

TRI-VALLEY RISING 2018

About this Report

Tri-Valley Rising was published in 2014 with the aim of taking inventory of the Tri-Valley region's assets and resources, explaining its impressive economic success, identifying challenges that could threaten to impede its future growth, and providing policy recommendations to ensure its continued vitality. Among the report's findings were that the Tri-Valley's innovation assets were driving its economy, high-value connections between the Tri-Valley and the broader region were growing, a high quality of life was a large part of the Tri-Valley's competitive advantage, and improving transportation systems between the Tri-Valley and broader region would support growing economic activity and improve competitiveness.

This July 2018 update to *Tri-Valley Rising* builds on the findings and information presented in the first report, while also exploring more policy options for local and regional stakeholders to better connect and strengthen the Tri-Valley's economy as it continues to grow.

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About the Institute

Since 1990, the Bay Area Council Economic Institute has been the leading think tank focused on the economic and policy issues facing the San Francisco/Silicon Valley Bay Area, one of the most dynamic regions in the United States and the world's leading center for technology and innovation. A valued forum for stakeholder engagement and a respected source of information and fact-based analysis, the Institute is a trusted partner and adviser to both business leaders and government officials. Through its economic and policy research and its many partnerships, the Institute addresses major factors impacting the competitiveness, economic development and quality of life of the region and the state, including infrastructure, globalization, science and technology, and health policy. It is guided by a Board of Trustees drawn from influential leaders in the corporate, academic, non-profit, and government sectors.

The Institute is housed at and supported by the Bay Area Council, a public policy organization that includes hundreds of the region's largest employers and is committed to keeping the Bay Area the world's most competitive economy and best place to live. The Institute also supports and manages the Bay Area Science and Innovation Consortium (BASIC), a partnership of Northern California's leading scientific research laboratories and thinkers.

Cover Photo

At Lawrence Livermore National Laboratory, researchers rely on some of the world's fastest supercomputers to simulate technologies at the atomic scale. This image shows metal atoms captured in a carbon honeycomb, called graphene. While the image combines science and art, Lawrence Livermore scientists are using such imagery to study materials in hopes of improving performance and storage capacity in lithium-ion batteries.

Image by Ryan Chen/LLNL

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Executive Summary

Located in the geographic center of the San Francisco Bay Area, the Tri-Valley is both a hub of business and a highly desirable place to live. Encompassing the five cities of Danville, Dublin, Livermore, Pleasanton, and San Ramon, the Tri-Valley punches far above its weight in terms of economic power. With an annual output of \$42 billion, the small region is an integral part of the Bay Area economy. Its institutional assets and history of entrepreneurship have brought it to the forefront of Bay Area innovation.

Since the publication of *Tri-Valley Rising* in 2014, the Tri-Valley region has only continued to grow. Given its high quality of life and proximity to top jobs, large numbers of people have continued to move to the Tri-Valley. The region has grown by 8% just since 2014, adding 28,000 more people. The number of jobs has grown even more rapidly, increasing by 12% since 2014.

This growth is due to a variety of assets that have made the Tri-Valley such a successful hub of economic activity. These key factors include:

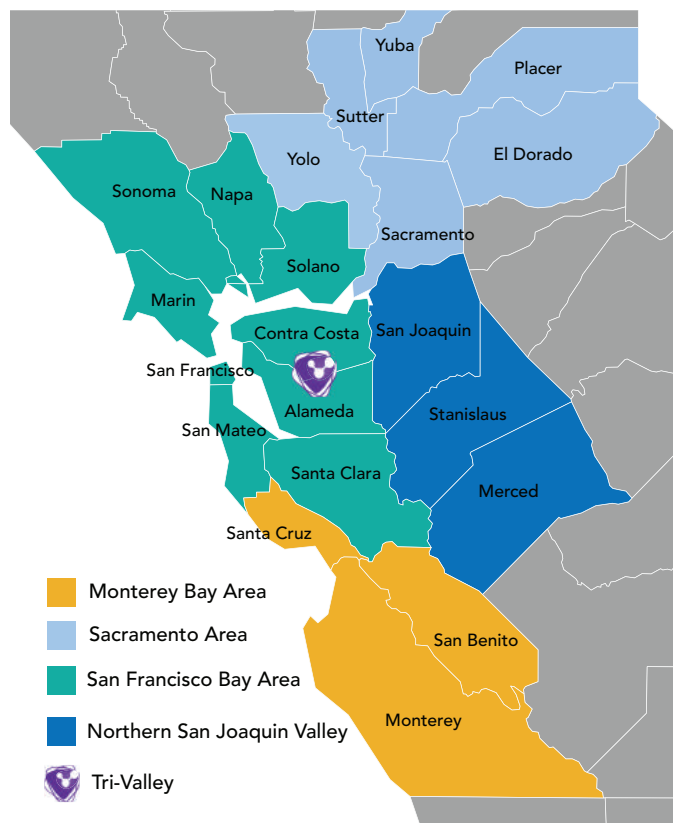
- **A highly educated population** — 60% of Tri-Valley residents have a bachelor's degree or higher, making the region significantly more highly educated than California or the Bay Area as a whole. This strong talent pool makes the Tri-Valley a very attractive place for employers to locate.
- **Geographic connectivity to one of the most economically productive regions in the world** — the Tri-Valley is at the heart of the Northern California Megaregion, close to San Francisco, Silicon Valley, Sacramento, and the Central Valley, which has allowed it to attract new and growing businesses, in addition to a large pool of workers.
- **Comparative affordability of housing** — although Tri-Valley home prices have been rising quickly, they are still less expensive than in Silicon Valley and San Francisco. The median home value in the Tri-Valley is still below \$1 million, while in San Francisco it is \$1.2 million and in Silicon Valley it is \$1.1 million.
- **High-value, lower-cost commercial real estate** — for businesses looking to open offices in the region, locating in the Tri-Valley instead of San Francisco can mean saving more than half of what they would otherwise be paying for rent. It also often means getting high-value space in amenity-filled campuses like Bishop Ranch and Hacienda. The average price per square foot for office space is \$32.04 in the Tri-Valley, compared to \$52.20 in Silicon Valley and \$74.17 in San Francisco.
- **A high quality of life that attracts innovators and business leaders** — the Tri-Valley's natural beauty, tight-knit communities, top-notch schools, and charming downtowns are often cited as key reasons behind the decision to do business in the Tri-Valley. The region's schools are among the best in the state, with a graduation rate of 97%, compared to 86% for the Bay Area as a whole. The Tri-Valley also excels at offering opportunities for work-life balance, allowing people to live nearby to where they work.
- **An ecosystem of innovation** — the Tri-Valley has become a hotbed of innovation and entrepreneurship. The two national laboratories—Lawrence Livermore National Laboratory and Sandia National Laboratory—have led the region in innovation for over 50 years. Incubators such as i-GATE and accelerators such as BRIIA have helped homegrown entrepreneurs succeed. Over 450 technology companies are located in the Tri-Valley, and the region has received over \$4 billion in

venture capital and private equity investment in the past 10 years.

While all of this growth has brought great economic success to the Tri-Valley, it has also brought with it some of the accompanying challenges that have been facing much of the rest of the Bay Area. We present several key findings and recommendations to ensure that the Tri-Valley retains its high quality of life while at the same time allowing innovation and economic expansion:

- **Housing development is needed to stem the rise in cost of living.** Although wages have generally kept better pace with increases in the cost of living in the Tri-Valley than in San Francisco, growth in cost of living has begun to outpace wages in recent years. High demand for housing in the Tri-Valley is reflected in rapidly rising home prices.

The Tri-Valley Sits at the Heart of Innovation in the Northern California Megaregion



- **If housing prices continue to rise, Tri-Valley businesses may have a hard time attracting workers.** It will be imperative to increase the supply of housing to satisfy some of the high demand. The Tri-Valley has been more successful than Silicon Valley and San Francisco in creating a jobs-to-housing balance, but more housing is still needed. Transit-oriented development will be an important piece in achieving a better jobs-to-housing balance.
- **Transportation is the key bottleneck for the Tri-Valley's growth.** The increasing cost of Bay Area housing has also contributed to another of the Tri-Valley's major challenges: transportation. As people working in the Bay Area move to more far flung places around the megaregion, they must travel longer distances to get to their jobs.
- **Average daily vehicle hours of delay on I-580 and I-680 have increased significantly since 2013, and greater strain has been placed on both BART and ACE as transit ridership rises.** Investment in transportation will be key in maintaining the Tri-Valley's status as a desirable place to live and work. Important steps will include creating greater megaregional transit connectivity in the form of a rail link between ACE and BART, as well as strengthening the core of the transit system.

Planning for the future of the Tri-Valley will require a great deal of collaboration. To this end, we recommend that Innovation Tri-Valley Leadership Group serve as the convener of the five cities, two counties, and other regional stakeholders to create an "Innovation Tri-Valley Vision Plan." Through the process of creating this plan, stakeholders should seek to answer how they can ensure the sustainability of their economies while continuing to attract businesses and the jobs that they bring.

The plan should address the need for greater transit connectivity, improved transportation infrastructure, a larger supply of housing for a range of income groups, preparedness for future innovations in mobility and the nature of work, and enhanced support for entrepreneurship and innovation. Such a plan can create a roadmap for setting the Tri-Valley on a path toward an even brighter future.





1

Introduction

Sitting in the center of the economically vibrant Bay Area, the Tri-Valley has put itself on the map as one of the most innovative and fastest growing areas in Northern California. Surrounded by rolling hills, parkland, and a significant piece of the Bay Area’s agricultural footprint, the Tri-Valley’s physical character is far from dense or urban. Yet, its economic character can hardly be categorized as suburban.

Unlike most suburban areas, the Tri-Valley is a major job center, home to two national labs and the headquarters of more than 450 technology companies.¹ With a regional gross domestic product (GDP) of \$42 billion—similar to that of the Durham-Chapel Hill metropolitan area—the Tri-Valley is far more than a bedroom community. The juxtaposition of urban and suburban elements defines the Tri-Valley, a region that combines livability with rapid economic growth.

The Tri-Valley takes its name from three nearby valleys: Amador Valley, Livermore Valley, and San Ramon Valley. It encompasses the cities of Danville, Dublin, Livermore, Pleasanton, and San Ramon. Located near the geographical middle of the Bay Area, it is 20 miles from Oakland, 28 miles from San Francisco, and 30 miles from San Jose. The region has a population of 361,000, comprising about 5% of the Bay Area’s population.

Looking ahead, the Tri-Valley is well-positioned to be a key cog in the economy of the Northern California Megaregion. As the Bay Area’s economy expands, roadblocks to growth lie in the availability of affordable space—housing for a growing workforce and office and industrial buildings for growing companies.

For this reason, planning for growth outside of the traditional nine-county boundary of the Bay Area region, to the Northern San Joaquin Valley and Sacramento Region, is imperative for the Tri-Valley to continue along an upward economic growth trajectory. Without long-term planning, the Tri-Valley might face many of the same problems that plague other parts of the Bay Area—extremely high housing costs, a lack of economic mobility, and heavy congestion on roadways.

The Tri-Valley’s story is one of rapid growth and economic progress, which we first explored in *Tri-Valley Rising* in 2014. That report sought to illuminate the Tri-Valley’s role in the Bay Area by focusing on the connectivity between the Tri-Valley and San Francisco and Silicon Valley. It found that the Tri-Valley has strong links to the broader Bay Area, with many of its residents commuting to other parts of the region and a great deal of capital and resources flowing in from Silicon Valley.

This report will provide an update to many of the numbers and trends seen in the last report, but it will place a greater focus on turning inward to explore the Tri-Valley’s successes and future challenges that come with rapid growth. It will examine how and why the Tri-Valley got to where it is today, as well as how the region can continue to expand economically while at the same time maintaining its quality of life. This will involve looking in-depth at the people, businesses, and collaborative organizations of the Tri-Valley, and exploring how the Tri-Valley can best position its economic assets in the context of the Bay Area region and the broader Northern California Megaregion.

