CALIFORNIA STATE UNIVERSITY, DOMINGUEZ HILLS

SOUTH BAY ECONOMIC FORECAST & INDUSTRY OUTLOOK

2021-2022

SOUTH BAY ECONOMICS INSTITUTE
CALIFORNIA STATE UNIVERSITY, DOMINGUEZ HILLS

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About California State University, Dominguez Hills

California State University, Dominguez Hills was founded in 1960 and permanently relocated to Carson in 1965 in response to the Watts Rebellion and the need to increase access to higher education for Southern California residents. For over 50 years, CSUDH has served a diverse community of learners and educators collaborating to change lives and communities for the better. CSUDH is committed to connecting its students to a higher-quality, transformative education while providing the L.A. region with a vital resource for the talent, knowledge, skills, and leadership needed to thrive today and tomorrow. Of the university's over 100,000 alumni, 65% live and work within 25 miles of campus.

About the South Bay Economics Institute

The South Bay Economics Institute at CSUDH aims to lead the South Bay region with innovative and forward-thinking economics education and research. The Economics Institute serves the College of Business Administration and Public Policy faculty and students, as well as community stakeholders, by:

Developing CSUDH economics curriculum and teaching while incorporating proven high-impact practices;

Engaging our diverse student body in economic analysis projects through mentoring programs, guest speakers, and community outreach opportunities;

Facilitating faculty development through economics research resources, grant writing deliverables, and local business and government community engagement.

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OVERVIEW

The Grand Reopening! Just as 2020 was the year of the COVID-19 pandemic and economic shutdowns, 2021 has been the year of reopening. The vaccine rollout during early 2021 and a declining winter COVID-19 surge were met with a softening of government lockdowns and reopening of schools. This began a cautious and gradual return to "normal" life and economic activity. Offices began to welcome back employees, though perhaps with new flexible schedules. Restaurants and bars began to fill again, even though indoor dining areas were less packed than before. Consumers hesitantly reentered their favorite gyms, theaters, and museums, if they were still in business.

By the summer months, the economy was starting to purr. High vaccination and low COVID-19 rates were dampening public fears, and consumer confidence was buoyed thanks to pent-up demand, government stimulus checks, and the promise of a hot summer. Domestic tourism spiked, pushing up prices of hotels, flights, and especially rental cars. Open air destinations and events were often busier than pre-pandemic levels. Such was the increase in demand that businesses were scrambling to hire workers, and price increases were starting to pinch for the consumer. There was also greater optimism in the business community, as investments picked up and new businesses were launched.

As we look forward, there are many reasons to be optimistic about the state of the economy, especially in the South Bay region. Major national forecasters anticipate strong economic growth to continue into 2022 and beyond, with unemployment continuing to decline. The return of something close to a pre-pandemic normality—reflected in reopening businesses, lower health wariness, children returning to school in person, and increasing consumer confidence—is expected to combine with low interest rates and government infrastructure spending to create sustained economic growth. Locally, the COVID-19 period has shown regional businesses and communities to be innovative, adaptive, and resilient in the face of adversity. These qualities will enable them to thrive as the virus threat diminishes. We encourage regional policymakers to continue business-friendly programs, such as allowing flexibility for outdoor dining, and to invest in our region's transportation and communications infrastructure.

In all, the COVID-19 pandemic has been remarkable from an economic perspective. The initial recession was unprecedented in its depth. The speed of the economic recovery has also not been seen before. Americans have experienced substantial changes to their home and working lives, as telecommuting has become commonplace, shopping has shifted online, and schooling has been conducted remotely; all through a computer screen. While these changes have demonstrated resiliency in the face of adversity, they have also caused many to reevaluate their participation in the labor market, their spending habits, their place of residence, and their life priorities. The pandemic has also exposed many inequalities in our society, with less affluent, minority communities in our region bearing the brunt of health and economic impacts.

Macroeconomic Trends

- Most forecasters predict a GDP growth of 4%-6% in 2021 for the US, which could be the strongest since 1984. The pace of growth will likely slow to around 4% in 2022.
- The unemployment rate is generally anticipated to return to around 4.5-5% by the end of 2021, and down to 4% in 2022.

OVERVIEW

All this raises numerous important questions about the state of the South Bay economy and how it will fare in the coming years:

SECTION 1: THE GRAND REOPENING

- *How long will labor shortages last?*
- *Is price inflation here to stay?*
- *Are we seeing a housing market bubble?*
- *Where are entrepreneurs and investors placing their bets?*

SECTION 2: THE IMPACTS OF THE COVID-19 RECESSION

- *How does this recession compare to previous ones?*
- *How have financial markets fared?*
- *What economic changes did COVID-19 accelerate?*

SECTION 3: LOOKING AHEAD

- *How quickly will we get back to normal?*
- *What innovations will shape our region's future?*
- *What are the South Bay's strengths as we look to the future?*

GEOGRAPHICAL SCOPE

In this report, the South Bay region of Los Angeles County includes the following incorporated cities and communities:

- Avalon
- Carson
- El Segundo
- Gardena
- Hawthorne
- Hermosa Beach
- Inglewood
- Lawndale
- Lennox
- Lomita
- Manhattan Beach
- Palos Verdes Estates
- Rancho Palos Verdes
- Redondo Beach
- Rolling Hills
- Rolling Hills Estates
- Torrance
- Harbor City/Harbor Gateway
- San Pedro
- Wilmington
- Rancho Dominguez
- View Park/Windsor Hills

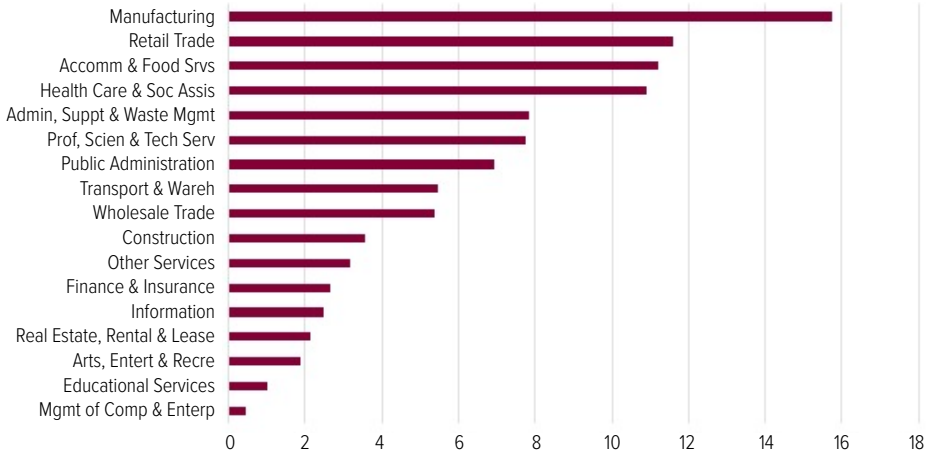
SECTION 1 THE GRAND REOPENING OF 2021

How long will labor shortages last?

While labor shortages have been a concern in 2021, the labor market appears to have largely recovered already. The labor market experienced substantial upheaval during the COVID-19 pandemic. Many workers were laid off due to lockdown measures, with unemployment insurance provisions softening the blow to household finances. However, many businesses began re-hiring quickly after the shutdowns, such that national unemployment rates returned quickly to mid-2010s levels. As with prior periods, there remains a structural gap between total unemployment and the rates for African Americans (8.8% in August 2021) and Latinos (6.4% in August 2021). At the state level, California has an unemployment rate of 7.6%, compared to 7.6% in New York, 6.2% in Texas, 7.1% in Illinois, and 6.6% in Pennsylvania.

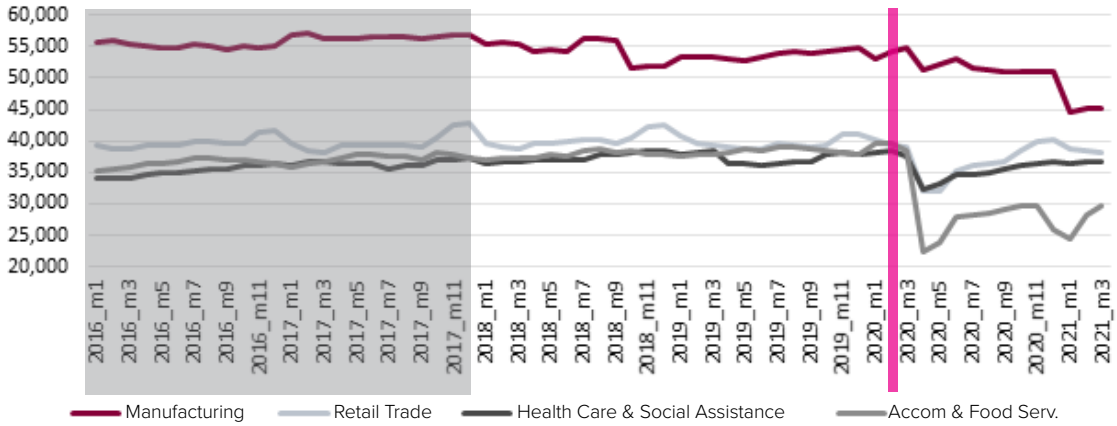
The South Bay's employment conditions are highly influenced by conditions in Los Angeles County and the Southern California economy. Prior to the COVID-19 outbreak, Manufacturing, Retail Trade, Accommodations, and Food Services, and Health Care and Social Assistance were the major employers in the South Bay, accounting for nearly half of all jobs (see Figure 1). As early-2020 Stay-at-Home orders took effect, employment in all major South Bay industries declined sharply, particularly in Accommodations and Food Services, Retail Trade, and Health Care and Social Assistance, which typically require close indoor contact with customers. Between 2019 Q2 and 2020 Q2, overall employment in the South Bay declined by more than 12%, which is slightly smaller than the 14.2% decline for the Los Angeles Metropolitan Area (see Figure 2).

FIGURE 1. SOUTH BAY EMPLOYMENT BY INDUSTRY SECTOR (% OF TOTAL), 2019



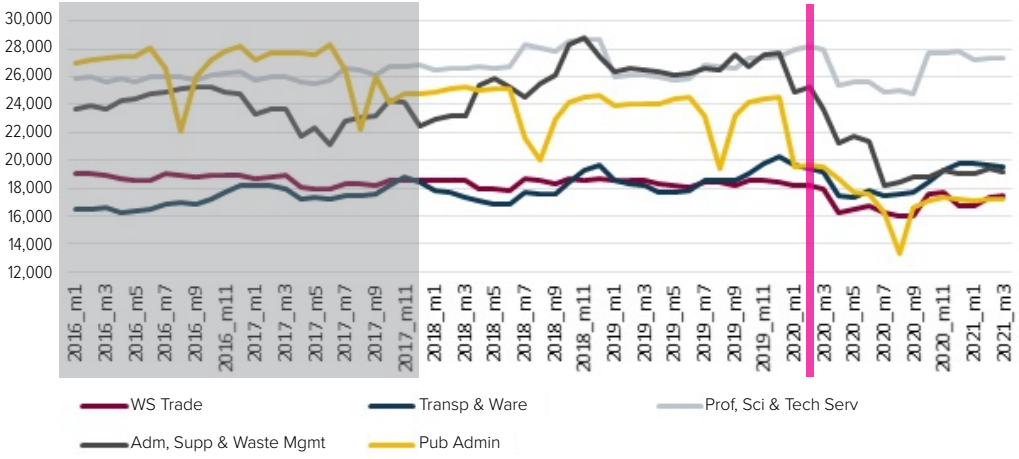
Source: California EDD data and authors' calculations. Some data was suppressed due to confidentiality.

