Europe and the Pacific in 1941 added greatly to California's fortunes, though, in often unique ways. "Unlike other areas," McWilliams writes of wartime Los Angeles, "the West did not *convert* to war production for there was nothing much to 'convert.'" Indeed, southern California's peacetime development of a manufacturing base grew economically in the 1940s by greatly expanding its labor force and quickly embracing new industries rather than displacing older ones. The distinction was a critical one both for the speed of California's industrial boom and for its social impact: California enjoyed sufficient size and population growth to support both its older industries and its newer ones. This dynamic helped California avoid much of the social dislocation and unemployment that accompanies massive shifts in a region's productive enterprises, and the region was partially insulated from the later postwar demobilization of the aviation industry.

Once federal contracting dollars arrived, California experienced a boom that stretched its housing, water, and power generation capacity, but which ultimately produced expansion of its aviation industry and unparalleled prosperity that only increased after the end of the war.[15] Like many states, mobilization for World War II brought significant outside funding into the state: nearly 10 percent of all federal funding for the continental United States. A large, populous state border-

ing a contested ocean and protected by many ports and airfields, California saw the construction of new military camps, shipyards, and other installations that provided jobs for thousands of people. Wartime labor needs demanded that factory owners open their doors to women and minority workers, increase on-the job training, and offer health benefits to their workers, helping to ensure federal spending produced equitable growth for the region's workers.[16]

Women at work on a bomber at Douglas Aircraft Company.

BY ALFRED T. PALMER, VIA WIKIMEDIA COMMONS

While the accidents of geography and history that made aircraft one of California's major industries would prove fortuitous, government policies surrounding wartime contracting made certain that prosperity would be shared widely. Aircraft accounted for 60 percent of federal spending in California, and the production of aircraft required large plants employing many thousands of workers (most with only high school educations[17]) as well as related industries in materials and electronics.[18] Lockheed's wartime payroll peaked at 94,000 workers.[19] These manufacturing facilities could not be moved overseas for technical and security reasons, making the sites of existing aircraft fabrication the beneficiaries of increased production.

Already home to aviation companies, among them Lockheed and Douglas, southern California was well-positioned to benefit from military production contracts. Unused, parched land outside of Los Angeles proved perfect for aviation plants, while the desolate dry lake beds nearby provided natural landing strips and test facilities for aircraft. Eventually, Lockheed opened feeder plants in Bakersfield, Fresno, Pomona, Taft, and Santa Barbara, to keep its Los Angeles manufacturing on schedule.[20]

Instead of enriching a few industrialists, government management of the economy ensured that federal contracting dollars were spread throughout the community. Wartime economic restrictions limited war profiteering by regulating contracting practices and directly controlling wages and taxation. Defense industries produced war materiel under "cost-plus" contracts that guaranteed business owners a modest but reliable return on their investment, no matter the scale or cost of production.[21] This policy encouraged ambitious industrialists to increase production rather than fire workers, as the former strategy offered the only route to increased profits. Government contracting policy (including the requirement of multiple manufacturers for critical items) also disfavored consolidations among aviation manufacturers, insuring a robust competitive landscape and abundant opportunities for newer entities. Policing of defense contracts by Sen. Harry S. Truman of Missouri and other government officials encouraged transparency and reduced graft.

In a time of unprecedented federal spending, a variety of economic mechanisms acted directly to spread government largess and reduce the disparity between the

highest- and lowest-paid employees in private firms. High federal income tax rates (the highest marginal rate was in excess of 90 percent) and higher corporate tax rates encouraged industrialists to invest earnings in increased production capacity rather than extract them as profit or dividends, while wartime restrictions made various contemporary forms of tax avoidance, such as reincorporation on foreign soil, impossible. The National War Labor Board, meanwhile, acted to limit wage inflation among the highest-paid employees while allowing periodic increases to wages for lower-paid workers.[22]

The result was thousands of relatively well-paying factory jobs. With civilian industry curtailed due to wartime economic restrictions and food rationed, the workers with surplus income were likely to save or invest it in war bonds or other securities, ensuring financial security for years to come.

The workers who flocked to southern California during World War II largely stayed after its conclusion.[23] This could have brought economic ruin to the state, but did not, largely due to commitments by federal state leaders and private businesses to expand local housing, education, utility, and transportation infrastructures. Generous educational and other benefits offered to returning service members under the Servicemen's Readjustment Act of 1944, for example, enabled many Californians to afford education and retraining for civilian life. A bipartisan commitment to growth, particularly under two-term Democratic Gov. Edmund Gerald "Pat" Brown, Sr. (1959–1967), led to an increase, not only in the size of California's public university system, but more critically, the infrastructure needed to supply the southern half of the state with enough water to fuel its explosive business and housing growth (at least for a time).[24]

An advertisement promoting the affordability of a Lakewood home in the early 1950's.