Collaboration Drives Innovation in the Tri-Valley

Much of the Tri-Valley's economic success stems from its strength in innovation and entrepreneurship. A large piece of this is due to the region's two national labs—**Sandia National Laboratory** and **Lawrence Livermore National Laboratory** (LLNL). Catalysts for scientific discovery, the labs collectively employ about 8,000 people. In recent years, they have worked heavily with industry to transfer lab technologies to both startups and established businesses. Initiatives like the Livermore Valley Open Campus have also allowed the labs to partner directly with private-sector entrepreneurs and problem-solvers to develop new, groundbreaking technologies.

Another key player in the Tri-Valley's ecosystem of entrepreneurship and discovery is the **Innovation Tri-Valley Leadership Group** (ITV), which was created by business leaders and influencers committed to connecting the businesses, research labs, educational institutions, and civic leaders in the Tri-Valley.

ITV is comprised of cross-sector collaborators who are drawing in new businesses, helping existing businesses expand, attracting workforce, and branding the Tri-Valley as a region that enables businesses and residents alike to help to create a better world, while living a better life. The Tri-Valley has positioned itself as a key node in the Bay Area's innovation ecosystem, and as the region has developed, its businesses, entrepreneurs, and leaders have proven that they can stand on their own—no longer reliant on a close proximity to Silicon Valley as a main selling point. ITV advances the region by illuminating and advocating for its unique attributes and assets, while putting the spotlight on its member businesses and their impact on the world.

Innovation Tri-Valley Leadership Group's work plan has four major pillars described below. ITV has formed working groups around each of these pillars with the aim of increasing public engagement, improving access to education and health care services, and with an overarching goal to promote and advance the Tri-Valley's innovative regional ecosystem.

Business Innovation: Attract businesses and skilled workforce to the region. Support accelerator and incubator programs so that new businesses can launch and flourish. Better leverage local intellectual property through tech transfer and commercialization programs and by working with the region's two national laboratories.

Education and Workforce Development: Develop an innovative workforce by bringing business and educators to the same table so they can work together on curriculum and resources to produce a talent pipeline for the Tri-Valley region and the world.

Public-Private Innovation: Advocate for greater infrastructure investment in the region. Housing, infrastructure, and transportation are all key initiatives. ITV has close relationships with government officials and staff from local up to the federal government, positioning it to be a powerful advocate for infrastructure investment.

Innovation-Based Brand Positioning: Showcase the Tri-Valley region as a community of thinkers fueled by collaboration, empathy, innovation, and a high quality of life.

Today, the Tri-Valley is home to a vital ecosystem of innovation and collaboration, as heralded by CEOs from throughout the region. In this report, we will seek to explain why the Tri-Valley has seen so much economic success, and will provide a roadmap for navigating the potential challenges that could prevent the region from continuing along its current path of prosperity.

As nearby San Francisco and Silicon Valley become increasingly expensive and congested, the Tri-Valley has an opportunity to capture a greater share of the Bay Area's growth. But as its economy expands, the Tri-Valley will need to proactively address some of the same problems that have plagued other parts of the Bay Area if it is to maintain its combination of robust growth and high quality of life. One opportunity may come from better connections outside of the nine-county Bay Area, as the Tri-Valley sits at the geographic center of the coalescing economy of the Northern California Megaregion.



Elements of Economic Success: Community, Connections, and Competitive Advantage

Across the United States, companies are leaving the suburbs for large cities. McDonald's, General Electric, Motorola Solutions, and Marriot International all recently announced plans to move headquarters from their previous suburban locales to downtown city centers. Wages are increasing more rapidly in urban counties than in suburban ones,² and poverty rates are rising faster in suburbs than in cities.³

Yet, against this national backdrop, the traditionally suburban Tri-Valley is thriving. Its population has grown by 29% since 2005, compared to 13% growth in the Bay Area as a whole. The Tri-Valley's five major cities have all experienced population expansions in the last 10 years, and the region's population now totals 361,000. If the Tri-Valley was a single city, it would be the 11th largest city in California, just behind Anaheim. Dublin has grown particularly quickly, increasing its size by 66% from 2005 to 2018 and ranking as California's seventh-fastest-growing city in 2017.⁴

Employment, too, is growing rapidly in the Tri-Valley, faster even than in other job centers in the high-growth Bay Area, and much faster than California overall. Tri-Valley employment—which surpassed 194,000 in mid-2017—increased by 35% from 2006 to 2016,

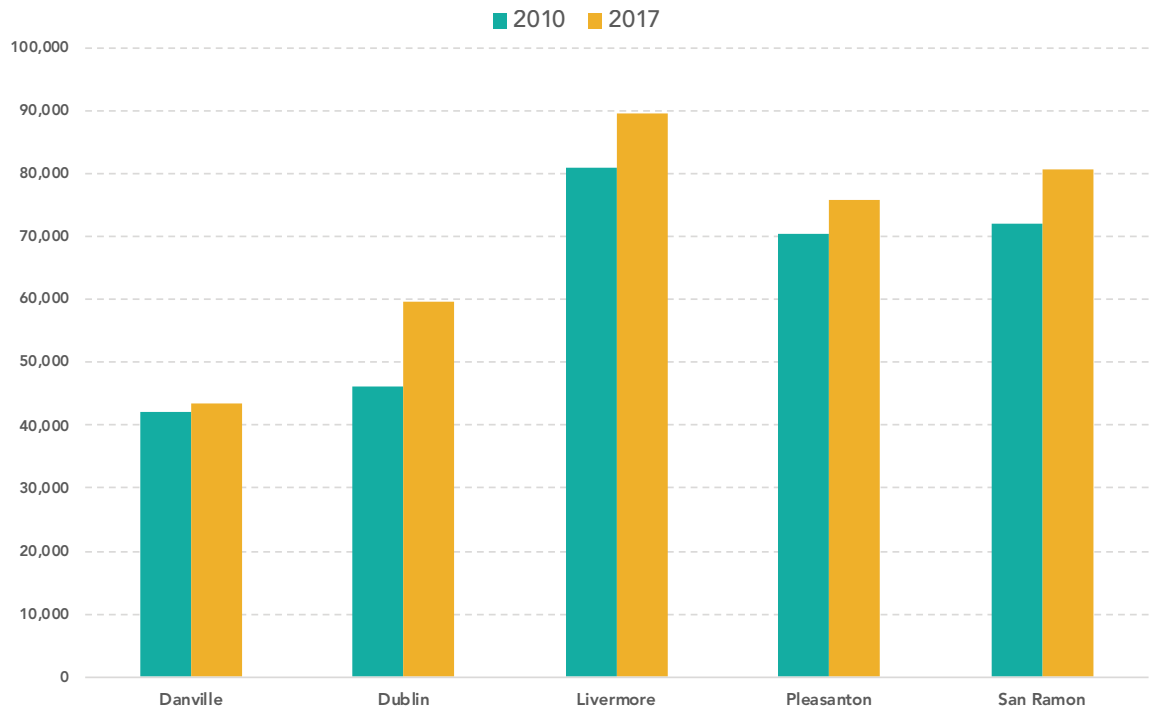
compared to 31% growth in San Francisco and 19% in Silicon Valley. California's employment growth in this time period was only 8%.

Though employment in the Tri-Valley took a greater hit during the recession than in some of these other places, it has seen strong recovery since 2010, during which time it grew at the same rate as in Silicon Valley and much faster than in California overall.

Why has the Tri-Valley become such a hub of economic and population growth when suburban areas across the country are struggling to attract business? One key reason is its history of innovation and entrepreneurship, which we will explore in a later section. In the remainder of this section, we will analyze five other qualities that have been critical drivers of this growth:

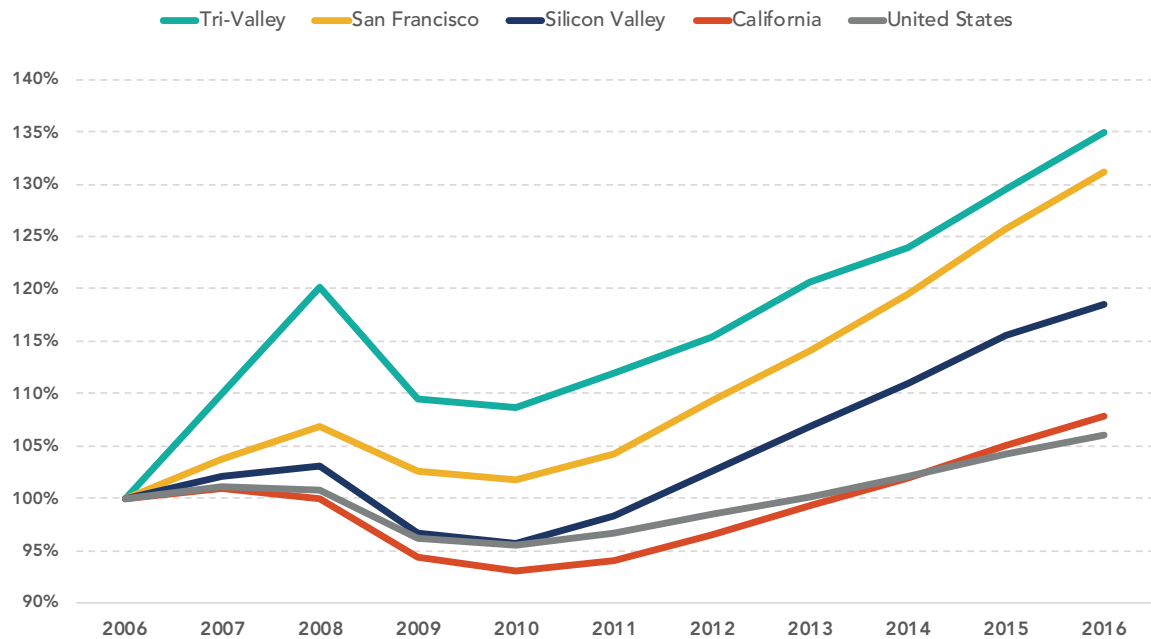
1. A highly educated population
2. Geographic connectivity
3. Comparative affordability of housing
4. High-value, lower-cost commercial real estate
5. A high quality of life that attracts innovators and business leaders

Population Growth in the Tri-Valley from 2010 to 2017



Source: California Department of Finance, E-1 Population Estimates
Analysis: Bay Area Council Economic Institute

Percentage Employment Growth Since 2006



Source: California Economic Development Department; Bureau of Labor Statistics, Quarterly Census of Employment and Wages
Analysis: Bay Area Council Economic Institute

Workforce Talent Draws Employers to the Tri-Valley

The Bay Area is one of the most well-educated regions of California, and the Tri-Valley's workforce has significantly higher educational attainment than the Bay Area as a whole. Where 33% of California's adult population and 47% of the Bay Area's had a bachelor's degree or higher in 2016, 60% of the Tri-Valley's adult population did. Similarly, 26% of adults in the Tri-Valley had a graduate or professional degree. In California, this number was only 12%, and in the Bay Area it was 19%.

The Tri-Valley has become even more highly educated since the publication of *Tri-Valley Rising*. From 2012 to 2016, the percentage of the population with a bachelor's degree or higher rose by 6 percentage points. In California as a whole, this percentage rose more slowly, with a 3-point increase. The portion of the Tri-Valley's population with a high school degree or lower dropped by 4 percentage points, from 19% to 15%. In the Bay Area, this population shrank by 3 points, and in California by 2 points.