FIGURE 2. TOTAL JOBS IN FOUR LARGEST SOUTH BAY SECTORS



Among the South Bay's large industries, Manufacturing saw a relatively smaller decline due to the pandemic but has struggled recently to get back to pre-pandemic levels. This is likely due to a lack of available workers and input shortages. In contrast, Retail Trade and Health Care and Social Assistance saw significant job declines initially but have now mostly recovered. For Health Care and Social Assistance, ongoing pandemic health risks and burnout among frontline health workers might explain lingering labor shortages. Public Administration and the Administrative and Support industries saw even larger job cuts in the South Bay, as public finances struggled to adjust to reduced sales tax revenues. However, Professional, Scientific, and Technology Services saw a relatively small decline in employment, and have now recovered completely.

FIGURE 3. TOTAL JOBS IN FOUR NOTABLE SOUTH BAY SECTORS



Considering the most recent data available, overall employment by industry in the South Bay cities is still below pre-pandemic levels. However, the overall number of establishments in the South Bay continued to increase and even accelerated for many of the South Bay's major industries, particularly in the Arts, Entertainment and Recreation, Educational Services, Professional, Scientific and Technology Services, the Real Estate, and the Rental and Leasing industry. **Considering the work disruptions caused by pandemic that continue to force people and businesses to adjust and innovate in order to survive, the South Bay's increase in the number of establishments, along with a decrease in employment, could be part of the creative destruction process—the innovation-driven process that replaces old production processes with new ones. As such, it can be argued that industries in the South Bay may now be more resilient than before the COVID-19 pandemic.**

FIGURE 4. SOUTH BAY TOTAL ESTABLISHMENTS AND WAGES

Employment and Comparison with Prior Recessions

- Employment disruptions in the South Bay could be part of the creative destruction process, the innovation-driven process that replaces old production processes with new ones. It can be argued that industries in the South Bay may now be more resilient than before the COVID-19 pandemic.
- The 2007-2009 recession was caused by structural problems in the economy, for the most part, while the most recent one, caused by the exogenous shock of the COVID-19 pandemic. As such, we should expect a relatively faster recovery for the latter, though new variants of the virus might delay the recovery.
- For the most part, the current pace of the recovery has been remarkable, especially when compared to the 2007 recession. Back then, it took about 20 quarters to reach the pre-recession employment peak. At this rate, it will be until 2026 Q3 for the U.S. to reach pre-pandemic peak employment levels.
- At the August 2021 pace of the jobs report, which most economists considered significantly disappointing, it will take until June 2023 to reach pre-COVID-19 levels of employment. Even so, this will make the current recovery at least twice as fast as the 2007 recession.

Is inflation here to stay?

With the economy growing rapidly, there are concerns over inflation. Inflationary periods are a normal function of macroeconomic activity. However, the rapid reopening of once-shuttered sectors of the economy, increases in consumer spending, and the government stimulus packages have caused significant price shocks. These price increases are not expected to continue as industries will adjust to new supply chain flows and businesses will expand to meet market demands. Projections from major economic forecasters do not anticipate inflation to be a concern beyond 2021.

For the 12-month period ending in June 2021, consumer prices had increased by 4.2% for Restaurants, 4.9% for Apparel, and 2.6% for Shelter.[i] These jumps reflect relatively sudden consumer demand hikes, which are not fully met by required increases in supply. There will have been some surplus in supply, as many restaurants, stores, and housing had in effect "mothballed" some operations due to government lockdowns. However, upstream shortages in products purchased by these sectors, along with labor shortages, will have pressured companies to pass costs through to their customers.

The most startling price increases are in gasoline and used cars and trucks, both over 40%. These are particularly interesting because these are more consumer-driven and rely less directly on labor supply. The gasoline prices are driven by travel patterns, which dropped substantially in 2020, and have returned gradually since (see further discussion below). Similarly, car and truck rental prices increased significantly month-to-month during spring and early summer 2021, reflecting a surge in vacation booking demand. The used cars and trucks price increase far outweighs price changes to new vehicles, which only increased 5.3% over the same period. There have been supply shortages for new vehicles, which have, and will continue to be, impacted by current COVID-19 lockdowns in the Asian market and shortages in semiconductor chips. These lockdowns will be particularly impactful for the South Bay, given the critical role of the Ports of Los Angeles and Long Beach in the region's economy (see further discussion below).

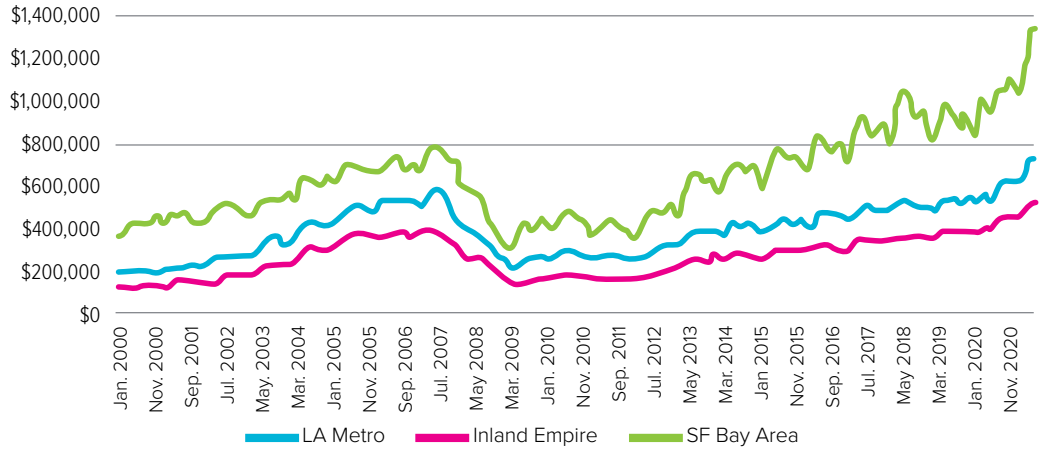
These price changes also reflect shifts in consumer spending, as we have replaced services with goods. Spending on services has declined significantly between April 2019 and May 2021, as seen with airline flights (-17%), taxis and ride shares (-30%), hotels (-38%), hairdressers (-46%), sports entertainment events (-65%) and movie theaters (-89%). In contrast, goods consumption increased significantly, such as lottery tickets (+18%), jewelry (+28%), televisions (+36%), games and toys (+53%), computer equipment (+58%), and new light trucks (+66%).[ii] While Los Angeles and the South Bay are dependent on services for employment in particular, the region is also an important importer and manufacturer of goods.

Are we seeing a housing market bubble?

In short, no. There does not appear to be an unsustainable speculative bubble in the housing market. Demand has increased as households cramped during lockdowns are seeking more spacious homes and neighborhoods. Historically low interest rates and household savings have allowed many to join or move up the property ladder. However, supply remains tight in Southern California as local planning rules are restrictive and homeowners are unwilling to sell.

Figure 5 (on page 9) shows median single-family home prices in Los Angeles, the Bay Area and the Inland Empire. The COVID-19 effect on prices was temporary and small: lowering in March to May of 2020 and recovering between June 2020 and April 2021; price increases have since slowed during May to June of 2021. This pattern is very different from the 2008 recession, where L.A. housing prices decreased for 25 months, and then took 158 months to recover to the pre-recession levels.

FIGURE 5. MEDIAN PRICE OF SINGLE-FAMILY HOMES (DETACHED ONLY)



Interestingly, price trends don't directly reflect sales trends (see Figures 6 & 7). The deep drop in sales between February and May of 2020 was not followed by a strong recovery between June 2020 and March 2021. Since then, sales have picked up, while prices growth has slowed down. This suggests sellers perceived the price drops last year as temporary and waited, postponing their sales.

Data on L.A. housing time on the market support this hypothesis (see Figure 7). Time on market slightly increased between June 2019 and June 2020, then strongly decreased by June 2021. L.A. homeowners are not selling; they are waiting for better prices to cover the high costs and taxes associated with selling property, the high cost of purchasing a new home, or the potential increase in property taxes for a new residence. This unwillingness to sell combined with demand recovery to push up prices during February—April of 2021.

FIGURE 6. YEAR-ON-YEAR PERCENT CHANGE IN SALES (L.A. REGION COUNTIES)

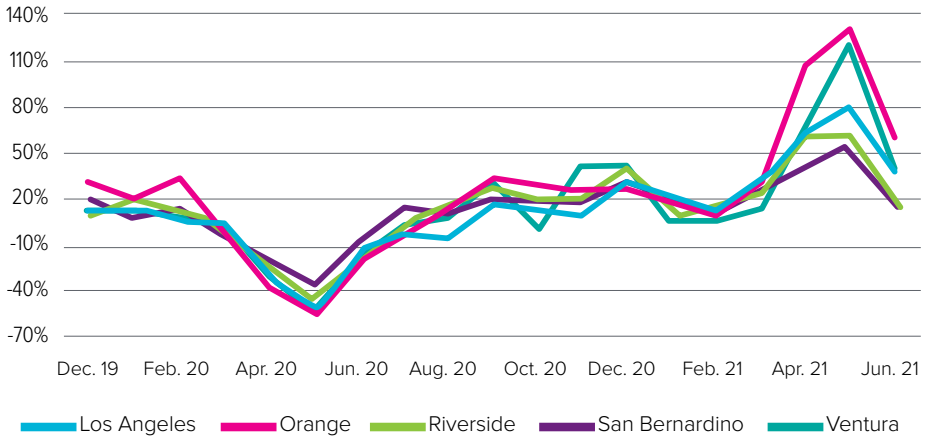
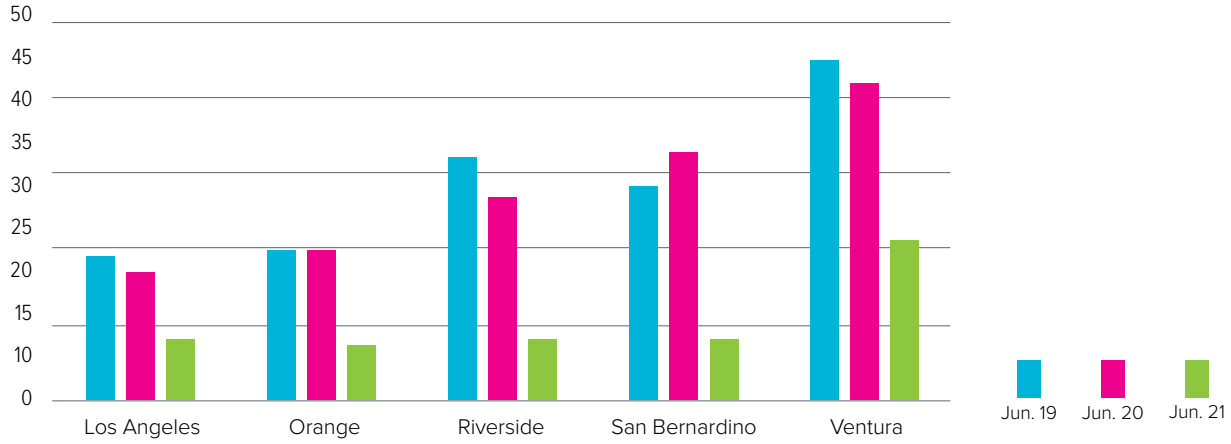


FIGURE 7. MEDIAN TIME ON MARKET (DAYS)



Figures 5, 6 & 7 – Source: own elaboration California Association of Realtors data

Housing

- Housing prices in the L.A. region recovered much faster during the Pandemic-emergency crisis of March-June 2020, than during the recession of 2008.
- Housing sales have not kept pace with the price recovery, with an unusually low indicator for days in market and low inventories.
- Coastal cities in the South Bay have higher housing prices, and have had a stronger price recovery since June 2020, when compared to other cities of the South Bay.