LAKEWOODCITY.ORG

Housing developments not far from southern California's aeronautical plants, author Joan Didion recalls of her childhood, sprouted almost overnight in gargantuan form after World War II, such as the 17,500 homes in Lakewood that promised returning veterans "ownership of a piece of the future."[25] While these manufactured neighborhoods would, in the late 1960s, give rise to a new kind of ennui, it was an ennui born of boredom, not material privation. At the time, "boxy" tract home developments in Lakewood and elsewhere placed homeownership within easy reach of blue-collar employees, especially the "Aviation Oakies" who had migrated to California after finding few job prospects in the Middle West. Accounts of the burst of the aerospace bubble often emphasize the psychic dislocation caused in Lakewood and other suburban cities, but even these temporary communities enjoyed decades of prosperity before their eclipse.[26]

Buzz Aldrin walking on the Moon, on Apollo 11, July 20–21, 1969.

BY NASA, VIA WIKIMEDIA COMMONS

Space and beyond

For southern California's aviation workers, postwar peace could have led to a catastrophic demobilization; while orders for civilian aircraft continued, military contracts had always promised the most certain profit base for aviation manufacturers. The wars in Korea in 1950 and Vietnam in 1965, though, spurred a second burst of military spending, supplemented, in the 1960s, by new contracts associated with both civilian and military space programs funded at near-military levels. Between 1961 and 1973, the National Aeronautics and Space Administration undertook a series of explorations of space, many in rockets and spacecraft design and built wholly or in part in southern California. The total amount of money spent by the civilian on the Project Apollo lunar landing program has been estimated to be as high as $25 billion in 1973 dollars (approximately $150 billion in 2015); 9 out of every 10 of those dollars purchased technology from U.S. businesses and research institutions. Similar expenditures financed the creation of fleets of intercontinental ballistic missiles, reconnaissance and communications satellites, launch vehicles, and a host of military space projects supported by additional congressional appropriations.

Throughout these decades of intermittent wars both hot and cold, demand for jet and missile technology reinvigorated the aviation industry and helped California maintain a vibrant industrial base characterized by a large number of employers and relatively high wages. Critically, the region's wartime mega-employers also never came to control economic activity in the region. While Los Angeles eventually attracted and created industrial powerhouses, these entities did not temper the entrepreneurialism of the region or limit economic activity to only a few very profitable enterprises. In 1949, 92,000 of Los Angeles's nearly 96,000 businesses had fewer than 50 employees; these businesses escaped absorption by larger entities and produced specialized products that found ready markets among the city's diverse populations.[27]

Throughout southern California, capital availability, educational institutions, and a culture that privileged inventiveness and novelty enabled former aerospace

workers to create whole new industries devoted to the arts, entertainment, and recreation—from computer animation to surfing[28]—which, in many cases, outlived the aerospace industries that spawned them. To travel to California in 1963, as *Mad Men*'s melancholic advertising executive Donald Draper (Jon Hamm) does in one 2009 episode, is to arrive in a place where "[e]verything is new, and it's clean. The people are filled with hope."[29]

One reason for that feeling was the popularization of new forms of architecture for public spaces that built upon an existing vocabulary of modernism but which appealed self-consciously to visions of the future, including space travel.

The Theme Building at LAX was designed by a team of Architects and Engineers headed by William Pereira and Charles Luckman.

BY MONKEYTIME | BRACHIATOR, VIA WIKIMEDIA COMMONS

Architects such as William Pereira pioneered the style for the headquarters of aerospace corporations, but it soon found wide use throughout the country.[30] The computer simulations developed by the region's aerospace research institutions—such as Pasadena's Jet Propulsion Laboratory—found their way into Hollywood movies, enriching this longstanding industry with technologies of a new era.[31]

Why equitable growth?

While blessed with more environmental and climatic attributes than other locales, southern California's rise as an economic center was not preordained or inevitable. Sparsely populated and beset with transportation and water-use problems, California would have remained an agricultural region of moderate productivity had wealthy private individuals and local, state, and federal governments not decided, during the 20th century, to intervene decisively in the region's economic development. The reasons for these interventions were neither uniform nor unvarying, but they shared a recognition that economic progress, for the captains of industry and for the population generally, required the near-simultaneous establishment of a nexus of interconnected resources—public transportation, educational institutions, and reliable, high-wage employment.