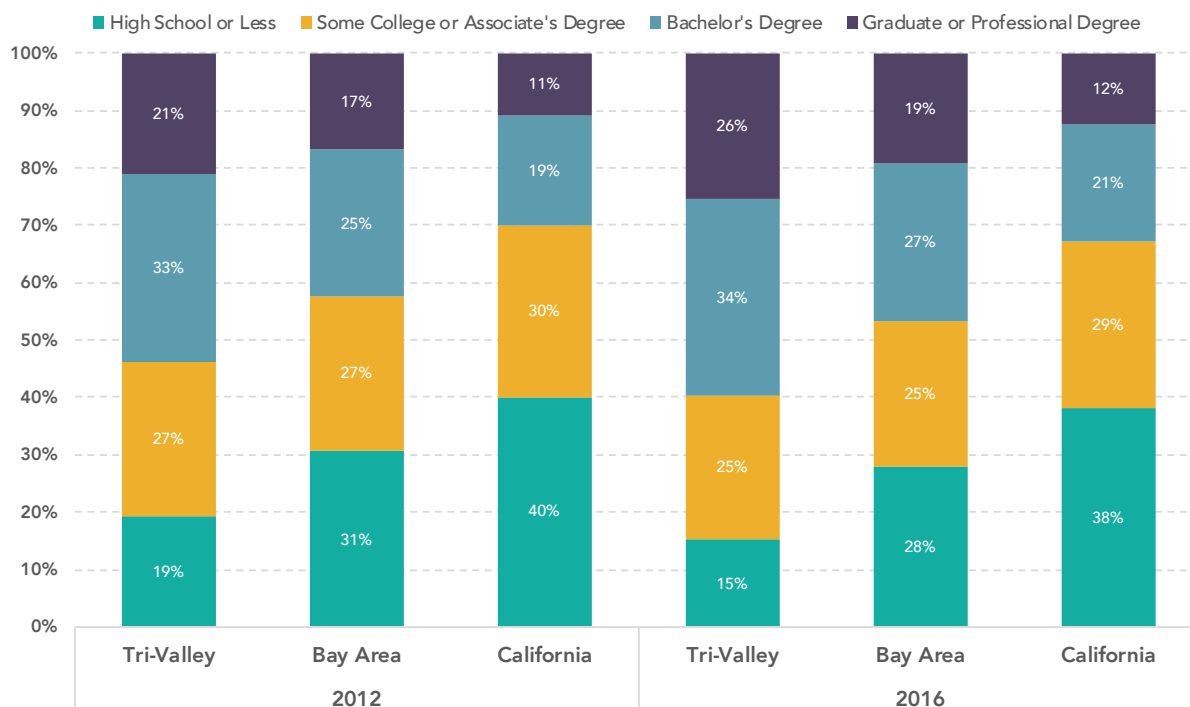
This highly-educated talent pool in the Tri-Valley contributes to a very productive workforce. With a regional GDP of \$42 billion in 2016, the Tri-Valley's GDP per worker is about \$225,000. This is much higher than California's \$160,000, and the U.S.'s \$132,000.

This is not to say that residents of the Tri-Valley are more hardworking than those in other places, but it is a reflection of the mix of high-value industries and occupations—which pay relatively high wages—that make up the Tri-Valley economy.

The Tri-Valley's workforce and talent pool make it a highly attractive place for employers to locate, especially for those that hire a large proportion of people with graduate degrees. This creates a cycle: as more STEM employers move to the Tri-Valley, more highly-educated people look to the region as a place to live and work.

However, the Tri-Valley's highly-educated talent pool is not the only reason the region has been so economically successful; its proximity and connections to other parts of the Bay Area have also been crucial.

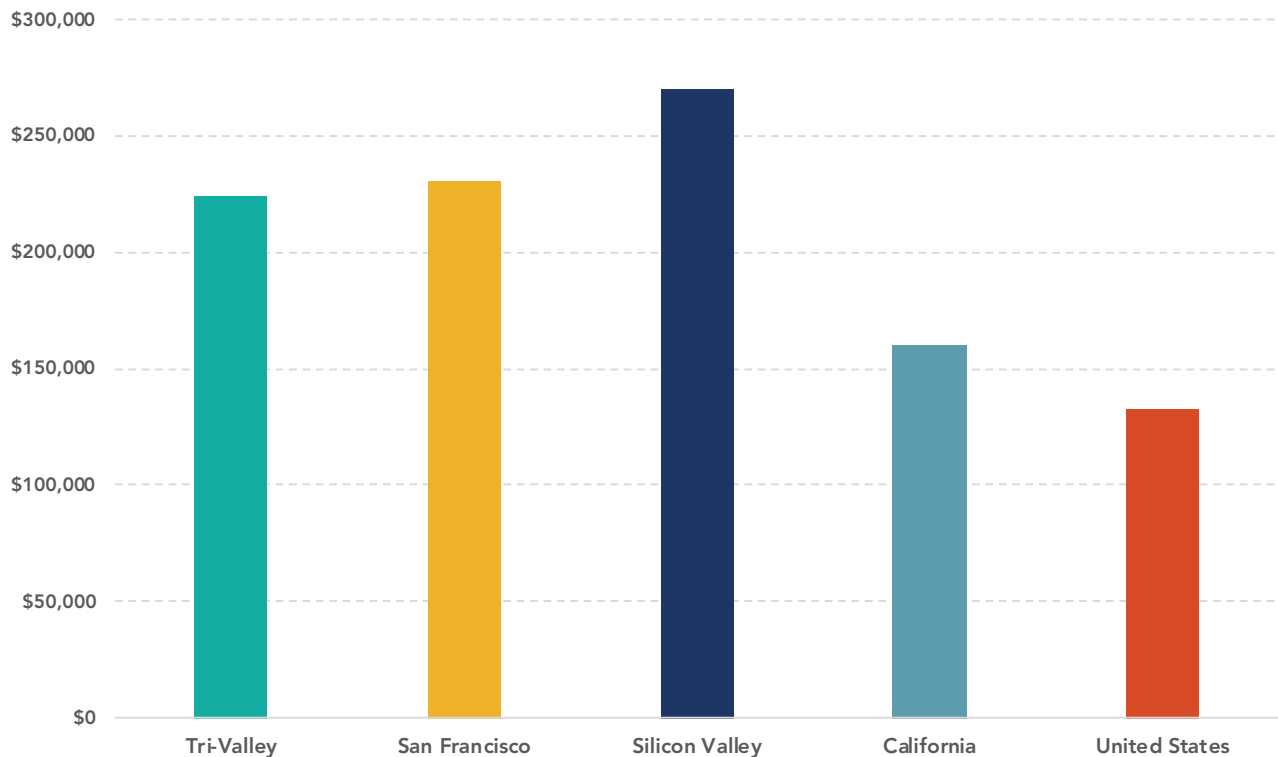
Educational Attainment



Source: U.S. Census Bureau, American Community Survey one-year estimates

Analysis: Bay Area Council Economic Institute

Productivity: GDP per Worker, 2016



Source: U.S. Department of Commerce Bureau of Economic Analysis; U.S. Census Bureau, County Business Patterns; U.S. Bureau of Labor Statistics, Quarterly Census of Wages and Employment
Analysis: Bay Area Council Economic Institute

TRI-VALLEY AT A GLANCE:

A Highly-Educated Foreign-Born Population Brings Talent and Diversity to the Tri-Valley

The Tri-Valley's population has become increasingly diverse over the past 10 years. The percentage of the population born in a foreign country has grown from 19% in 2006 to 22% in 2011 to 27% in 2016. This is lower than in the Bay Area as a whole, where 31% of the population is foreign-born, but it is much higher than the U.S. overall, where 13% of the population is foreign-born.

The Tri-Valley's foreign-born population is extremely highly educated, bringing a great deal of talent and experience to the region's economy. Of Tri-Valley adults over the age of 25 who were born in a foreign country, 32% have a graduate or professional degree. This compares to 19% for the native-born population. The Tri-Valley's foreign-born workers are a strong asset to its innovative economy and community.

Geographic Connectivity

The Bay Area is one of the most economically vibrant regions in the nation. If it were a country of its own, it would be the 19th largest economy in the world.⁵ Being a part of this region has been vital to the Tri-Valley's success at averting the fate of suburban areas across the U.S. that are facing economic stress. The Tri-Valley's advantageous position at the juncture of I-580 and I-680 and proximity to San Francisco, Silicon Valley, Sacramento, and the Central Valley have allowed it to attract new and growing businesses, in addition to a very large pool of workers.

At the same time, affordability issues in the core of the Bay Area continue to make the Tri-Valley an attractive alternative for households and companies at the geographic center of the economically diverse Northern California Megaregion.

This puts employers like **Topcon Positioning Systems**—a maker of geo-positioning technology used in a variety of commercial arenas from agriculture and construction to military equipment and city infrastructure—in a very advantageous position. With

offices all over the world, being based in Livermore allows Topcon to take advantage of the highly-educated workforce in the Tri-Valley and nearby Silicon Valley, while still being close to the more affordable housing in San Joaquin County, where it can recruit for its manufacturing jobs.

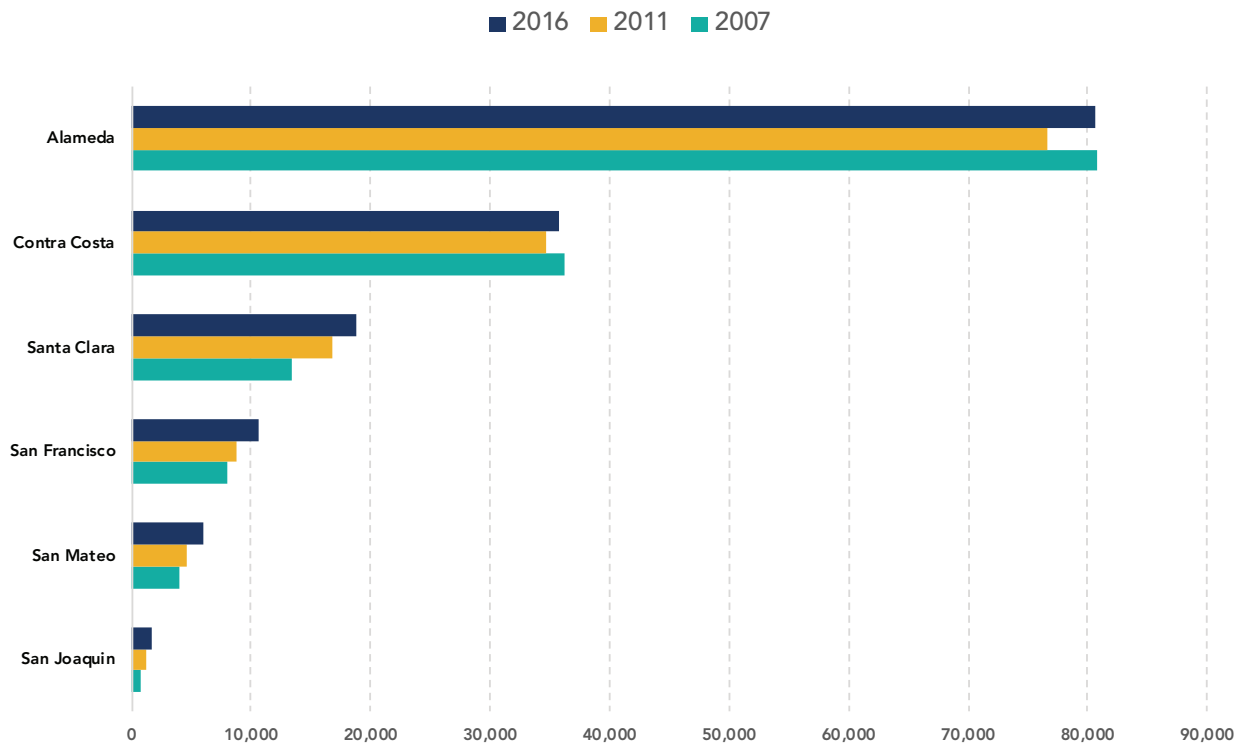
Lam Research, a Fortune 500 maker of semiconductor manufacturing equipment, employs a large number of Tri-Valley and San Joaquin County residents, and its location in Livermore makes this possible. Lam Research gives some employees the option to work in Livermore or its Fremont headquarters. The company is doubling the size of its Livermore work space as a large number of people have chosen the Livermore location, coupled with a volume increase driven by chips for cloud computing, big data analytics, and Internet of Things.