The South Bay housing market has performed differently to the region in terms of price recovery, housing units' sizes, and sales. As shown in Figures 8 & 9, in July 2021 the highest prices were reported in coastal cities (Manhattan Beach, Hermosa Beach, and Palos Verdes Estates). However, other cities had stronger price growth: Inglewood, Wilmington, and Rancho Palos Verdes. Hermosa Beach and Rolling Hills even experienced negative price growth, lagging in reference to the local and regional trends. The case of Hermosa Beach is notable, given its high prices but slow price growth.

FIGURE 8: HOUSING PRICES IN SOUTH BAY CITIES

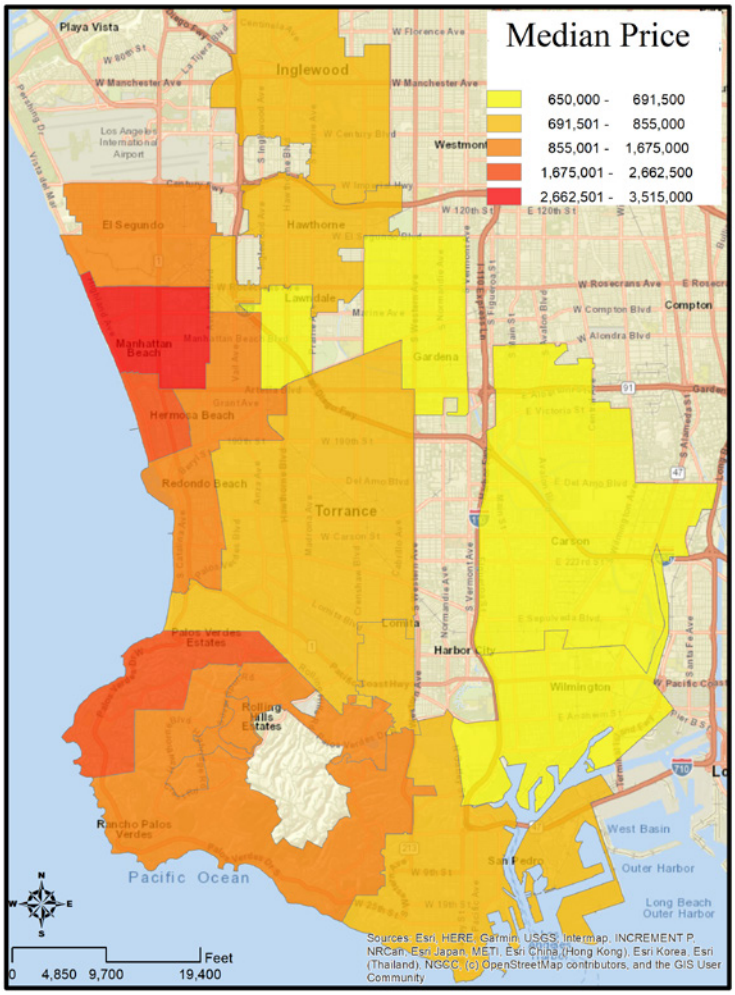
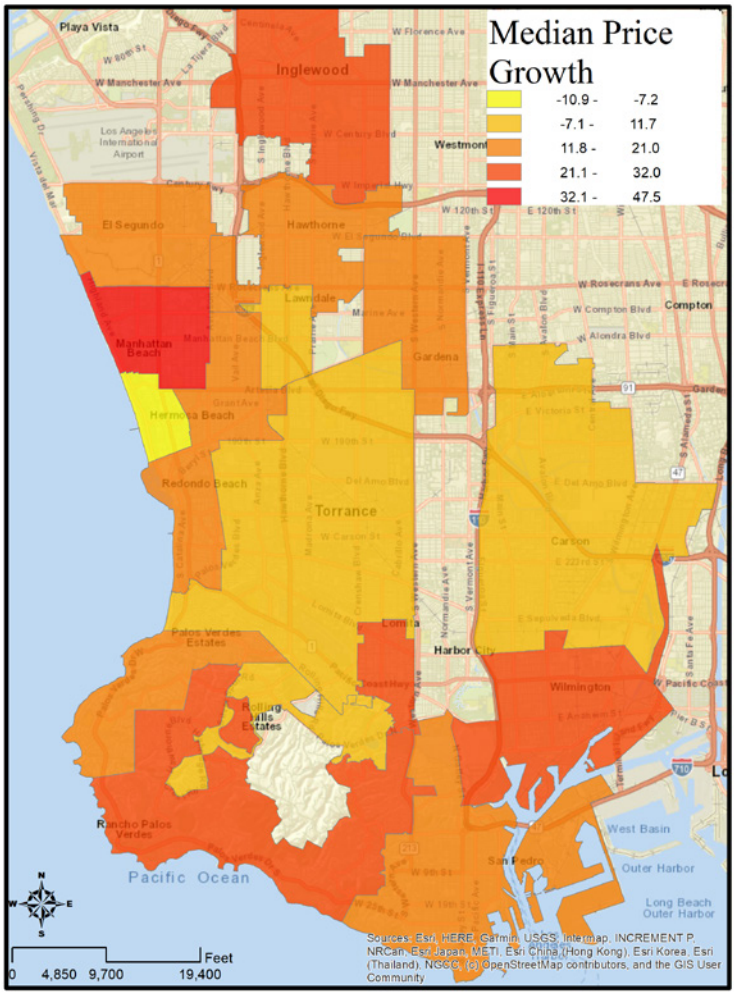


FIGURE 9: PRICES GROWTH IN SOUTH BAY CITIES



Large cities like Torrance and Carson have had the most sales during the period (Figures 10 & 11). The differences in sales growth are however remarkable, with higher growth in coastal cities: Palos Verdes Estates, Manhattan and Redondo Beach, and much lower growth in San Pedro, Carson, and Rolling Hills. As discussed above, sales growth has not kept pace with prices growth in L.A. metro region. Homeowners appear to be waiting for higher prices, even though current prices are actually higher than pre-emergency values. In the South Bay, this might explain the relative lack of association between sales and prices: fast price growth in Wilmington, Gardena, Lawndale and Palos Verdes, coincides with slow sales growth. There is also relatively high sales growth in Lawndale, and in El Segundo, which are cities with relatively low median prices.

FIGURE 10: TOTAL HOUSING SALES IN SOUTH BAY CITIES

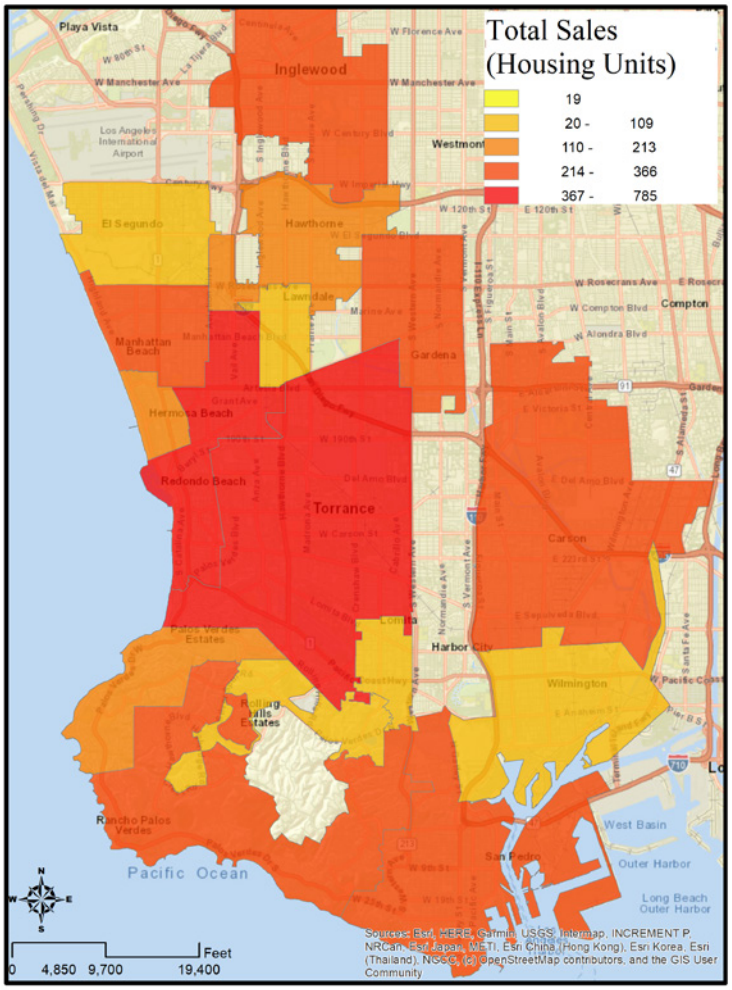
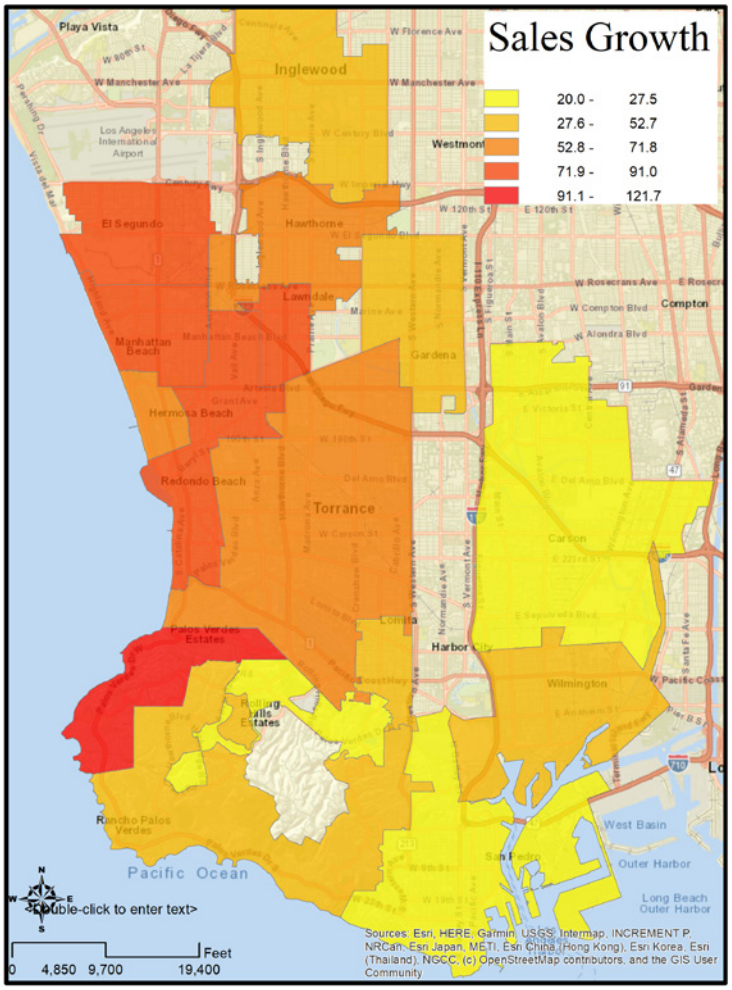


FIGURE 11: SALES GROWTH IN SOUTH BAY CITIES



Figures 8, 9, 10 & 11 – Source: own elaboration using Corelogic data

Where are entrepreneurs and investors placing their bets?