California's citizens regarded the development of these institutions and infrastructures as neither wholly private nor wholly public responsibilities. In the same way that federal, state, and local government would facilitate economic activity through private contracting activities, the area's wealthiest residents (among them Huntington and Hearst) recognized their role as boosters and philanthropists for aviation and for the region. They regarded their generosity as a long-term investment in their state that would reap dividends both tangible and intangible.

Southern California's exponential growth was facilitated by a global marketplace but nurtured by a protected, local one: Absent California's geographic isolation, the tens of thousands of small businesses that provided economic mobility and innovation for the larger economy would have never emerged. The greatest generator of high wages for southern California's industrial workers was labor scarcity brought on by geography.[32] Efforts to increase employment by reducing restrictions on business or curtailing the power of labor often acted only to depress wages and increase temporary profits. California's many isolated ethnic and cultural subcultures, meanwhile, enhanced the economic opportunities available to all citizens by creating markets for unique foods, music, clothing, and other goods

and services for distinct communities. Had transportation, labor, and markets been truly global in 1910, California's manufacturing industries would likely have never emerged or emerged more slowly, and economic growth would have stalled.

Similarly, had southern California merely exchanged one national product for another—agricultural production for aerospace contracting—the state's economy would have collapsed after World War II. Instead, the region experimented with new industries, including clothing[33] and entertainment locally, and then exported its innovations nationally as the rest of the United States began to recognize California's appeal. Later, the rapid exploitation of technology (entertainment, aerospace, electronics) prevented any single, favored industry from depressing wages or parasitizing the local economy. When consolidations and mass layoffs finally struck the southern California aerospace industry in the 1990s, the region struggled to recover, but a diverse economic life helped to ensure that it would remain known for what is and will be, rather than what it was.

Airplane factories looked to the Los Angeles area not for tax breaks but for the region's weather and geographic features, education institutions, and a quality of life that attracted workers at all socioeconomic levels. This imported human talent, much of which had already gambled on emigration westward, proved amenable to innovation and transformation. A combination of easy living, economic opportunity, and creative destruction permeated the region, offering ample opportunities for both reliable, equitable growth and entrepreneurship. In southern California, a cultural synthesis emerged around aerospace, modern architecture, informal and comfortable clothing, warm-weather activities, music, film, television, and an ethos of casual luxury represented in apparel and other products that found export markets even in colder climes on the East Coast.

Conclusion

How did southern California maintain a vibrant economic base while other, similar communities faded after World War II? Other regions that produced for wartime needs experienced a temporary boom but fared badly upon the cessation of hostilities, while still others enjoyed a robust civilian market for a time before contracting. Even as the rest of the nation experienced deindustrialization in the 1970s, California managed to not only retain its manufacturing but grow it slowly.[34] Much of California's continuing success in this period appears to owe to the large, mostly independent market the state offered, and well as the connections it fostered between private industry and the establishment of the infrastructure of civil society.

The growth of the aviation industry had been accompanied by housing, schools, and entertainment facilities for hundreds of thousands of people. Southern California, a region steeped in notions of the frontier and relatively tolerant of novelty and difference, encouraged the growth of vibrant "do-it-yourself" cultures that ranged from agricultural collectives to hot-rodding. And, most importantly, the region offered a landscape of social mobility in which blue-collar workers could expect their children to achieve even more than they had. California emerged in the 20th century as a cultural touchstone in addition to an economic region, creating a worldwide popular interest in its habits and lifestyle that itself became a marketable commodity.

About the author

Matthew Hersch is an Assistant Professor of the History of Science at Harvard University, and a Research Associate of the Smithsonian Institution's National Air and Space Museum. After receiving his S.B. in Political Science from the Massachusetts Institute of Technology, he received a J.D. from New York University School of Law and an A.M. and Ph.D. in the History and Sociology of Science at the University of Pennsylvania, where he taught as a Lecturer in Bioengineering, and in Science, Technology and Society. During 2007–2008, he served as a Guggenheim Fellow of the Smithsonian Institution's National Air and Space Museum, and during 2009–2010, furthered his research as the History of Science Society/National Aeronautics and Space Administration Fellow in the History of Space Science. Dr. Hersch also served as the 2010–2011 National Science Foundation Postdoctoral Teaching Fellow in Aerospace History with the Huntington-USC Institute on California and the West, where he worked with the Aerospace History Project to exhibit the history of California's aerospace engineering community.