The Tri-Valley's central location is not only critical to the businesses of the area, it also gives residents the opportunity to work across the Bay Area region. While 76% of Tri-Valley employed residents work in either Alameda or Contra Costa counties, a full 16% of Tri-Valley residents who work outside their homes—nearly 25,000 people—commute to work in Silicon Valley



Photo Credit: Lam Research

Tri-Valley Resident Commuters by Work Destination County



Source: IPUMS-USA, University of Minnesota
 Analysis: Bay Area Council Economic Institute

(defined as San Mateo and Santa Clara counties). Another 10,000 residents (7%) commute to work in San Francisco. This connection to the rest of the Bay Area appears to have strengthened since 2007, at least in terms of commute flows, as the number of commuters to Santa Clara, San Francisco, and San Mateo counties has increased. Since the Tri-Valley is located near the geographic center of the Northern California Megaregion, its residents have access to jobs across counties, giving them a high degree of flexibility and a wide range of opportunity. This is helped by the Tri-Valley's two BART stations and location at the juncture of I-580 and I-680.

The Tri-Valley's geographic location has also facilitated the flow of investment, resources, and expertise into the Tri-Valley. Many Tri-Valley entrepreneurs and business leaders have worked in San Francisco and Silicon Valley in the past and have successfully leveraged these experiences and connections to create new companies in the Tri-Valley:

- One example is the story of **Unchained Labs**, a medical instrument manufacturer. Founded by Tim Harkness in 2014, the company received a Series A investment round of \$25 million in 2015 and a Series C round of \$13 million in 2017. Harkness previously helped found ProteinSimple and Molecular Devices, both companies located in Silicon Valley. The new company did not have to look far for funding; one of its lead investors is a San Francisco-based firm and another is based in Silicon Valley.
- Another such example is **Deep Sentinel**, founded in Pleasanton by David Selinger in 2017. Selinger worked directly with Jeff Bezos in Amazon's early days and then went on to co-found both RichRelevance and Redfin. Deep Sentinel, an artificial-intelligence-based home security startup, is his current project. The company has already raised \$7 million in a Series A round from investors such as Shasta Ventures, Bezos Expeditions, and Lux Capital.

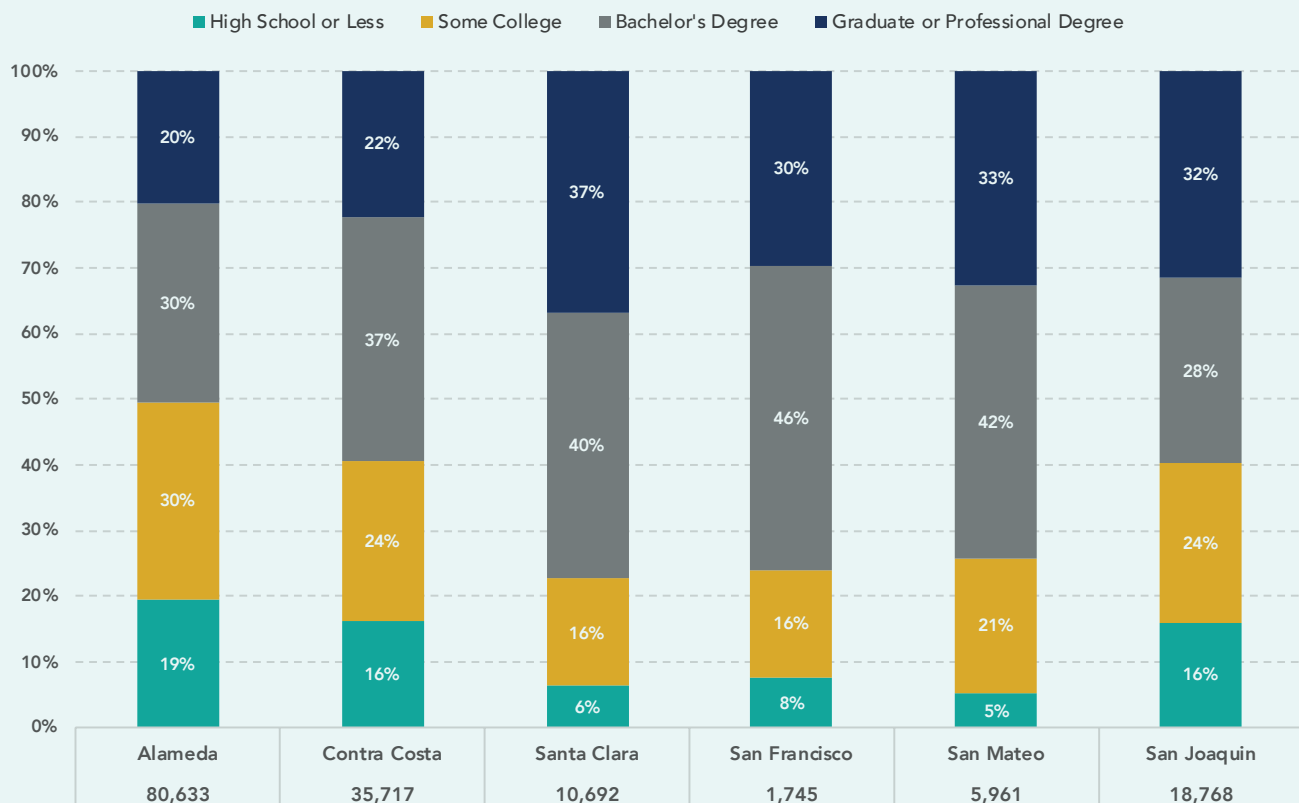
TRI-VALLEY AT A GLANCE

Cross-County Commuters by Education Level

Tri-Valley residents' commute destination by level of education reveals significant variation depending on place of work. The Tri-Valley residents who commute to Santa Clara, San Francisco, and San Mateo counties are the most highly educated groups of commuters. Among those who work in Santa Clara County, 77% have a bachelor's degree or higher. For Contra Costa County, by contrast, 59% have a bachelor's degree or higher, and for Alameda County 50% do.

This suggests that many of the very highly-educated people working in San Francisco and Silicon Valley are choosing to live in the Tri-Valley. As such, there may be a significant economic development opportunity for Tri-Valley businesses to recruit from the pool of highly-educated workers who already live in the area and who might be enticed by the prospect of a much shorter commute.

Tri-Valley Commuters by Destination County and Educational Attainment, 2016



*Total number of commuters to each county listed beneath county name

Source: IPUMS USA, University of Minnesota
Analysis: Bay Area Council Economic Institute

Comparative Affordability of Housing

The Tri-Valley's geographic place within the Bay Area has also helped its success in another way: giving it a comparative cost advantage over the region's other job centers. As both housing and commercial real estate have become increasingly expensive in the Bay Area's inner core, the Tri-Valley has remained more affordable, enticing businesses and people alike to move there.

Though Tri-Valley homes are expensive compared to California as a whole, they are relatively inexpensive compared to many other parts of the Bay Area.

- Since 2012, the median home value in the Bay Area has increased by 76%. In San Francisco, it increased by 74%, and in Silicon Valley, it increased by 79%. The median home value in San Francisco is now \$1.2 million, and in Silicon Valley it is \$1.1 million.
- In the Tri-Valley, the median home price is below \$1 million and its value increased by 56% between 2012 and 2017.

High-Value, Lower-Cost Commercial Real Estate

Another key reason the Tri-Valley has been an appealing place for companies to locate is its relatively inexpensive commercial real estate. In 2017, the average yearly rental price per square foot for office space in the

Tri-Valley was \$32.04. For Silicon Valley it was \$52.20, and for the Oakland metropolitan area it was \$38.52. In San Francisco, office space was more than twice as expensive as in the Tri-Valley, at \$74.17 per month.

Commercial real estate prices have also grown more slowly over the past few years in the Tri-Valley than in nearby areas. From 2014 to 2017, Silicon Valley rents increased by 40% and Oakland metropolitan rents by 46%. The Tri-Valley saw increases of only 20%.

For businesses looking to open offices in the region, locating in the Tri-Valley instead of San Francisco can mean saving more than half of what they would be paying for rent. It also often means getting high-value space in amenity-filled campuses like Bishop Ranch and Hacienda business parks, where some of the nation's top companies have major offices, including Allergan, AT&T, Bank of the West, Blackberry, Boeing, Chevron, Cisco Systems, Donor Network West, Gap, GE Digital, Hewlett-Packard Inc., IBM, Kaiser Permanente, MetLife, Morgan Stanley, Nestlé, Oracle, PG&E, Rodan + Fields, SAP, Verizon, Walgreens, and Walmart. Commercial real estate in the Tri-Valley is also desirable for many employers because of its proximity to the Central Valley, where more of their employees can afford to live.

There is still office space available for businesses to move in to the Tri-Valley and expand, meaning that upward pricing pressures are currently fairly limited. With a vacancy rate of 10%, the area still has some office capacity.⁶ San Francisco has a tighter market, with a vacancy rate of 8.6%, leaving less room for new businesses to move in without additional development.⁷



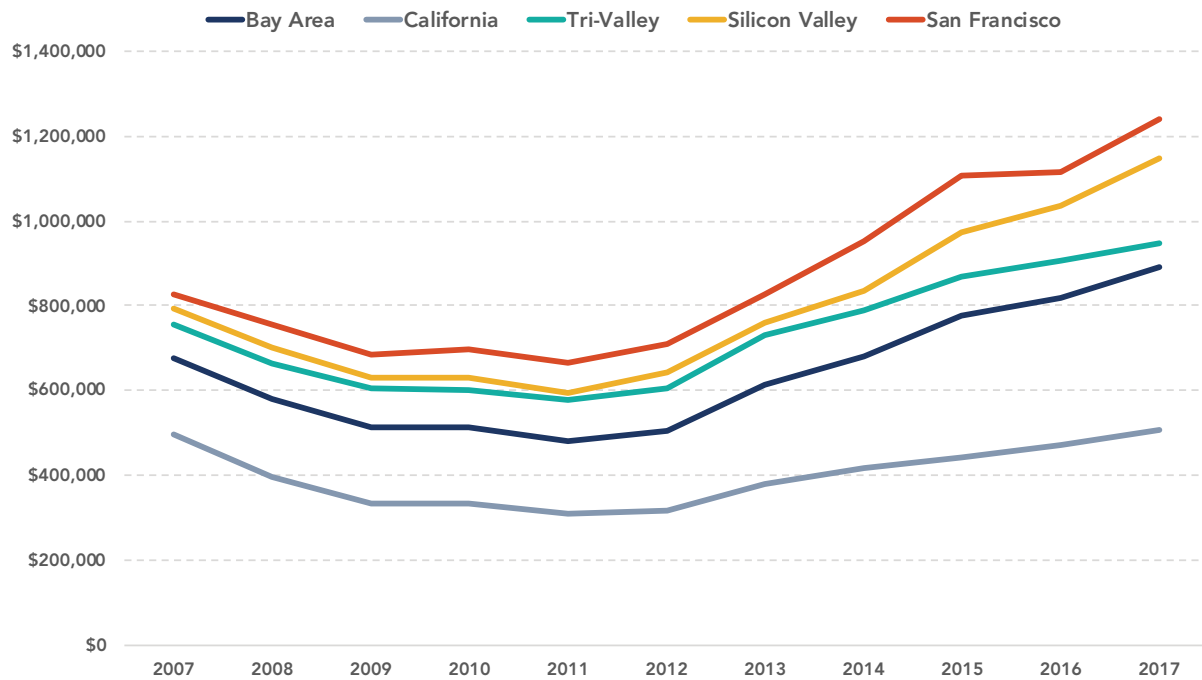
Brighton Homes in Livermore



CallidusCloud in Dublin

Median Home Value Regional Comparison

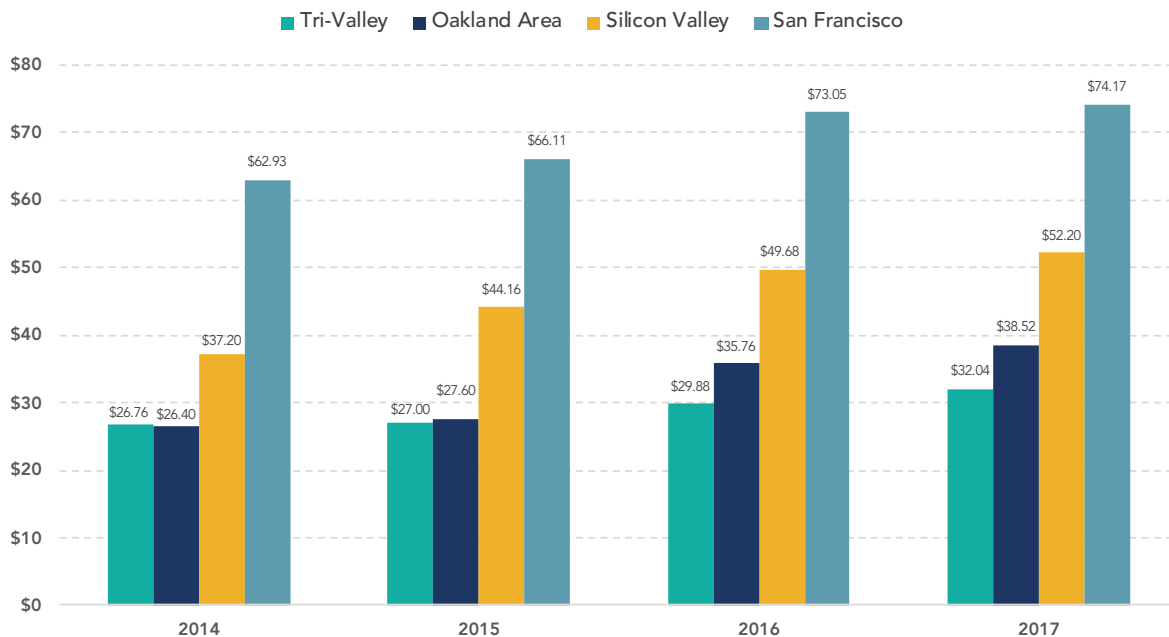
(Based on Zillow Home Value Index)