Despite news headlines about business relocation out of California, the Los Angeles area is still a major destination for venture capital. Investors are providing startup capital in numerous South Bay industries, especially aerospace, electric vehicles, healthcare, telecommunications, and agribusiness (see Figure 12). The Top South Bay Investors are a combination of government organizations (NASA, U.S. Department of Defense, National Science Foundation), angel investors (Tech Coast Angels), and venture capital (Wavemaker Partners, Plug and Play Tech Center) (see Figure 13). The top South Bay private companies attracting investment are in aerospace (SpaceX, ABL Space Systems), apparel (TechStyle Fashion Group, TechStyle Fabletics), healthcare (Radiology Partners), and tech (Internet Brands).

FIGURE 12. SOUTH BAY INVESTMENT HIGH-FLYERS

South Bay Firms with Most Capital Raised

SPACE X
Total Raised: $6.69B
Last Deal Type: Secondary-Private

INTERNET BRANDS
Total Raised: $3.83B
Last Deal Type: Debt Refinancing

RADIOLOGY PARTNERS
Total Raised: $3.42B
Last Deal Type: Debt

CANOO
Total Raised: $1.45B
Last Deal Type: PIPE

BRITISH TELECOMMUNICATIONS
Total Raised: $1.08B
Last Deal Type: M&A

SALIM GROUP
Total Raised: $1.00B
Last Deal Type: PE Growth

Top South Bay Investors

TECH COAST ANGELS
Deal Count: 22
Last Deal Type: Jul. 9 2021

WAVEMAKER PARTNERS
Deal Count: 17
Last Deal Type: Sep. 16, 2021

NASA
Deal Count: 16
Last Deal Type:

NATIONAL SCIENCE FOUNDATION
Deal Count: 14
Last Deal Type: Sep. 15, 2021

US DEPARTMENT OF DEFENSE
Deal Count: 12
Last Deal Type: Jul. 17, 2021

PLUG AND PLAY TECH CENTER
Deal Count: 11
Last Deal Type: Aug. 31, 2021

Top Private Companies

SPACE X
Last Post Valuation: $74.31B
Last Deal Type: Secondary Private

TECHSTYLE FASHION GROUP
Last Post Valuation: $6.88B
Last Deal Type: Series F

RADIOLOGY PARTNERS
Last Post Valuation: $4.29B
Last Deal Type: Debt

TECHSTYLE (FABLETICS BUSINESS)
Last Post Valuation: $1.05B
Last Deal Type: M&A

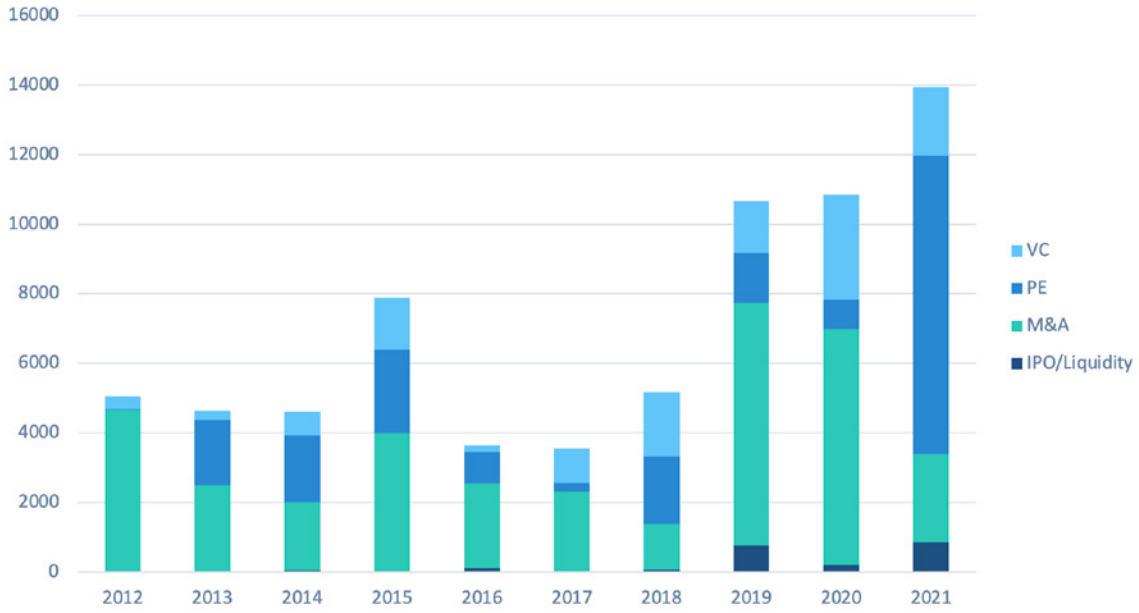
ABL SPACE SYSTEMS
Last Post Valuation: $1.32B
Last Deal Type: Series B

INTERNET BRANDS
Last Post Valuation: $1.10B
Last Deal Type: Debt Refinancing

Source: Pitchbook

Venture capital has been a primary source of startup investment in South Bay firms over time. This holds for 2021 despite a large decline from the previous year. Declines also occurred in Corporate/Strategic M&A from 2020 to 2021. Private equity investment held steady from 2020 to 2021 and rises in IPO activity occurred in 2021.

FIGURE 13. SOUTH BAY BUSINESS INVESTMENT TRENDS



Source: https://my.pitchbook.com/?pcc=518992-48 **data as of 09/21/2021*

Finance and Entrepreneurship

- Venture capital has been a primary source of startup investment in South Bay firms over time. This holds for 2021 despite a large decline from the previous year. Declines also occurred in Corporate/Strategic M&A from 2020 to 2021. Private equity investment held steady from 2020 to 2021 and rises in IPO activity occurred in 2021.
- Emerging South Bay industries include Electric Vehicle Platforms and Ghost Kitchens, which have received large investments of $37.66 billion and $15.48 billion, respectively. Artificial intelligence products—such as AIOps ($29.59B), Autonomous Trucking ($28.14B), and AI-enhanced learning ($16.46B)—have received substantial investment. Internet of Things (IoT) security has also emerged with $15.11 billion in capital invested.
- Investors are providing startup capital in numerous South Bay industries, especially aerospace, electric vehicles, healthcare, telecommunications, and agribusiness. The Top South Bay Investors are a combination of government organizations (NASA, US Department of Defense, National Science Foundation), angel investors (Tech Coast Angels), and venture capital (Wavemaker Partners, Plug and Play Tech Center).
- Studies suggest new COVID-19 cases and deaths have had an impact on the VIX.x Large declines in volatility occurred from the end of March 2020 until the end of June 2020, with spikes throughout the end of 2020 and the beginning of 2021.

Table 1 shows the emerging South Bay industries. Electric Vehicle Platforms and Ghost Kitchens were featured in our 2020 South Bay Economic Forecast report, and have received large investments of $37.66 billion and $15.48 billion, respectively. Artificial intelligence products—such as AIOps ($29.59B), Autonomous Trucking ($28.14B), and AI-enhanced learning ($16.46B)—have received substantial investment. Internet of Things (IoT) security has also emerged with $15.11 billion in capital invested.

TABLE 1: INVESTMENTS IN RISING SOUTH BAY INDUSTRIES FROM 2020-2021

INDUSTRY	CAPITAL INVESTED	FIRMS	DEALS	INDUSTRY DESCRIPTION
TinyML	$41.30B	28	44	Businesses that develop machine learning algorithms to conduct sensor data analytics using very limited power. These efforts seek to address the issue that sensor data is ignored due to cost, bandwidth, or power constraints.
Electric Vehicle Platforms	$37.66B	37	88	Firms that develop and manufacture electric vehicles, powertrains, and platforms.
Computational Storage	$35.04B	7	10	Companies that develop new IT architecture where computational functions are added to the data storage layer instead of moving the data to the host CPU for processing compared to traditional computation, which aims to reduce bottlenecks in order to accelerate "execution of latency-sensitive applications."
AIOps	$29.59B	18	26	The use of data analytics and artificial intelligence integrates IT systems with broader observational and engagement data where machine learning algorithms to address IT operations issues in real time.
Autonomous Trucking	$28.14B	21	53	Trucking companies that use technologies such as lidar, computer vision, and AI for long-haul trucking automation.
Next-Generation Battery Technology	$25.88B	27	71	Companies that are creating improvements and alternatives to lithium-ion battery, such as using new materials through chemistry and advanced materials sciences.
AI-Enhanced Learning	$16.46B	15	20	Businesses that use artificial intelligence to develop improved educational materials for students through AI, which can create more personalized learning at scale.
Ghost Kitchens	$15.48B	65	104	Also known as cloud kitchens, virtual restaurants, and restaurant-as-a-service (RAAS). Businesses that are stripped down commercial kitchens that do not provide in-door dining and essentially work as hubs for online delivery and catering.
IoT Security	$15.11B	108	178	Companies that develop platforms to protect connected devices and networks.
Gene Therapies	$11.81B	28	58	Companies that use gene therapies by inserting sections of DNA to a patient's cells to correct damaged and abnormal genes. These processes enable researchers to find cures for diseases, such as cancer, HIV, and heart disease.

Source: Pitchbook

In June 2021, $100 million government investment has been approved by the California State legislature to provide funding for the legal cannabis industry with majority of the benefits going to businesses in Los Angeles.[iii] The social equity program launched to include underrepresented entrepreneurs in the cannabis industry has been subjected to application processing delays, which has negatively impacted applicants. Long wait times have left businessowners paying rent for empty retail spaces.[iv] This provides substantive hardship for entrepreneurs that are capital constrained. In addition, means of accessing and storing capital is still a major issue. In 2018, former California State Treasurer John Chiang was exploring a California state bank to provide financial services for cannabis businesses.[v] Without access to traditional financial services, “shadow banking” is being conducted by crypto-finance companies and RocketFuel has just launched in July 2021 to provide payment solutions for cannabis dispensaries and merchants.[vi]

Minority and women entrepreneurship and access to capital

Access to capital has been a major issue for minority and women entrepreneurs. Reports conducted by the South Bay Economic Institute, the Mervyn M. Dymally African American Political and Economic Institute (MDAAPEI), and the CSUDH College of Business Administration and Public Policy surveyed women entrepreneurs and African American women entrepreneurs in the South Bay Los Angeles and greater Los Angeles area and find the following:

- There has been an increase in investment in funds that finance Women and Minority owned business enterprises (WMBEs) with total capital raised rising from $5 million in 2016 to $35.10 million in 2019.
- Of the 116 deals in California that have financed women entrepreneurships, 25 of those deals were with women entrepreneurships in the South Bay/Los Angeles area with 3 of the 25 deals involving minority women entrepreneurships.
- Survey responses from women entrepreneurs reflect that they rely mainly on family and friends, or banks for funding their business rather than venture capital, private equity, or equity crowdfunding.
- The majority of women entrepreneurs surveyed consider the cost of capital, lack of network, and financial hardships as the major obstacles facing them in accessing capital. African American women entrepreneurs state that the barriers they have faced include collateral requirements, cost of debt capital (i.e., high interest rate on loans), lack of network, financial hardships, lack of financial support, and collateral requirements.
- The primary resources women entrepreneurs pursued are Small Business Development Centers (34.38%), business incubators (34.38%), co-working spaces (34.38%), followed by business accelerators (28.13%).

Sources: Women Entrepreneurship Report, African American Women Entrepreneurship Report

SECTION 2 THE IMPACTS OF THE COVID-19 RECESSION

How does this recession compare to previous ones?