Acknowledgements

The author wishes to thank William Deverell and Peter Westwick of the Huntington-USC Institute on California and the West for their assistance with this research.

Endnotes

1 A complete account of the history of this region is beyond the scope of this work. See, e.g., Kevin Starr, *Material Dreams: Southern California through the 1920s* (New York: Oxford, 1990); Kevin Starr, *Embattled Dreams: California in War and Peace, 1940–1950* (New York: Oxford, 2003); Kevin Starr, *Golden Dreams: California in an Age of Abundance, 1950–1963* (New York: Oxford, 2009).

2 See, e.g., Kyser Center for Economic Research, "The Aerospace Industry in Southern California" (LAEDC, 2012).

3 E.g., Peter J. Westwick, ed., *Blue Sky Metropolis: The Aerospace Century in Southern California* (Berkeley and Los Angeles: University of California Press, 2012).

4 Carey McWilliams, *California: The Great Exception* (Berkley: University of California Press, 1999) (first published, 1949).

5 McWilliams, 226.

6 Ibid., 235.

7 Ibid., 236.

8 See, e.g., Roger Bilstein, *Flight in America* (Baltimore: Johns Hopkins, 1994). The literature on the history of aviation is exhaustive and largely beyond the scope of the present study.

9 Peter J. Westwick, "Photo Essay: An Album of Early Southern California Aviation," in Peter J. Westwick, ed., *Blue Sky Metropolis: The Aerospace Century in Southern California* (Berkeley and Los Angeles: University of California Press, 2012), 22.

10 Ibid., 17.

11 Ibid., 26, 30.

12 Ibid., 26.

13 McWilliams, 234.

14 Ibid., 233–35. See, also, Paul W. Rhode, *The Evolution of California Manufacturing* (San Francisco: Public Policy Institute of California, 2001), 13.

15 McWilliams, 233.

16 James J. Rawls and Walton Bean, *California: An Interpretive History* (New York: McGraw-Hill, 1993), 335–336.

17 Sherman N. Mullin, "Robert E. Gross and the Rise of Lockheed, in Peter J. Westwick, ed., *Blue Sky Metropolis: The Aerospace Century in Southern California* (Berkeley and Los Angeles: University of California Press, 2012), 64.

18 Rawls and Bean, 339.

19 Westwick, 30. See, also, Mullin, 63–65.

20 Ibid., 64.

21 Rawls and Bean, 339.

22 See, e.g., Thomas Piketty and Emmanuel Saez, "Income Inequality in the United States, 1913–2002," in A.B. Atkinson and T. Piketty eds., *Top Incomes over the Twentieth Century: A Contrast between European and English-Speaking Countries* (Oxford University Press, 2007).

23 "Departmental Change and Growth through the Years of Depression and War, 1927–1945," in *A History of the California State Department of Education 1900–1967* (Sacramento: Bureau of Publications, State Department of Education, 1968).

24 See, e.g., Adam Nagourneymay, "Brown's Arid California, Thanks Partly to His Father," *New York Times*, May 17, 2015: A1.

25 Joan Didion, *Where I Was From* (New York: Vintage, 2003), 103–105.

26 D. J. Waldie, "Lost in Aerospace," in Peter J. Westwick, ed., *Blue Sky Metropolis: The Aerospace Century in Southern California* (Berkeley and Los Angeles: University of California Press, 2012), 37–38.

27 McWilliams, 223.

28 E.g., Peter Westwick and Peter Neushul, *The World in the Curl: An Unconventional History of Surfing* (New York: Crown, 2013).

29 "Love among the Ruins," *Mad Men*, directed by Lesli Linka Glatter (Episode 302, aired August 23, 2009, AMC).

30 Stuart W. Leslie, "Spaces for the Space Age: William Pereira's Aerospace Modernism," in Peter J. Westwick, ed., *Blue Sky Metropolis: The Aerospace Century in Southern California* (Berkeley and Los Angeles: University of California Press, 2012), 127–158.

31 Peter J. Westwick, "Aerospace and Hollywood: How Computer Animation Went from Space to Cineplex," in Peter J. Westwick, ed., *Blue Sky Metropolis: The Aerospace Century in Southern California* (Berkeley and Los Angeles: University of California Press, 2012), 159–170.

32 See, McWilliams, 152.

33 Ibid., 218–

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