Source: Zillow Home Value Index, All Homes Time Series
Analysis: Bay Area Council Economic Institute

Note: Median values are for the month of August of each year

Average Price per Square Foot for Office Space



Source: Colliers International Research and Forecast Reports; Jones Lang LaSalle United States Office Outlook
Analysis: Bay Area Council Economic Institute

Note: Oakland area is defined as Alameda, Berkeley, Emeryville, Oakland, and Richmond

A High Quality of Life Attracts Innovators and Business Leaders

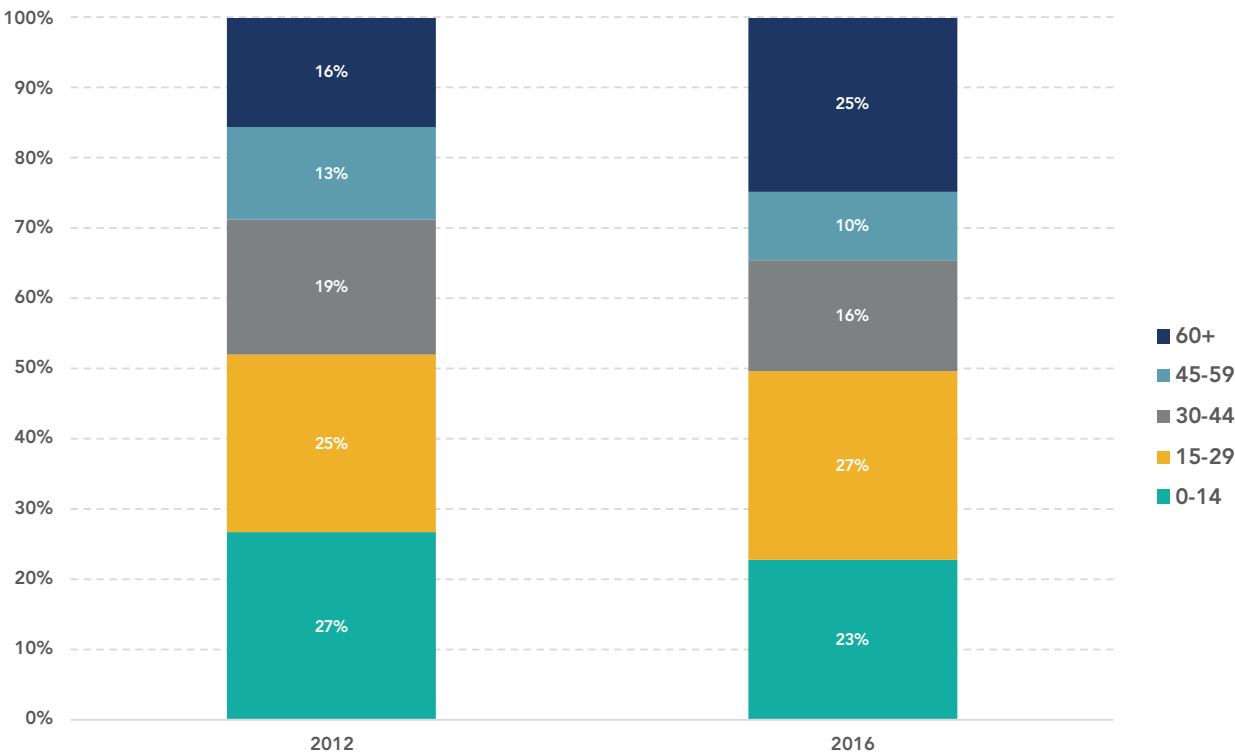
The high quality of life in the Tri-Valley has helped to attract companies and jobs to the region. Many business leaders described the region’s natural beauty, tight-knit communities, top-notch schools, and charming downtowns as key reasons behind their decision to do business in the Tri-Valley. Indeed, the region appears to offer an alternative to those who want to have an option for easy commutes between home and work.

Fifty percent of Tri-Valley residents who work outside their homes have a commute of 30 minutes or less. Twenty-three percent of residents have a commute of under 15 minutes. This compares to only 11% of San Francisco residents with a commute under 15 minutes. However, a significant proportion of Tri-Valley residents,

25%, commute over an hour to get to work. There is likely significant overlap between this group and the 23% of Tri-Valley residents who work in Silicon Valley or San Francisco.

The Tri-Valley also excels at offering opportunities for work-life balance. People who both live and work in the Tri-Valley often have short commutes, which helps maximize the time they are able to spend with their families. Additionally, because the Tri-Valley is home to so many families with children, business leaders have noted that the region’s workplace culture is supportive of policies like flexible scheduling that allow people to participate in their children’s lives and in their communities. Tri-Valley community members do not have to sacrifice the opportunity to work at impactful and innovative companies for the ability to invest quality time at home.

Length of Commute to Work for Tri-Valley Residents, in Minutes



Source: U.S. Census Bureau, American Community Survey One-Year Estimates
Analysis: Bay Area Council Economic Institute

TRI-VALLEY AT A GLANCE

Education System Adds to Quality of Life

In interviews, many business leaders in the area cited the quality of the region's schools as one of the main reasons why they chose to move to the Tri-Valley.

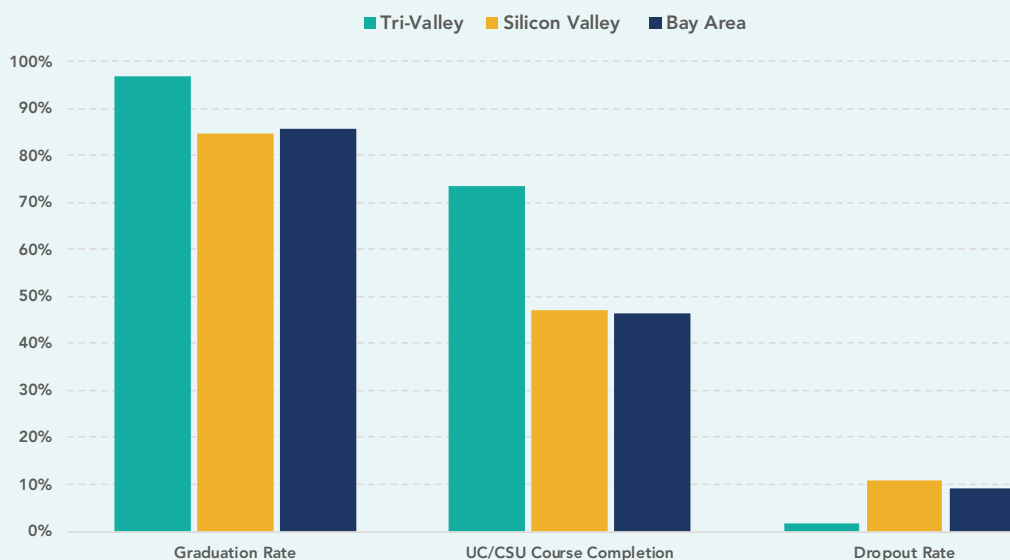
For the 2015-2016 school year, the graduation rate for Tri-Valley school districts was 97%. This was more than 10 percentage points higher than the rates for both Silicon Valley and the Bay Area as a whole. Similarly, the dropout rate in the Tri-Valley was only 2%, compared to 11% for Silicon Valley and 9% for the Bay Area. This is an improvement since the publication of *Tri-Valley Rising*, at which time the most recent data available was from the 2011-2012 school year, and the Tri-Valley's graduation rate was 95%.

Over 70% of Tri-Valley high school students completed the courses required for application to the University of California and California State University systems. In Silicon Valley and the Bay Area overall, fewer than 50% of students completed these courses. Tri-Valley students have become even better prepared for college since 2012, when 60% of students completed the UC/CSU course requirements.

Further providing educational opportunities to the Tri-Valley's youth, Lawrence Livermore National Laboratory (LLNL) and Sandia have launched several initiatives to support STEM education. LLNL's annual Science on Saturday lecture series reaches thousands of Tri-Valley K-12 students each year. Its Fun With Science program is presented to elementary-age students at the laboratory's Discovery Center auditorium throughout the school year. Furthermore, more than 600 college students from across the nation regularly intern at LLNL during the summer months.

Through LLNL's Teacher Research Academy, middle school, high school, and community college faculty can get hands-on experience in real-world science. Additionally, LLNL and Sandia co-sponsor two annual Expanding Your Horizons conferences, which are designed to encourage middle school and high school girls to consider careers in math and science. Sandia's Family Science Night provides hands-on science activities at local elementary schools, inspiring Tri-Valley students to become interested in science fields.

Graduation Rate, Dropout Rate, and Share of Graduates Who Meet UC/CSU Requirements, 2015-2016



Source: California Department of Education, California Longitudinal Pupil Achievement Data System
Analysis: Bay Area Council Economic Institute





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A Diverse Economy Provides the Base for Sustained Growth

As the Tri-Valley has grown, it has done so through a diverse array of industries with a spectrum of employment across all skill levels. While the region certainly has clusters in the life sciences and software industries, it hosts companies and jobs of many types—from high-skilled technology jobs, to middle-skilled jobs in manufacturing, to local-serving roles in retail, leisure, and healthcare.

Additionally, the cities of the Tri-Valley all recognize their unique strengths that allow the region to form a cohesive economy. This is especially true when it comes to real estate, as cities like San Ramon and Pleasanton contain much of the Tri-Valley's prime office space, Danville is mainly residential, Dublin offers flexible spaces for retail and commercial uses, and Livermore can host many industrial companies. This unique diversity allows companies that locate in the Tri-Valley to have multiple locations for multiple types of operations but that are still near one another and still connected.