The COVID-19 recession differs significantly from the 2008 recession, especially in terms of employment impacts. In 2008, employment losses were strongest in Construction, Administrative, Support and Waste, Manufacturing, Information, Wholesale Trade, and Transportation, Warehousing and Utilities industries, in that order. The COVID-19 recession was relatively brief (February 2020 to April 2020), but many negative effects on employment remain today. Early pandemic employment losses (up to Q2 2020) were in the Arts, Entertainment, and Recreation, Leisure and Hospitality, and Accommodation and Food Service, in that order: these industries require close contact with and among customers and for extended periods.

As of 2021 Q1, South Bay cities' industry employment data show the same industries continue to struggle to reach pre-pandemic levels. The Educational Services industry is now among the top employment losses industries. Anecdotally, it has been suggested that a significant portion of teachers and administrators, most of them vaccinated, still feel at risk for having to interact with unvaccinated children.

TABLE 2. LARGEST EMPLOYMENT LOSSES BY INDUSTRY

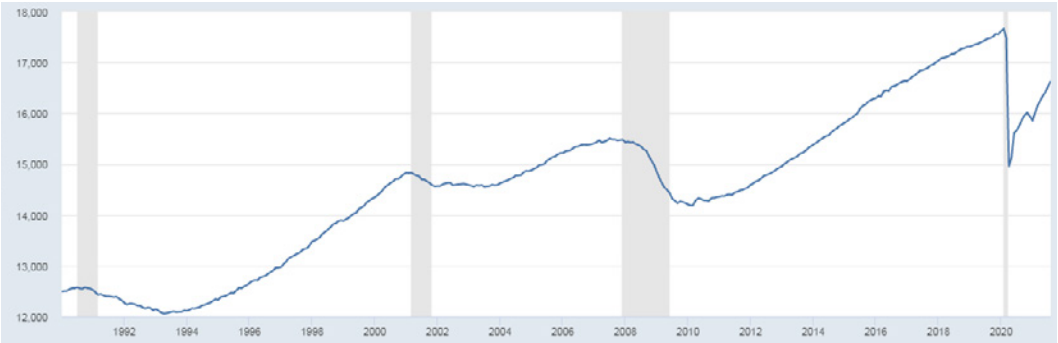
2008-2009	2019 Q2 – 2020 Q2	2019 Q1 – 2021 Q1
Construction	Arts, Entertainment & Recreation	Arts, Entertainment & Recreation
Administrative, Support & Waste	Leisure and Hospitality	Leisure and Hospitality
Manufacturing	Accommodation & Food Service	Accommodation & Food Service
Information	Other Services	Other Services
Wholesale Trade	Information	Administrative, Support & Waste
Transport, Warehousing, Utilities	Administrative, Support & Waste	Educational Services

Source: Authors calculations based on California Employment Development Department data

In addition, the 2008 recession was caused by structural problems in the financial and housing markets, while the COVID-19 recession was due to an exogenous shock. We expect—and have seen so far—a relatively faster recovery for the latter, if the shock conditions are minimized. However, new virus variants make the employment recovery from the pandemic more uncertain.

August 2021 jobs numbers suggest the U.S. is still missing 5.3 million jobs from the pre-pandemic peak; a 3.5% total job deficit compared to February of 2020 (see Figure 14). California is still missing 1.1 million jobs, or a 6%+ total job deficit compared to the February 2020 peak. The Los Angeles Metro Area employment deficit is even higher at 9%.

FIGURE 14. CALIFORNIA TOTAL NONFARM EMPLOYMENT. SOURCE: FEDERAL RESERVE BANK OF ST. LOUIS,



Shaded areas indicate U.S. Recessions. *Source: U.S. Bureau of Labor Statistics*

That said, the current pace of the recovery has been remarkable, especially when compared to the 2008 recession. Back then, it took 20 quarters to reach the pre-recession employment peak. At the September 2021 pace of the jobs report, which most economists considered disappointing, it will take until September 2023 to reach pre-COVID-19 levels of employment, twice as fast as the 2008 recession.

How have financial markets fared?

COVID-19 shutdowns caused a major drop in the Dow Jones Industrial Average (DJI) from February 2 until April 7, 2020 (see Figure 15).[vii] Major rebounds then occurred in May 2020 when Wall Street became more optimistic about the economy reopening. In December 2020, stocks rose again on positive news on COVID-19 vaccines—Pfizer-BioNTech being approved for emergency use authorization by the Federal Drug Administration (FDA)—and the additional fiscal stimulus.[viii] The 2021 market has rebounded from those drops in 2020. Recently, on September 7, 2021, there was strong performance in tech stocks, which contributed to record highs from the tech-heavy Nasdaq Composite while the DJI has fluctuated having gains from the beginning of the previous week. [ix] There have been recent small drops in both DJI and the S&P 500 due to investor concern about a slower economic recovery, despite the Fed stating delays in interest rates are rising due to a lackluster U.S. payrolls report.[x]

FIGURE 15. DOW JONES INDUSTRIAL AVERAGE

Shaded areas indicate U.S. Recessions.

Source: S&P Dow Jones Indices LLC

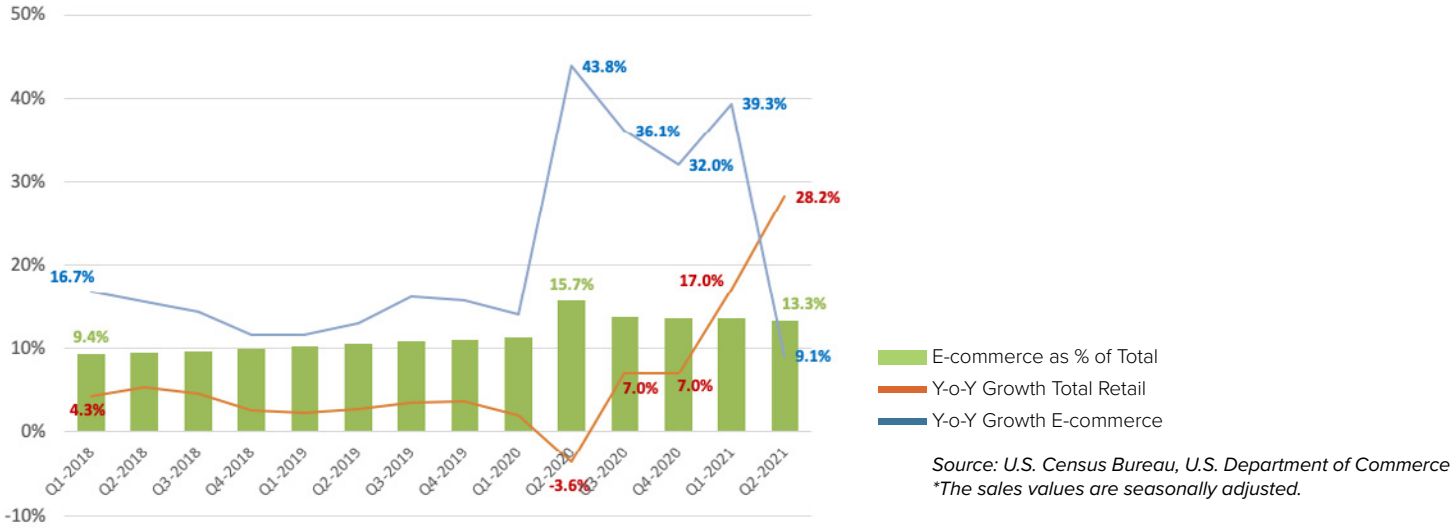
In February 2020, financial markets appeared to price in the risk of the coronavirus as being temporary. When more negative news on the impact of the coronavirus spread, it may have led to further risk repricing.[xi] Volatility then peaked on March 20, 2020 from economic shutdowns. **Studies suggest new COVID-19 cases and deaths have had an impact on the VIX.[xii] Large declines in volatility occurred from the end of March 2020 until the end of June 2020, with spikes throughout the end of 2020 and the beginning of 2021.**

What economic changes did COVID-19 accelerate?

E-commerce

Booming e-commerce activity has dramatically transformed the retail sector, especially during the COVID-19 pandemic. **In Q2 2020, while the year-on-year growth of the U.S. retail sales dropped to -3.6% due to lockdowns and social distancing practices, e-commerce jumped 43.8% and stayed at more than 30% year-on-year growth rates till Q1 2021 (Figure 16).** The contribution of e-commerce to total U.S. retail sales increased from 9.4% in Q1 2018 to 15.7% in Q2 2020. With more retail business re-opening in Q1 2021, U.S. retail sales rebounded to 17% in Q1 2021 and 28.2% in Q2 2021, while the growth of e-commerce slows down to 9.1% in Q2 2021.

FIGURE 16. QUARTERLY U.S. RETAIL SALES: TOTAL AND E-COMMERCE



Source: U.S. Census Bureau, U.S. Department of Commerce
**The sales values are seasonally adjusted.*

Amazon forecasts provide reliable insights for the future of e-commerce, as the company accounts for 41.4% of total e-commerce sales, followed by Walmart's 7.2% and eBay's 4.3% in 2021 [xiii] (eMarketer, 2021). Amazon is particularly important for the Southern California region as 18% of Amazon's U.S. fulfillment centers are in the Golden State and the Southern California region accounts for about 55% of Amazon's operations space in California. Amazon expects Q3 2021 net sales to grow between 10% and 16% over last year, much slower than Q2's 27%. We expect Southern California e-commerce to grow at a similar pace.

Supply chains

In 2020, most manufacturing industries were facing declining demand and operational constraints from lockdowns and social distancing measures. **Total manufacturing shipment values decreased 6.7% over 2019, though a few industries bucked this trend, such as medical equipment and supplies manufacturing, computers and electronic products, food products, and wood products (see Table 3).**

The gap between supply and demand in microchips has significantly widened during the pandemic, leading to a global microchip shortage and supply chain crises. Halted production in semiconductor plants led to supply shortages, and people started working or studying from home, generating strong demand for electronic devices that require microchips. Because of the microchip shortage, carmakers and electronic equipment manufacturers needed to decrease production volumes, slowing the broader economic recovery.

Shipment values rebounded strongly in the first half of 2021, rising 13.2% over the same period in 2020. Several manufacturing industries showed strong growth, including miscellaneous products, petroleum and coal products, wood products, leather, metals, transportation equipment, machinery, and electrical equipment.

TABLE 3. SHIPMENT VALUE GROWTH (SEASONALLY ADJUSTED) OF U.S. MANUFACTURING INDUSTRIES DURING 2019-2021

INDUSTRY	2020 FY	2021 Jun YTD
Petroleum and Coal Products	-30.40%	33.70%
Transportation Equipment	-15.60%	19.70%
Primary Metals	-8.70%	21.20%
Textile Product Mills	-8.50%	8.10%
Textile Mills	-7.90%	10.60%
Furniture and Related Products	-5.70%	1.00%
Fabricated Metal Products	-5.30%	13.60%
Printing and Related Support Activities	-4.50%	3.30%
Machinery	-4.50%	13.60%
Leather and Allied Products	-3.20%	29.50%
Plastic and Rubber Products	-2.80%	5.40%
Beverage and Tobacco Products	-2.40%	6.00%
Apparel	-2.10%	6.60%
Electrical Equipment, Appliances, and Components	-2.10%	13.50%
Chemical Products	-1.20%	8.70%
Food Products	0.70%	4.30%
Paper Products	1.00%	7.50%
Nonmetallic Mineral Products	1.50%	7.40%
Wood Products	3.60%	30.50%
Computers and Electronic Products	3.60%	8.50%
Miscellaneous products	11.40%	22.10%
TOTAL MANUFACTURING	**-6.7%**	**13.2%**

The growth of miscellaneous products is mainly contributed by medical equipment and supplies manufacturing.