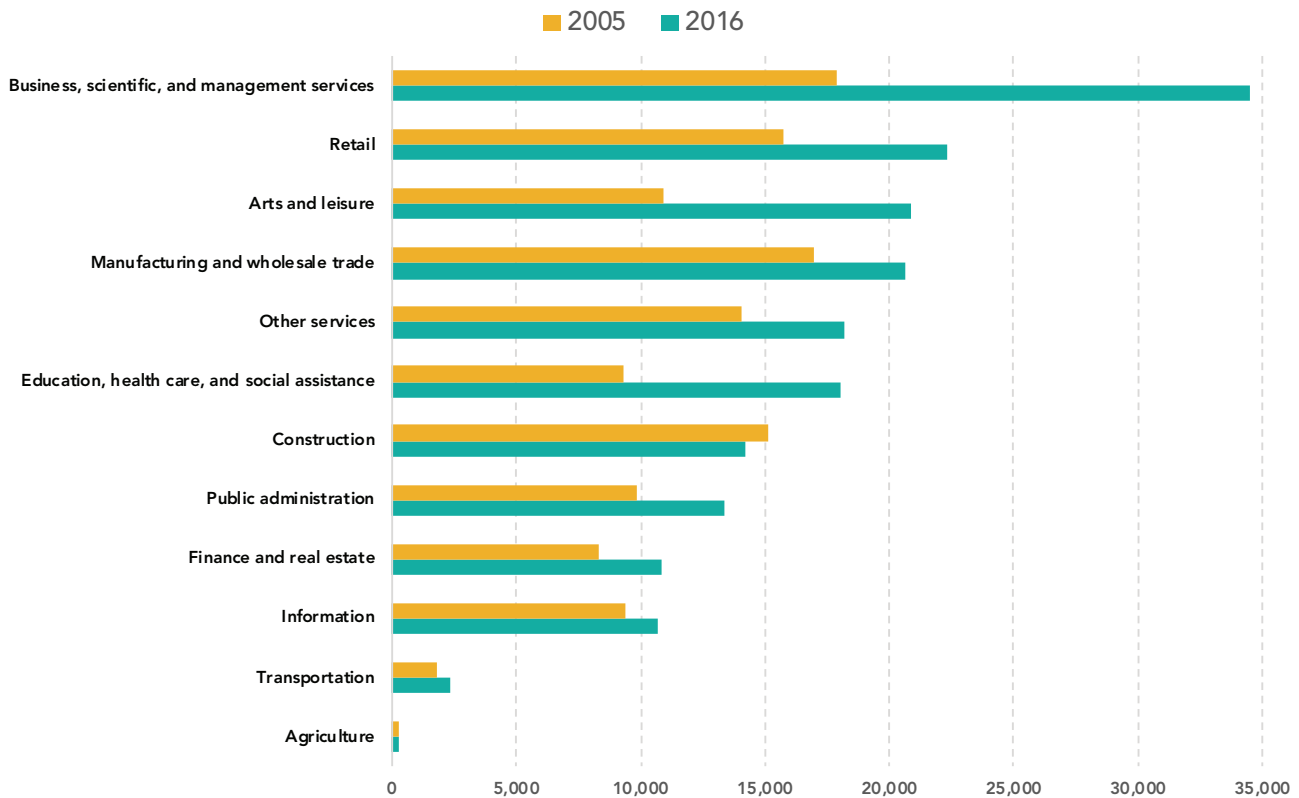
The Tri-Valley's main employment sectors have experienced differential rates of growth since 2005. The sector group that added the most jobs was business, scientific, and management services, which nearly doubled its employment in the past 11 years. About 30% of all new jobs created in the Tri-Valley since 2005 were in this group. Though it added a smaller absolute

number of jobs, the education, health care, and social assistance sector is the fastest growing in the Tri-Valley, increasing its employment by 94% since 2005—this falls in line with trends seen nationally. The only sector to lose jobs over this time period is construction, which decreased its employment by about 6%.

When drilling down into specific industries, hospitality is becoming an increasingly significant part of the Tri-Valley economy. Employment in accommodation and food services more than doubled from 2005 to 2016, now accounting for about 9% of Tri-Valley jobs. A further dive into sub-industries reveals that five of the top 15 sub-industries in terms of absolute employment growth between 2005 and 2017 have a high percentage of STEM occupations:

- 1. Computer Systems Design and Related Services (+2,225 jobs)**
- 2. Outpatient Care Centers (+1,974 jobs)**
- 3. Navigational and Control Instruments Manufacturing (+812 jobs)**
- 4. Software Publishers (+750 jobs)**
- 5. Computer Equipment Manufacturing (+500 jobs)**

Tri-Valley Employment by Sector



Source: State of California, Employment Development Department

Analysis: Bay Area Council Economic Institute

Top Ten Fastest Growing Tri-Valley Industries

Industry	% Growth in Employment Since 2005
Educational Services	157%
Accommodation and Food Services	118%
Health Care and Social Assistance	97%
Professional, Scientific, and Technical Services	97%
Management of Companies and Enterprises	62%
Other Services (except Public Administration)	59%
Retail Trade	46%
Utilities	39%
Public Administration	32%
Wholesale Trade	30%

Source: California Employment Development Department

Analysis: Bay Area Council Economic Institute

Healthcare Sector Provides Jobs and Adds to Quality of Life

As shown on the opposite page, jobs in healthcare are growing at a very fast rate in the Tri-Valley. Not only do healthcare systems provide a variety of jobs across skill levels, they also make the region an attractive place to live. **Stanford Health Care - ValleyCare, John Muir Health, Stanford Children's Health, Kaiser Permanente**, and others create a very strong regional healthcare system in the Tri-Valley.

Kaiser is in the process of constructing a new 220,000 square foot facility in Dublin, which will provide

primary care as well as specialty medicine in fields such as head and neck surgery, urology, and radiation therapy. Kaiser also owns 58 acres of land surrounding its Dublin medical site where further development is possible, depending on factors like membership growth, economic health, and changes in medical technology.

It is important to note that these healthcare providers do not operate in isolation, they often partner with medical and biotechnology start-ups in the region. It is this type of collaboration that has allowed the Tri-Valley to develop a robust cluster of health and biotechnology companies, including **Purigen Biosystems, Natus, Carl Zeiss Meditec, BioVentrix, and Spirosure**.

TRI-VALLEY AT A GLANCE

Agricultural History of the Tri-Valley Remains Important Today

The Tri-Valley is not just a hub for the high-tech industry; it is also home to many acres of highly fertile agricultural land. Known especially for its wine, the Tri-Valley has been growing grapes since the 1840s. More than 50 wineries are located in the Tri-Valley, including the nation's oldest continuously operated family-owned winery, **Wente Vineyards**. Founded in 1883, it operates 3,000 acres in the Livermore Valley. With 400,000 visitors each year, Wente Vineyards is a good example of Tri-Valley businesses adapting to provide more entertainment and cultural activities as the region grows and attracts more residents and visitors from across the Bay Area. At its Livermore location, the winery offers a golf course, wine tours, restaurants, concerts, and a variety of other special events and activities.

Wente Vineyards expects the Tri-Valley's wine industry to grow substantially in the next 20 years. As demand for California's wine continues to increase, wineries will

need to expand, and there is space for them to do so in the Tri-Valley. The area is poised to capture agricultural growth, as the National Resource Conservation Service identified 50,000 acres outside of the five cities' general plans that would support intensive agriculture.

Part of the success of the preservation of agricultural lands in the Tri-Valley is due to the **Tri-Valley Conservancy**. Formerly called the South Livermore Valley Agricultural Land Trust, the organization was formed in 1987 to protect the area's agricultural land. It created a comprehensive South Livermore Valley Area Plan, which put in place incentives to invest in winegrowing, as well as regulations to limit development on the land. In 2003, it became the Tri-Valley Conservancy and expanded its reach to a larger geographic area, with a broader mission of open space preservation.

Part of the reason the Tri-Valley has been able to attract and retain a diverse mix of industries lies in its high-quality office space—much of which is located at Hacienda in Pleasanton and Bishop Ranch in San Ramon. The prevalence of relatively affordable space also means that new companies that grow up in the Tri-Valley can often find a place to expand their operations without needing to leave the region.

BISHOP RANCH SPOTLIGHT

Bishop Ranch Business Park is a key fixture in San Ramon's economy and daily life. Spanning 585 acres and hosting 30,000 employees, Bishop Ranch has attracted some of the most prominent employers in the region, including **AT&T, Bank of the West, Blackberry, Chevron, Donor Network West, GE Digital, IBM, Nestlé, PG&E, Rodan + Fields,** and **SAP**. In contrast to dense office space locations in San Francisco or downtown Oakland, Bishop Ranch offers free parking and a spacious campus that includes a lake.

The business park also offers transportation options that may serve as a model for Tri-Valley businesses looking to attract younger talent and create greater regional connectivity. All Bishop Ranch employees receive free passes for County Connection buses, which include express lines to the business park from the Pleasanton ACE station and the Walnut Creek and Dublin/Pleasanton BART stations. Bishop Ranch has also been piloting two fully autonomous buses on its campus. The partnership between Bishop Ranch, GoMentum, and Contra Costa County Transportation Authority shows that the Tri-Valley is on the cutting edge in finding solutions to employers' first- and last-mile challenges.

Sunset Development, the owner of Bishop Ranch, is currently undertaking another project that will create an entirely new downtown area for San Ramon. Called Bishop Ranch City Center, it will feature 300,000 feet of commercial space, anchored by an Equinox Fitness and a high-end movie theater called The Lot. World-renowned Italian architect Renzo Piano, who also designed San Francisco's California Academy of Sciences, designed the space. Set to be completed in fall 2018, the project aims to provide a social center with urban-style amenities to San Ramon and Tri-Valley residents. About half of its space will be dedicated to traditional retail, and half will be for entertainment and food. The space is meant to serve as a true city center, with a one-acre piazza at its center and a goal of enticing visitors to come together and interact.

Efforts like this to enhance quality of life and inject vitality into suburban areas have been key to the Tri-Valley's success in attracting major companies, and they will continue to be important in drawing in young talent to the area. The project will be combined with a revamped library and a new city hall nearby, rounding out the area's role as a focal point for the San Ramon and Tri-Valley communities.



HACIENDA SPOTLIGHT

Located in Pleasanton, Hacienda is a mixed-use, planned unit development that contains 875 acres of transit-oriented, mixed-use space. A central hub of residential life and business activity in the Tri-Valley, it is home to about 680 companies, employing 20,000 people, and also featuring 2,300 residential units. With the Dublin/Pleasanton BART station located within Hacienda, the development is well-connected to transit, allowing for the high level of work-life integration that the Tri-Valley is known for.

Hacienda hosts many of the Tri-Valley's major employers. Its tenants include **Allergan, Boeing, Cisco Systems, Gap, Hewlett-Packard Inc., Kaiser Permanente, MetLife, Morgan Stanley, Oracle, Verizon, Walgreens,** and **Walmart**. Additionally, headquartered at Hacienda are **Ellie Mae, Iron Planet, Roche Molecular Diagnostics, Shaklee, Signature Homes,** and **Veeva Systems**. Hacienda has been growing along with its tenant companies in recent years. In 2017, Roche Molecular completed construction of a new 70,700 square foot facility. Hacienda has had positive net absorption every year for the past seven years, and it still has room to expand as its current companies grow and new businesses arrive. Its biggest expansions have been from companies that began small and have since grown.

The City of Pleasanton has collaborated with Hacienda in innovative ways on several occasions to make the area as conducive to economic success as possible. One such example is the partnership to create "smart poles" by installing small cell wireless systems in streetlight poles owned by Hacienda in the public right-of-way in order to deliver robust cell coverage in the area. Hacienda has also worked with the city to bring in fiber optic infrastructure to improve service quality for its tenants and residents. These initiatives will provide Hacienda businesses and residents with state-of-the-art services delivering high-speed connectivity.

As a truly mixed-use development, Hacienda exemplifies a promising model for successful future growth in the Tri-Valley. It recently completed construction of three major residential complexes and is nearly done building a development of 94 townhomes and condominiums. The three completed projects are comprised of nearly 700 units of rental housing, providing a great option for younger workers to live and work in a vibrant area near transit. With a nationally recognized commute program, Hacienda subsidizes Wheels bus passes for all its residents and tenants, and it runs a free interregional bus service along the I-680 corridor.



Innovation Defines the Tri-Valley's Past and its Path Forward

The key characteristic of the Tri-Valley and a crucial element in its story of economic success is the region's history of innovation. This history has been helped by an ecosystem of entrepreneurship and discovery, built around collaboration between the national labs, business leaders, governmental bodies, educational partners, and civic leaders.

National Laboratories Anchor Ecosystem

Around the country, the network of national laboratories has historically been viewed as closed-door facilities whose reach into the local community has been somewhat limited. In the Tri-Valley, the only area of the country to be home to two major neighboring laboratories, a sense of collaboration between the labs, civic leaders, and the business community has made these research institutions an integral part of the economy. Both laboratories have taken a stake in growing the innovation economy of the area, and a great deal of the Tri-Valley's innovation has been spurred by technologies first researched at the national labs. The overall Tri-Valley economy has also benefited as the labs have brought a great number of workers with advanced degrees to the region, some of whom have gone on to found their own companies.

Lawrence Livermore National Laboratory (LLNL)

has been a mainstay in the Tri-Valley for more than 65 years. As a world leader in the advancement of science and technology, it has helped build the region into a center of innovation. With an annual budget of around \$1.7 billion, and more than 6,500 employees—half of whom live in the sphere of the Tri-Valley—LLNL is a powerhouse of economic activity and innovation for the region. Each day, it has 10,000 people on site (including contractors).

LLNL's primary role is to ensure the safety, security, and reliability of the U.S. nuclear stockpile. However, its broader mission also includes developing cutting-edge science and technology to address a broad range of future challenges to national security and global stability. Its technologies have been used to achieve breakthroughs in counterterrorism and nonproliferation, defense and intelligence, and energy and environmental security. It hosts a number of unique, world-class facilities, including the National Ignition Facility—the largest laser facility in the world—and the Livermore Computing Complex—home to some of the fastest computers in the world. LLNL works hard to ensure that its inventions make it to market and that its activities foster innovation throughout the Tri-Valley.

LLNL's innovation initiatives include its Innovation and Partnerships Office (IPO) and Livermore Valley Open Campus (LVOC), which are focused on public-private partnerships and growing high-tech business opportunities in the Tri-Valley and greater Bay Area. These goals are enhanced by relationships with regional business-supporting organizations such as the Bay Area Council and Bay Area Science & Innovation Consortium, Silicon Valley Leadership Group, Innovation Tri-Valley Leadership Group, and East Bay Economic Development Alliance.

One of LLNL's Innovation and Partnerships Office's main functions is to license technologies invented at the lab for commercial use. Its portfolio has commercial licenses with more than 100 companies in the United States and worldwide, including 52 in California. Licensing and royalty income from these relationships has reached as high as \$10 million in recent years, with a good portion of that remaining in California. This has represented more than \$300 million in annual sales of products based on LLNL technologies, which supports the Tri-Valley and regional economies.

LLNL's partnerships with businesses have been a catalyst for discovery and innovation in the Tri-Valley. One such example is **Metal Improvement Company**, a subsidiary of Curtiss-Wright Surface Technologies located in Livermore, which teamed with the lab to develop a new type of treatment to increase the durability of metals. Similarly, **IDES** in Pleasanton—a company that produces dynamic transmission electron microscopes—was founded by a scientist who did Ph.D. research at LLNL.

LLNL was ranked 25th in Reuters' list of the world's most innovative research institutions in 2017. Its success at commercialization and technology transfer has been helped by its joint **National Labs Entrepreneurship Academy**, which is also hosted by Sandia—a three-day entrepreneurship business training course for its scientists and engineers. This has helped prepare the lab's scientists to pitch their technology to businesses and even start their own companies.

Sandia National Laboratory is also a driving force in the Tri-Valley economy. It shares a similar mission to LLNL, aiming to protect global stability by creating technology that solves a variety of national security problems. It employs about 1,200 people and draws highly-educated workers to the Tri-Valley.

Sandia partners with LLNL on a variety of innovative programs such as the entrepreneurship academy and the Livermore Valley Open Campus. It has achieved a great deal of success in commercializing its technology, having been associated with the creation of 95 new companies since 1994. Having recently celebrated its 60th anniversary, Sandia has been a key player in building the Tri-Valley region into what it is today.

In 2017, 152 new patents were issued for Sandia technologies, and the lab had 597 active commercial licenses in place. In addition, Sandia has a wide-ranging impact on the local economy through its interaction with the community. It has encouraged STEM education by holding programs like Family Science Nights. Sandia is currently one of the pilot labs for the Department of Energy's Small Business Vouchers program, through which clean energy businesses are given vouchers to access lab facilities, work with lab experts, and license technologies.

Sandia, as well as LLNL, will likely be a large force for increased employment in the Tri-Valley in coming years. Due to a combination of retirements and the need to increase its investment in modernizing and maintaining the weapons stockpile, Sandia will need to hire at least 250 people in the next three to five years. At LLNL, leadership expects to hire 600 to 800 people each year for the next five years, which comes on top of 3,000 new hires in the last four years alone.

Technologies Move from Laboratory to Marketplace

A large number of companies have seen a great deal of success from licensing LLNL and Sandia technologies. Some recent highlights include:

- **Opcondys, Inc.** licensed the technology for the opticondistor from LLNL. Its technical team is led by the inventor of the technology, which allows for fast electrical switching at extremely high voltages. Established in 2014, Opcondys has won competitive funding awards totaling several million dollars.
- **EVOQ Therapeutics** has licensed LLNL's nanolipoprotein particles technology for cancer immunotherapy. The technology shows great potential for delivering cancer nano-vaccines more effectively using the body's own immune system, and it could revolutionize treatment. EVOQ is currently testing clinical applications of the technology and results have been promising.
- **Sandstone Diagnostics** was created by Sandia scientists who developed technology for the Trak Male Fertility Testing System. They have since licensed the technology from Sandia, and the at-home male fertility testing product has been approved by the FDA and is patent-pending.

LIVERMORE VALLEY OPEN CAMPUS:

In an effort to increase collaboration with businesses and create more opportunities for discovery and commercialization of technology, LLNL and Sandia partnered to create the previously mentioned LVOC. Located along the eastern boundaries of the two

labs' adjoining sites, the LVOC is a novel venue where researchers from private industry and academia can collaborate with laboratory personnel. Because the work being done in the open campus is not classified, the space is well-suited for technology transfer and collaboration with industry partners. It also draws young scientists through networking events and entertainment.

The first two LLNL facilities based in the LVOC are the High Performance Computing Innovation Center (HPCIC) and the Advanced Manufacturing Laboratory (AML). The HPCIC opened in 2010 and provides companies with access to LLNL's supercomputers, software and domain expertise, as well as guidance on the application of advanced computing technologies. Completed in March of 2018, the AML is a 13,700-square-foot facility for developing next-generation materials and manufacturing technologies, and it serves as a focal point for research collaborations with industry and academia.

On the Sandia side, facilities in the LVOC include the Combustion Research Facility, the Center for Infrastructure Research and Innovation, the Cybersecurity Technologies Research Laboratory, and the Biotech Collaboration Center. In 2013, Sandia collaborated with **Cool Earth Solar** to create the first public-private partnership on the LVOC, forming a five-year cooperative research and development agreement to work to make solar energy more affordable and accessible.

TRI-VALLEY AT A GLANCE

Vets to Tech

In an effort to both reduce the job gap in technology occupations in the Tri-Valley area and provide employment to veterans returning from service, Lawrence Livermore National Laboratory, Las Positas College, the Alameda County Workforce Investment Board, and Growth Sector partnered in 2014 to form the

Vets to Tech program. The initiative creates a pipeline for veteran students at Las Positas College to explore engineering occupations and receive skills training, mentorship, and paid internships. The program uses a cohort model, through which a group of enrollees can earn a two-year degree in mechanical engineering.

A Cycle of Entrepreneurship Propels Creation of New Tri-Valley Businesses

The Tri-Valley's innovative history has also been fueled by a cycle of entrepreneurship, in which top people leave successful companies or the laboratories and then go on to found new businesses in a similar sector. This creates an ecosystem of innovation, in which new scientists and entrepreneurs have access to increased resources and opportunities for collaboration.

One such cycle began with the founding of the Pleasanton company **QuantaLife**:

- One of QuantaLife's founders, Bill Colston, co-invented a digital polymerase chain reaction technology for genetic analysis while working at Lawrence Livermore National Laboratory. Colston left the lab to start QuantaLife, growing the company from four founders in 2008 to more than 60 employees by 2011.
- QuantaLife was acquired by Bio-Rad in 2011 for \$162 million. Following his success with QuantaLife, Colston founded another company called **HealthTell**, which aims to provide an early detection diagnostic platform for complex diseases. Based in San Ramon, HealthTell has raised \$45 million in funding.⁸
- After QuantaLife's acquisition, co-founders Ben Hindson and Kevin Ness and VP of Applications Serge Saxonov went on to create **10x Genomics**, a DNA sequencing company headquartered in Pleasanton. It has raised over \$100 million in equity and employs over 200 people.⁹

This sort of exponential growth in Tri-Valley companies can also be seen in the story of PeopleSoft, which was acquired by Oracle in 2005. Afterward, founders and top team members went on to create major companies like **Workday** and **Veeva Systems**, both headquartered in Pleasanton. This phenomenon has created a web of entrepreneurs that are now providing expertise and resources to emerging entrepreneurs.

A similarly beneficial phenomenon in the Tri-Valley business environment is that innovative companies that

move there often stay in the Tri-Valley once they achieve success, continuing to add value to the area:

- One example is **Sybase**, an enterprise software and services company that was founded in Berkeley in 1984 but moved its world headquarters to Dublin in 2002. It was acquired by **SAP** in 2010 for \$5.8 billion. After the acquisition, SAP stayed in the Dublin location until 2017, when it moved to a new office in San Ramon. As such, the previous Sybase jobs have stayed in the Tri-Valley and the company has doubled down on its original investment.
- The region has also benefitted in other ways from SAP's decision to stay in the Tri-Valley. SAP holds an annual Academy for Early Talent in San Ramon, through which recent college graduates from around the world prepare for a career in sales. The program is advantageous to the Tri-Valley in that it exposes a host of bright young people to the vibrant and innovative region, hopefully encouraging them to stay and contribute their talent.

Given the amount of talent in the Tri-Valley and a growing sense of entrepreneurialism that has come out of the national laboratories and the employees at many of the region's tech-based companies, stakeholders in the Tri-Valley have seen a clear need to cultivate and grow this innovation ecosystem.

We highlight two key examples of institutions in the Tri-Valley that foster these entrepreneurial networks:

i-GATE

The Tri-Valley's innovation ecosystem is embodied by **i-GATE**, a nonprofit dedicated to building a thriving startup community in the Tri-Valley. i-GATE is unique in that it came about as a partnership between four Tri-Valley cities as well as the national labs.

One of i-GATE's main activities is operating **The Switch**, an incubator and co-working space for entrepreneurs and startups. Located in Livermore, The Switch currently has 10 companies in residence, most of which are in the life sciences industry. Its primary functions are to help entrepreneurs build valuable peer relationships and to provide mentorship to startups. Startups at The Switch benefit from i-GATE's ties to local entrepreneur and investor networks, but they have had no trouble

accessing capital on their own. The Switch is now on its third location, having tripled its square footage in its most recent move to a prominent space in downtown Livermore. Also in the same building is Switch Labs, a 9,000-foot industrial space for hard tech companies.

One of i-GATE's biggest success stories is **POC Medical Systems**, which was incubated there in its early days. Founded in 2013 by Sanjeev Saxena, the company created a platform for rapid, blood-based, point-of-care breast cancer screening to be used around the world, especially in regions where women do not have access to affordable, established screening methods. POC has since attracted a great deal of support, raising \$21 million in Series A funding for clinical beta testing and commercialization of its technology.¹⁰ Boosted by the resources and support it received from i-GATE, POC now occupies a 24,000-square foot research and manufacturing facility in Livermore.

i-GATE also supports local innovation by hosting the **NextTech Speaker Series** and **Tri-Valley Tech Connect**. The inaugural Tri-Valley Tech Connect event took place in February 2018, hosted in cooperation with the Innovation Tri-Valley Leadership Group. It brought together leading Tri-Valley tech companies and local professionals in a career fair that aimed to connect talented Tri-Valley residents with employers in their own community.

Tri-Valley companies were able to highlight the advantages of a culture of work-life balance and a much shorter commute than the two-hour drive to Silicon Valley. Participating employers included Veeva Systems, Lawrence Livermore National Laboratory, Sandia National Laboratories, Deep Sentinel, Unchained Labs, 10x Genomics, Title 21 Health Solutions, S2 Genomics, Convergence CT, Thermo Fisher Scientific, Google Cloud, Lam Research, Mom Relaunch, and Northland Controls. Over 300 local professionals attended, revealing a strong interest among Tri-Valley residents in working at companies close to home.