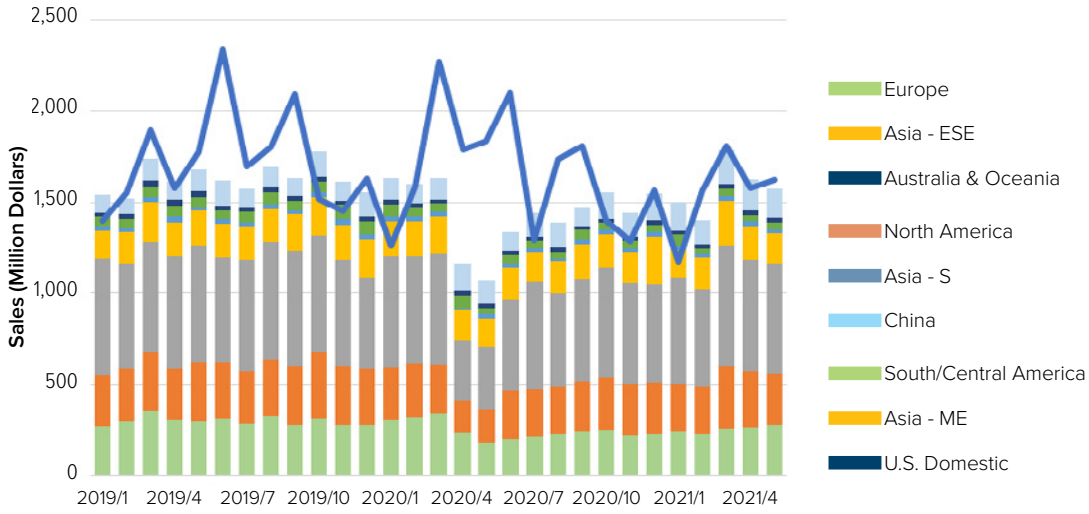
Source: Manufacturers' Shipments, Inventories, & Orders (M3) survey, U.S. Census Bureau

Supply Chain and E-Commerce

- E-commerce jumped 43.8% and stayed at more than 30% y-o-y growth rates until Q1 2021 but slowed to 9.1% in Q2-2021.
- The shipment value of the overall manufacturing industry decreased by 6.7% over 2019, while a few industries like miscellaneous products (including medical equipment and supplies manufacturing), computers and electronic products, food products, and wood products increased their sales.
- The gap between supply and demand in microchips has significantly widened during the pandemic, leading to global microchip shortage and supply chain crises.
- The firms with a high percentage of overseas revenue may suffer less during the COVID-19 pandemic.
- The surge in ocean cargo has caused significant import shipment delays and skyrocketed shipping rates in 2021.

Firms with a high percentage of overseas revenue appear to have suffered less during the COVID-19 recession. The correlation between the U.S. domestic market and foreign markets has dramatically reduced since the COVID-19 pandemic, and the recovery of one market could offset losses in another. For example, the electrical equipment manufacturing industry lost sales in foreign markets in April 2020 and then slowly recovered since May 2020. However, U.S. domestic sales have been on a downward trend since June 2020. Because of foreign market revenues, shipment value growth is more stabilized for the electrical equipment manufacturing industry (see Figure 17).

FIGURE 17. TREND OF U.S. DOMESTIC MARKET AND FOREIGN MARKETS DURING 2019 AND MAY 2021 - ELECTRICAL EQUIPMENT MANUFACTURING



Source: USA Trade Online and Manufacturers' Shipments, Inventories, & Orders (M3) survey, U.S. Census Bureau

The post-recession rebound for container shipping began in July 2020 as Asian manufacturers recommenced operations and U.S. consumers increased e-commerce purchases. In 2021, U.S. imports are growing strongly across all ports (see Table 4). In Southern California, the Ports of Los Angeles and Long Beach have had strong growth—38% year-on-year for May YTD—and reported record volumes. The Port of Los Angeles moved 1.012 million TEUs in May, the first time a Western hemisphere port has surpassed that level. The Port of Long Beach was close behind, moving 907,216 cargo container units in May, setting a monthly record for the 110-year-old port.

TABLE 4. GROWTH OF CONTAINERIZED VESSEL IMPORT TONNAGE DURING 2016-2021 MAY YTD

	2016	2017	2018	2019	2020	2021 May YTD
Los Angeles, CA	2.2%	1.9%	3.4%	-8.0%	2.0%	37.8%
Newark, NJ and New York, NY	-5.5%	4.8%	5.3%	1.3%	3.1%	21.2%
Long Beach, CA	-5.4%	13.8%	7.6%	-14.8%	12.8%	38.5%
Savannah, GA	4.7%	7.6%	10.5%	4.8%	1.5%	36.8%
Houston, TX	-4.3%	19.5%	7.9%	-1.3%	2.5%	24.2%
U.S. Total	-0.5%	4.6%	4.8%	-1.4%	1.4%	24.9%

This surge in cargo has caused significant supply chain challenges. There is an excessive backlog in the supply. Ships are sitting at anchor and staying at ports for longer periods. Manufacturers, retailers, and customers are waiting longer for their materials and products. Also, the shipping rate skyrocketed in the second half of 2020 and 2021: spot rates out of China increased 263% in Q2 2021 versus Q1 2020.

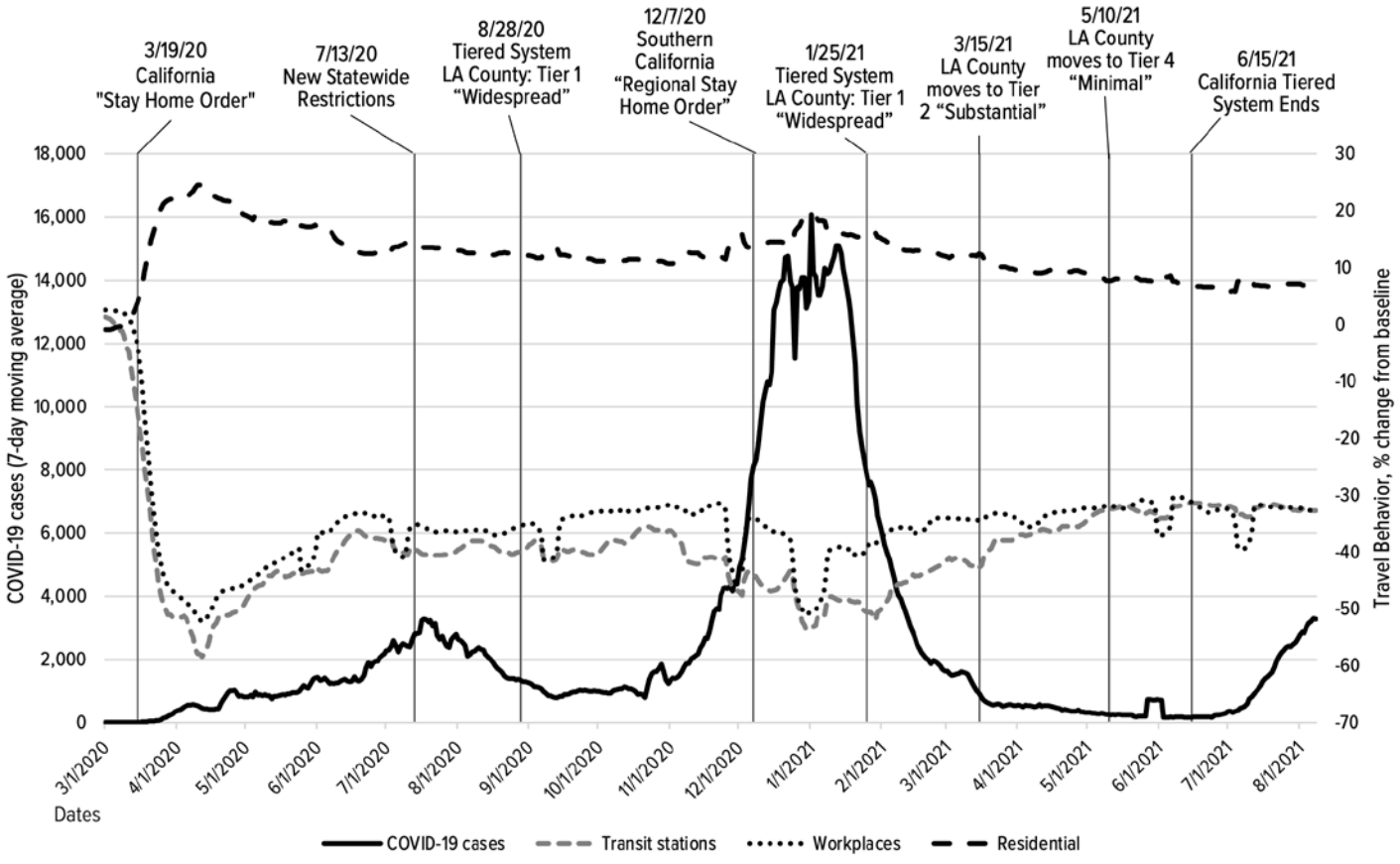
Working from home and traffic congestion

Working from home rates increased significantly during 2020. While rates have declined since, 23% of U.S. workers were still teleworking as of February 2021.[xiv] Reflecting the digital divide, telework rates for African Americans (20% in February 2021) and Latinos (13% in February 2021) were consistently lower throughout the pandemic period.

In Los Angeles County (see Figure 18), Google Mobility data [xv] show that trips to workplaces, transit stations, and residences were clearly influenced by the imposition and relaxation of COVID-19 restrictions. Trips to workplaces and to transit stations dropped by around half during the first "Stay at Home" guidance period in 2020, and only returned to around 30% below pre-pandemic levels by the summer of 2020. During the 20-21 winter surge and restrictions, workplace and transit trips dropped again to nearly 50% of pre-pandemic levels, before returning gradually to 30% below baseline by summer 2021.

A Los Angeles Metro and Duke University survey of employees in Los Angeles County looked at work practice changes during the COVID-19 pandemic. For South Bay respondents, those with shorter commutes of less than 40 minutes were less productive, while those with longer commutes were more productive.[xvi] This finding highlights the opportunity cost of commuting long journeys, and the potential for increased productivity.

FIGURE 18. LOS ANGELES COUNTY TRAVEL BEHAVIOR DURING THE COVID-19 PANDEMIC



Source: Authors calculations based on Google COVID-19 Community Mobility Reports data

South Bay Entrepreneurship during COVID-19

There was an uptick of entrepreneurship in Los Angeles County during COVID-19, with 157,459 business applications filed in 2020 compared to 127,902 in 2019.[xvii] This reflects a global trend in entrepreneurship. Analysts predict that entrepreneurship will continue to rise, even with the increase in vaccination rates and turning points in the pandemic.[xviii]

The impact of PPP loans

The Paycheck Protection Program (PPP) loans are Small Business Administration-backed (SBA) loans issued with the aim of keeping their workers employed during the pandemic.[xix] We examine the impact of PPP loans on South Bay businesses.

- 1,302,241 loans were issued to CA borrowers, which is 11.1% of total U.S. PPP loans.
- 463,504 loans were issued to L.A. County borrowers, which is 3.9% of total U.S. PPP loans.
- 67,075 loans were issued to South Bay L.A. borrowers, which is 0.6% of total U.S. PPP loans.
- South Bay L.A. received 14.5% of PPP loans issued to L.A. County and 5.2% of PPP loans issued to CA borrowers.

Other Services received the most loans (10,131 loans) followed by Professional, Scientific, and Technical Services (8,489 loans) and Health Care and Social Assistance (6,736 loans) (Table 5). The most PPP loans issued in the South Bay were to Wilmington with 18,292 loans, followed by Torrance with 8,047 loans, and Inglewood with 7,506 loans (Table 6). The most loans issued to female-owned businesses were in Wilmington (2,216 loans), followed by Inglewood (1,476 loans) and Torrance (1,020 loans). The highest percentage of loans issued to female-owned business compared to loans issued to city were Inglewood at 19.7%, followed by Carson at 18.4%, and Avalon at 18.3%.

TABLE 5. PPP LOANS ISSUES BY SECTOR

Industry Sectors	Number of Loans Issued	Percent
Other Business Services	10,131	15.1%
Professional, Scientific, and Technical Services	8,489	12.7%
Health Care and Social Assistance	6,736	10.0%
Retail Trade	5,481	8.2%
Transportation and Warehousing	5,348	8.0%
Accommodation and Food Services	4,890	7.3%
Construction	4,342	6.5%
Admin and Waste Management Services	3,335	5.0%
Real Estate and Rental and Leasing	3,014	4.5%
Manufacturing	2,883	4.3%
Arts, Entertainment, and Recreation	2,686	4.0%
Total	**67,075**	

Source: Small Business Administration
Industry sectors defined by the North American Industry Classification System (NAICS). Not all sectors represented.

TABLE 6. PPP LOANS ISSUED BY OWNERSHIP

	Loans to Female-owned businesses		Loans to Male-owned businesses		Loans to non-disclosed ownership		Total loans issued to city	
City	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Avalon	70	18.3%	104	27.2%	208	54.5%	382	0.6%
Carson	785	18.4%	1,164	27.3%	2,319	54.3%	4268	6.4%
El Segundo	201	9.8%	610	29.7%	1,241	60.5%	2052	3.1%
Gardena	951	16.8%	1,705	30.0%	3,018	53.2%	5674	8.5%
Hawthorne	979	15.6%	1,615	25.7%	3,689	58.7%	6283	9.4%
Hermosa Beach	140	13.9%	248	24.6%	620	61.5%	1008	1.5%
Inglewood	1,476	19.7%	1,892	25.2%	4,138	55.1%	7506	11.2%
Lawndale	201	12.2%	374	22.7%	1,070	65.0%	1645	2.5%
Lennox	20	8.7%	67	29.0%	144	62.3%	231	0.3%
Lomita	123	14.8%	176	21.2%	531	64.0%	830	1.2%
Manhattan Beach	271	12.9%	529	25.2%	1,299	61.9%	2099	3.1%
Palos Verdes Estates	49	13.1%	86	23.1%	238	63.8%	373	0.6%
Rancho Dominguez	53	13.5%	115	29.3%	224	57.1%	392	0.6%
Rancho Palos Verdes	122	13.5%	240	26.6%	541	59.9%	903	1.4%
Redondo Beach	367	13.3%	618	22.3%	1,783	64.4%	2768	4.1%
Rolling Hills/Estates	123	9.6%	255	20.0%	897	70.4%	1275	1.9%
San Pedro	344	16.1%	518	24.2%	1,279	59.7%	2141	3.2%
Torrance	1,020	12.7%	2,156	26.8%	4,871	60.5%	8047	12.0%
View Park/Windsor Hills	177	19.5%	197	21.7%	532	58.7%	906	1.4%
Wilmington	2,216	12.1%	4,283	23.4%	11,793	64.5%	18292	27.3%
Total	**9688**	**14.4%**	**16952**	**25.3%**	**40435**	**60.3%**	**67075**	**100.0%**

Source: Small Business Administration

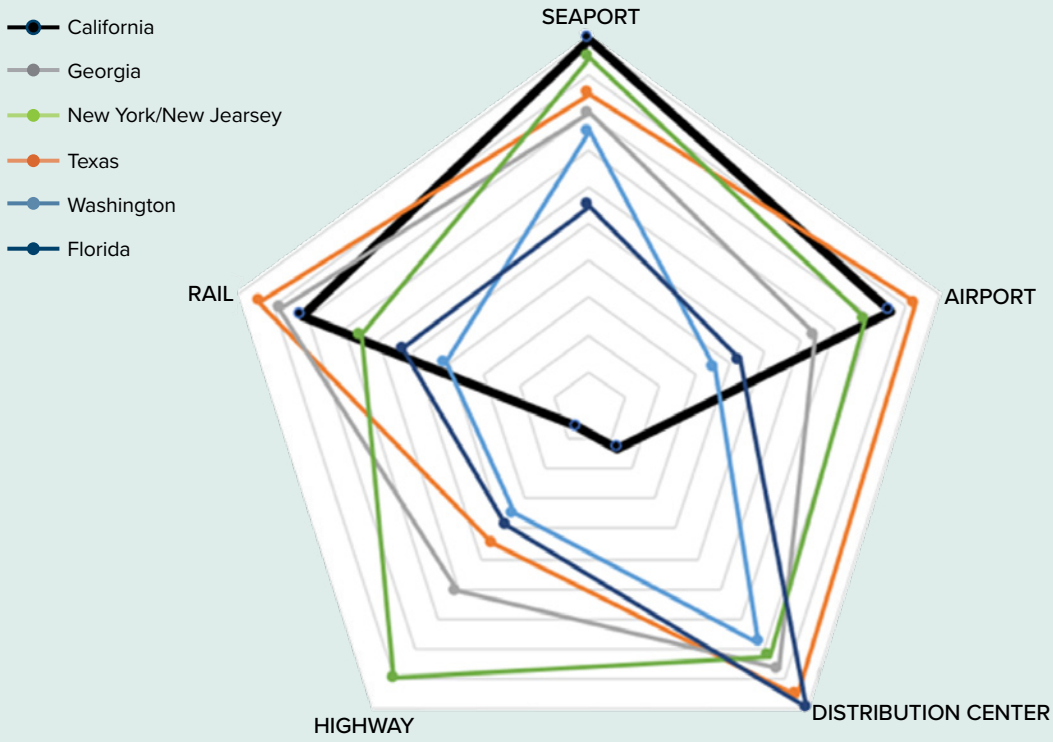
California Freight Competitiveness

Companies such as Tesla, Hewlett Packard, Oracle, and Toyota have recently announced moves from California to Texas. Is California competitive enough to retain our high-performing industries? Is the state's freight system fit for purpose in a competitive marketplace?

Our research team, led by Dr. Jian-yu Ke, interviewed freight industry experts and analyzed key data to evaluate California's overall freight competitiveness with other U.S. states and regions. Our balanced scorecard approach compares all primary freight segments—seaports, airports, highways, freight rail service, and distribution centers—by identifying the importance of different performance measures.

We found California's freight system to be highly competitive in terms of seaports, airports, and freight rail (Figure 19). However, there is potential for improvement in highways and distribution centers, especially to California's low travel time reliability and high operation costs.

FIGURE 19. A BALANCED SCORECARD EVALUATION OF STATE-LEVEL FREIGHT SYSTEM COMPETITIVENESS



California needs to prioritize investments for enhancing freight competitiveness, using Federal Infrastructure Bill dollars. Significant investments should aim to reduce congestion on urban interstates and improve highway travel time reliability. Investments should expand seaport container terminals and air cargo handling facilities and provide more intermodal connections to ports. Modern technology can help ports to manage the flows of chassis, container trucks, and empty containers, and address the cargo backlogs and congestion at the ports and warehouses. The state should also invest in inland ports, transporting goods by rail directly from seaports to the Inland Empire or Central Valley.

“Americans have experienced substantial changes to their home and working lives...”

SECTION 3 LOOKING AHEAD

How quickly will we get back to normal?

Many economists predict a GDP growth of 4%-6% in 2021 for the U.S., which could be the strongest since 1984 (see Table 7). UCLA forecasters predict that California will recover faster than other states due to the infrastructures in industries including information, trade, and healthcare sectors.

TABLE 7. PROMINENT MACROECONOMIC FORECASTS

FORECASTERS	2020 FORECAST	2021 FORECAST
UCLA Anderson[1]	• GDP to recovery steadily over 3 years and reach 2019 Q4 peak by 2023 Q1 • UR to lag behind; above 6% into 2022 • Assumes vaccines available early 2021 and most schools reopen in Fall 2020	• 5.6% average GDP growth for rest of 2021; 4.1% 2022; 3.1% 2023. • Return to normal economic cycles by end of 2021, after inflationary period. • UR: 5.1% end of 2021, 4.0% end 2022
US Congressional Budget Office[2]	• Real GDP: 2020 -6%; 2021 +5%	• Real GDP: 2021 +7.4%; 2022 2.8% • Unemployment: Decline in 2022 to 4%
US Federal Reserve Board[3]	• Real GDP: 2020 -6.5%; 2021 +5% • UR: 2020 9.3%; 2021 6.5%	• Real GDP: 2021 +5.9%; 2022 +3.8% • UR: 2021 4.8%; 2022 3.8%
Wells Fargo[4]	• Real GDP (quarterly change) • 2021: Q1 +5.1%, Q2 +3.2%, Q3 +3.1%, • UR declining to 6% in 2022	• Real GDP: 2021 +5.9%; 2022 +4.5% • UR: 2021 5.6%; 2022 4.3%
Deloitte[5]	• GDP 2020 recovery Q3, decline in Q4. • Full recovery to begin mid-21	• GDP growth strong in 2022 & beyond • UR back to below 4% by 2025

GDP = Gross Domestic Product; UR = Unemployment Rate

[1] https://www.anderson.ucla.edu/about/centers/ucla-anderson-forecast Note that UCLA Anderson Forecast's projection was downgraded from 7.1% growth in 2021 as of June, to 5.6% growth as of September, due to concerns over the Delta COVID-19 variant and supply chain issues.
[2] https://www.cbo.gov/system/files/2021-07/57218-Outlook.pdf Note the CBO forecast has not been updated since July. Given the other revisions, it is likely this forecast would be lower too if projected today.
[3] https://www.federalreserve.gov/monetarypolicy/fomcprojtabl20210922.htm
[4] https://www08.wellsfargomedia.com/assets/pdf/commercial/insights/economics/economic-forecast.pdf. The Wells Fargo forecast was also adjusted downward between summer and fall 2021.
[5] https://www2.deloitte.com/us/en/insights/economy/us-economic-forecast/united-states-outlook-analysis.html

The LAEDC 2021 forecast shows a promising trend for Real GDP, with growth of around 3% for the nation, Southern California, and Los Angeles County. For California, however, this forecast is only 2% growth. The 2022 trajectory of Los Angeles County's economic recovery is showing a large growth rate of 4.2%, larger than the entire state as well as the Southern California region. This shows the critical role of Los Angeles County in the state economy.

Employment in many L.A. region industries is projected to reach pre-pandemic levels as early as 2022, yet some others will take time to catch up. Manufacturing—including zero-emission vehicles, transportation infrastructure, and aerospace—is very important to the South Bay region. Companies like SpaceX and HyperLoop are key drivers in the growth activity in next-generation manufacturing companies. In addition, the Techstars Star Space Accelerator recently set up shops in L.A. to serve as a starting point for space companies.[xx] Because of these cutting-edge firms, the manufacturing sector in the region could begin to rebound in 2021 and continue to increase through 2025.[xxi]

The regional construction sector has been stable during the pandemic and is expected to continue as such through 2025; construction employment may return to pre-recession levels as early as 2022. Retail and financial services are among a few sectors expected to recover more slowly. The LAEDC forecast suggests the retail sector may not recover until 2025 due to the trending demand towards online shopping. The same trend is expected for the financial sector. Overall, the trajectories show all the industries are expected to be back to pre-pandemic employment levels by 2022, except for education and health services.

What innovations will shape our region's future?

The future of the South Bay region will center on a combination of industries, including manufacturing, trade, transportation (mobility), and information. As California and other states lift many of the restrictions imposed in 2020, economic activities in most industries accelerated throughout 2021. Most economic forecasts expect the economy to keep expanding at a relatively rapid pace in the near term. Meanwhile, specialists and analysts are paying careful attention to the new Delta variant and other future variants, as they have the potential of changing the trends and considerably altering the projections. Given the critical role of the South Bay region in the state's economy, it is important to focus on longer term economic forecasts and concerns in the region.

Different industries have been impacted by, and recovered from, the pandemic differently. There are also different trajectories for how each industry will contribute to the economy of the region in the future. The South Bay region is home to a lot of well-known companies in aerospace, technology and communication, ecommerce, and healthcare. These include the Space and Missile Systems Center of the Air Force Base as well as Henry Company, Radiology Partners, ABL Space Systems in El Segundo, and SpaceX in Hawthorne. Los Angeles, on the other hand, has a diversified economy from Hollywood and streaming services such as Netflix, Hulu, Disney Plus, and Paramount.

Clean vehicle rebate programs across the state promote the acceptance of clean vehicle technology including Plug-in Hybrid Electric Vehicles (PHEVs), Battery Electric Vehicles (BEVs), Fuel-Cell Electric Vehicles (FCEVs), and Zero-Emission Motorcycles. These vehicle technologies will reduce air pollution and GHG emissions, decrease our dependency on fossil fuels and attract green businesses to the state as well as the region (see Figure 20). Ninety percent of consumers believe the rebates are more than moderately important in their decisions. An example of a rebate program for clean vehicles in Los Angeles is the emPOWER campaign (overseen by the Liberty Hill Foundation), which helps to inform low-income residents of money-saving programs such as rebates (up to $14,000) to individuals or families who purchase new or used electric vehicles. Another example of a clean fuel program in the South Bay region is URB-E, a Los Angeles County based company which is helping transition last-mile goods delivery with a foldable zero-emission electric scooter.

FIGURE 20. CLEAN VEHICLE REBATE AMOUNT PER INDIVIDUAL ACROSS CALIFORNIA

	as of Mar. 2010	as of Jun. 2011	as of Jul. 2013	as of Jun. 2014	as of Mar. 2016	as of Nov. 2016	as of Dec. 2019
Fuel-Cell EVs	$3,000–$5,000 ‡	$1,500–$2,500 ‡	$2,500	$5,000	$5,000 *	$5,000 **	$4,500 ***
Battery EVs †	$3,000–$5,000 ‡	$1,500–$2,500 ‡	$2,500	$2,500	$2,500 *	$2,500 **	$2,000 ***
Plug-in Hybrid EVs	$3,000	$1,500	$1,500	$1,500	$1,500 *	$1,500 **	$1,000 ***
Zero-Emission Motorcycles	$1,500	$900	$900	$900	$900	$900	$750
Neighborhood EVs	$1,500	$900	$900	$900	$900	None eligible	None eligible
Commercial Zero-Emission Vehicle	$20,000						

= in effect during CY 2019

† Includes range-extended battery electric vehicles
‡ Amonts varied by ZEV type. For definitions, see CCR 1962.1
* Lower-income consumers eligible for an additional $1,500
** Lower-income consumers eligible for an additional $2,000
*** Lower-income consumers eligible for an additional $2,500

Source: CVRP-2019-Outcomes (cleanvehiclerebate.org)

Environmental Issues

- A changing climate will affect the availability of energy resources, particularly renewable energy, as well as consumers' energy demand.
- The forecasted changes in annual electricity consumption shows 30%-35% in consumption for inland parts of Los Angeles County compared to 10%-15% for coastal areas in the region.

What are the South Bay's strengths as we look to the future?

The South Bay economy has numerous strengths—especially diversity and innovation—that mean it will continue to be resilient in the face of current and future challenges. The South Bay has an important diversity of industry sectors, which leads to resiliency and flexibility whether benefitting from economic growth or confronting uncertain times. The semiconductor shortages are a good example here: while some sectors will have to navigate this issue, others are left unscathed, and the region overall is not substantially affected. The South Bay's diversity also extends to its residents and business owners. Cultural diversity can enrich our lives with food, art, and events, yet businesses benefit substantially too: foreign direct investment supports local workers and city government revenues, and global trade connections reduce business costs and spread risks. CSUDH and other local education institutions all play a key role in training our region's workforce to be highly competitive across a diverse range of occupations and skill areas.

The South Bay economy is also innovative. The "Silicon Beach" phenomenon in Los Angeles continues to spread into the South Bay, with new media, gaming, and e-commerce enterprises playing a key role El Segundo in particular. Aerospace remains a key player across numerous cities with respect to innovative advanced manufacturing, while healthcare and bio-tech companies continue to provide innovative products and services while attracting high-skilled workers. The top private companies in the South Bay are SpaceX (Aerospace), TechStyle Fashion Group (E-commerce), Radiology Partners (Healthcare), Internet Brands (Technology), TechStyle Fabletics (E-commerce), and ABL Space Systems (Aerospace).

Environmental Economics and The L.A. Region

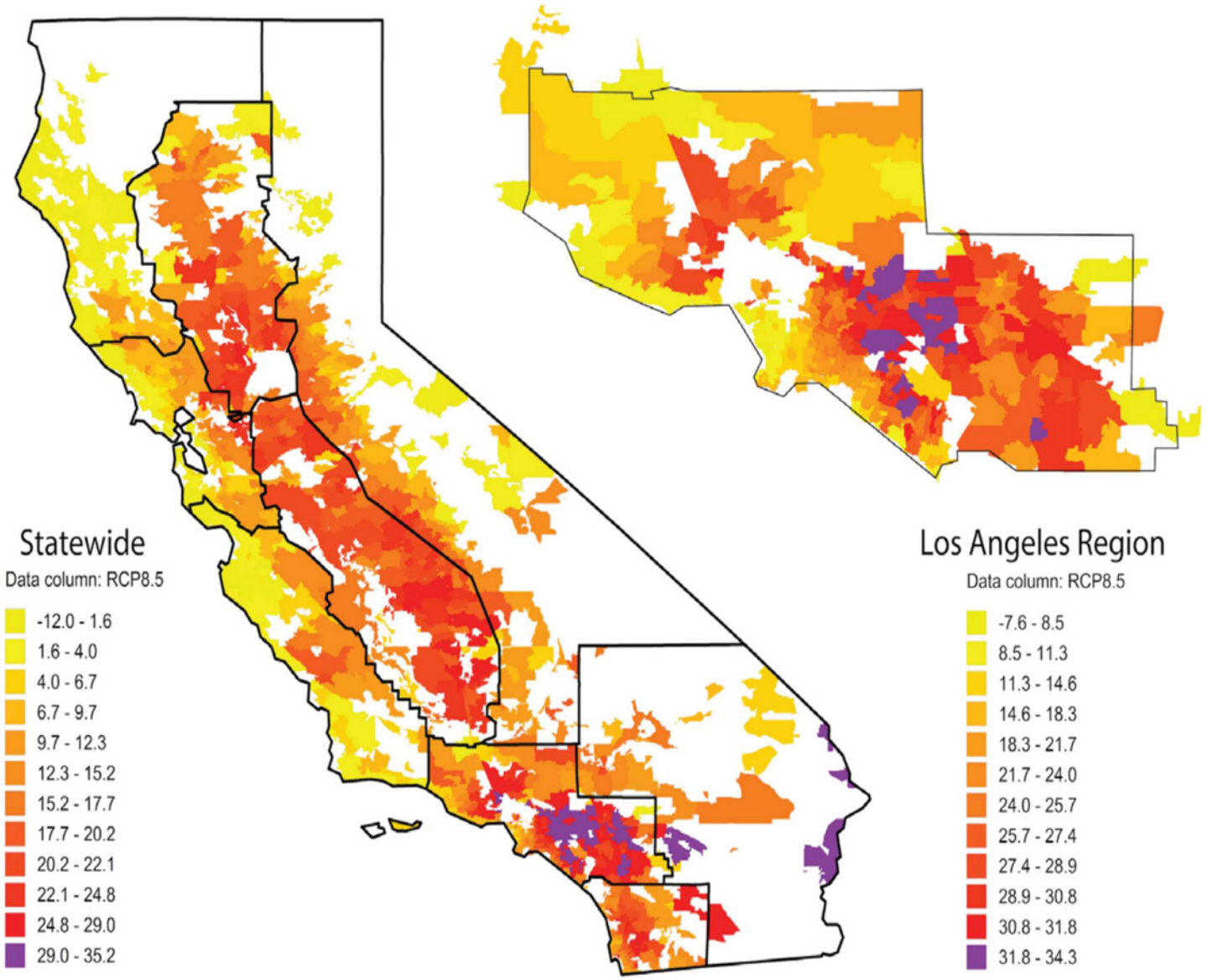
Climate change is affecting natural and human systems worldwide, and the South Bay region is no exception. Average maximum temperatures in L.A. will likely increase 4-5 degrees Fahrenheit by the mid-century, and 5-8 degrees Fahrenheit by the late century. Extremely hot days and wildfire events will happen more frequently. Sea levels will continue to rise.

Numerous groups—including the L.A. Regional Collaborative for Climate Action and Sustainability—have been planning for these changes. Enhancing regional resiliency and sustainability includes significant emissions reductions: California's Sustainable Communities and Climate Protection Act required strategies to reduce greenhouse gas emissions from passenger vehicles by 8 percent per capita by 2020 and 13 percent per capita by 2035 compared to 2005. Regional sustainability solutions also matter. For example, the "Sustainable City pLAn" for the L.A. metro region sets specific targets for renewable energy storage, storm water capture, recycling and reusing, healthy beaches, clean buildings, and efficient mobility.[xxii]

A changing climate will also affect energy availability and consumer demand. Natural gas is the main fossil-based energy source used for electricity generation in Southern California. Of 683 natural gas-fired thermal generating facilities statewide, 246 are in the Los Angeles region. For renewables, solar is king is Southern California—followed by hydroelectric and wind power. Average daily solar irradiance intensity of 6,000 Watt-hours per meter squared makes the region one of the best in the nation.

This energy will be needed as higher average temperatures will increase energy demand during warmer months. The largest projected growth (30%-35%) in consumption is for inland parts of Los Angeles County, while this change is modest (10%-15%) for coastal areas in the region. Installing solar panels on homes can lower utility bills and replace dirtier energy sources with clean ones. For example, GRID Alternatives Greater Los Angeles installed solar panels at no cost on the homes of almost 2000 low-income families in 2019, saving these families over $5,000,000 in lifetime expenses and cutting over 10,000 tons of carbon emissions.[xxiii]

FIGURE 21. FORECASTED PERCENTAGE INCREASES IN TOTAL ANNUAL ELECTRICITY CONSUMPTION BY ZIP CODE BY THE YEAR 2100 UNDER RCP8.5



"The *Silicon Beach* phenomenon in Los Angeles continues to spread into the South Bay."

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