BISHOP RANCH INTELLIGENCE INNOVATION ACCELERATOR (BRIIA)

Where i-GATE fills the Tri-Valley's need for an incubator-style program, **BRIIA** fills the need for a more traditional

and structured accelerator program. Bishop Ranch launched its accelerator for machine learning and artificial intelligence (AI) companies in the fall of 2017, bringing a new wave of innovative talent and resources to the Tri-Valley and adding to the region's burgeoning entrepreneurial ecosystem.

BRIIA's first-ever cohort of entrepreneurs began the 12-week program in September 2017, after the accelerator received applications from all over the world. Though BRIIA's initial aim was to provide resources for local innovators, it ended up also serving as a magnet to the Tri-Valley for entrepreneurs from a variety of places. Of the five companies in BRIIA's first cohort, only one was from the Tri-Valley, with two from elsewhere in the Bay Area and two from out of state. BRIIA's second cohort was more local, with four companies from the Tri-Valley and two from other parts of the Bay Area. Part of the program's draw for entrepreneurs outside of the Tri-Valley has been its exclusive focus on AI and machine learning—something that few other accelerators share.

As a member of the Global Accelerator Network, BRIIA has brought a global scale to the Tri-Valley startup scene. The network has 88 members from around the world that share mentors and resources, providing BRIIA and its companies with global reach. BRIIA alone has a network of 42 mentors, and 550 investors know about BRIIA—60 of whom came to its first Demo Day.

BRIIA contributes to the Tri-Valley's ecosystem of innovation not just through its accelerator program, but also through its coworking space. Of the 90 seats in its Bishop Ranch-based space, 70 are set aside for a coworking community of tech entrepreneurs. The environment is designed to foster spontaneous collisions between innovators, with an aim of facilitating connection, inspiration, and collaboration. To this end, BRIIA also puts on a variety of events for local entrepreneurs, such as the San Ramon Hackathon.

One BRIIA company that has seen particular success is **Datazoom**. An alumni of the first accelerator cohort, Datazoom uses machine learning to help content distributors better collect data to personalize and improve the monetization of the video viewing experience. It has closed funding of around \$700,000.

Investment in Startups and Growing Businesses in the Tri-Valley

The new companies being built in the Tri-Valley have taken advantage of the area's proximity to Silicon Valley to make themselves prime candidates for venture capital investment. Data on the flow of venture capital and private equity into Tri-Valley companies reveal that these companies have had varying degrees of success in attracting investment. From 2007 to 2017, Tri-Valley companies received over \$4 billion in venture capital investment, and just since 2015 they have received \$1 billion. For comparison, companies located in the Silicon Valley region garnered over \$2.6 billion in venture capital investment in the fourth quarter of 2017 alone.

The majority of this Tri-Valley investment has been in software companies, companies that manufacture

medical instruments, companies that produce chemical and pharmaceutical products, and companies that provide business services other than software. Other major recipients of investment have been electronic equipment, environmental quality and housing, engineering and management services, financial institutions, educational services, and health services companies.

The companies that received the largest rounds of funding were **SFJ Pharmaceuticals, Access Information Management, ServiceMax, Fulcrum Bioenergy, Accela, IntegenX, NeoTract, and 10X Genomics**. The life sciences industry in particular attracted a great deal of investment. In the past 10 years, medical device, pharmaceutical, and life sciences companies in the region have received over \$1 billion in venture capital and private equity.

Software companies also received over \$1 billion in private investment, with Accela—a provider of

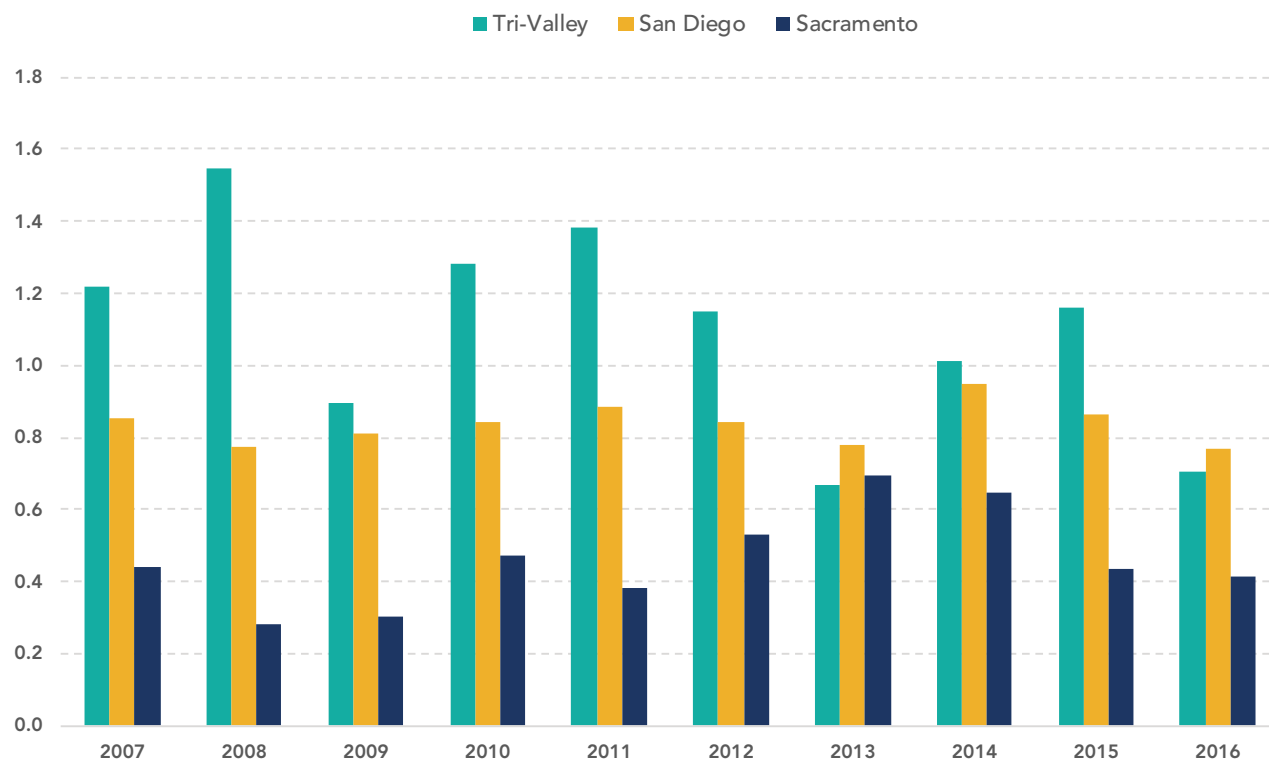
Investment in Tri-Valley Companies by Industry 2007-2017

Industry	Amount Invested (in millions)		
	2007-2011	2012-2017	Total
Software	\$373	\$774	\$1,146
Medical Instruments	\$371	\$339	\$710
Pharmaceutical and Chemical Products	\$224	\$400	\$624
Non-Software Business Services	\$182	\$375	\$557
Electronic Equipment	\$279	\$51	\$330
Energy	\$127	\$60	\$187
Engineering & Management Services	\$36	\$78	\$114
Financial Institutions	\$53	\$60	\$113
Educational Services	\$0	\$100	\$100
Metal Manufacturing	\$47	\$6	\$53
Personal and Health Services	\$35	\$9	\$44
Retail	\$0	\$34	\$34
Communications	\$8	\$10	\$18
Total for All Industries	\$1,734	\$2,296	\$4,031

Source: Thomson Reuters

Analysis: Bay Area Council Economic Institute

Number of Annual Venture Capital Deals per Ten Thousand Residents



Source: Thomson Reuters; PwC MoneyTree Report Q3 2017

Analysis: Bay Area Council Economic Institute

cloud-based software for governments that has since been acquired by Berkshire Partners—raising \$175 million. **Workday** received \$180 million before its 2012 initial public offering. Companies that manufacture semiconductors and electronic devices were another group that attracted large investments, garnering over \$325 million in the past 10 years.

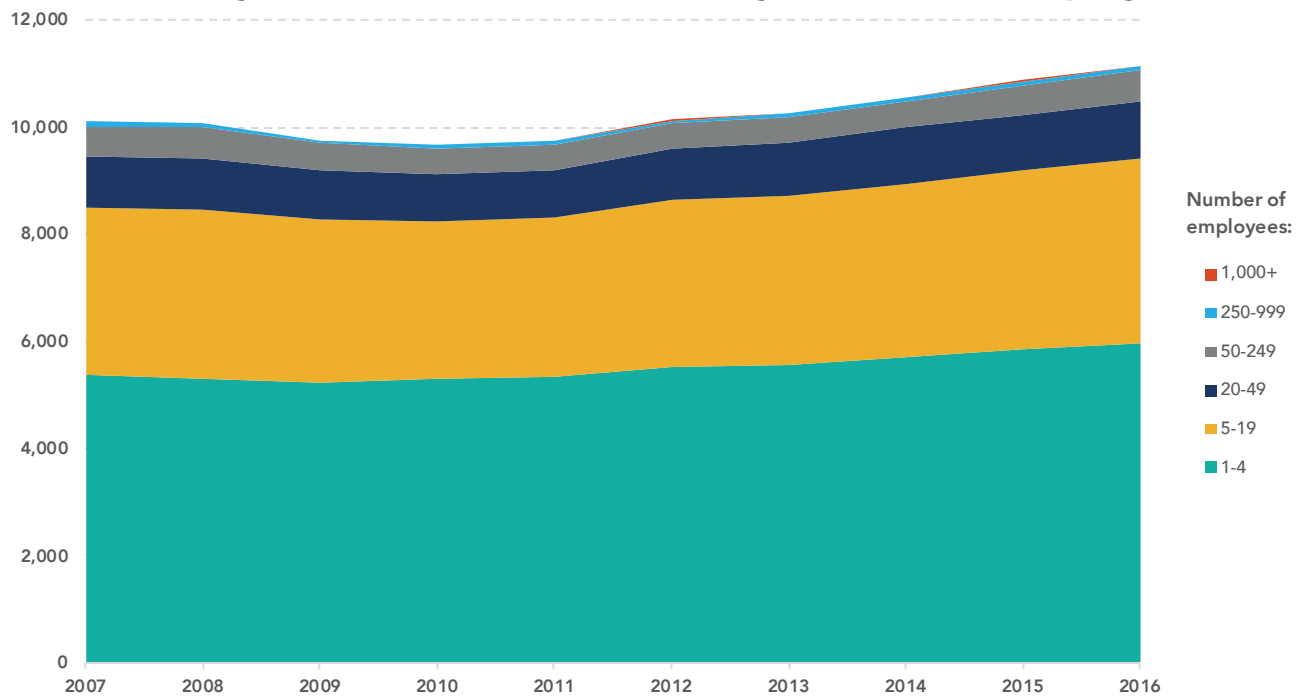
Though not captured in our data on Tri-Valley-headquartered companies, venture capital investment has been allowing Bay Area-headquartered companies to expand into the Tri-Valley. One such example is **Gritstone Oncology**, which completed a \$92.7 million Series B funding round in September 2017. Part of the investment supported the construction of the company's 43,000 square-foot manufacturing facility in Pleasanton, where Gritstone now continues to advance its precision cancer immunotherapy research.

While Silicon Valley venture capital activity is much larger than in the Tri-Valley, the Tri-Valley holds its own

among other California regions, especially in terms of number of deals per resident. Since 2007, the Tri-Valley has had more deals per 10,000 residents than Sacramento in every year but 2013, and more than San Diego in most years as well. In 2008, the Tri-Valley's highest year for investment, there were 1.55 deals per 10,000 residents in the Tri-Valley, compared to only 0.77 in San Diego and 0.28 in Sacramento.

We have highlighted the Tri-Valley's large companies—many with a presence at Bishop Ranch or Hacienda—and the growing number of mid-sized companies that have received venture capital investment. However, the Tri-Valley's next wave of innovative companies is likely still in their infancy stages. The vast majority of the Tri-Valley's business establishments are small businesses with fewer than 20 employees. About 54% of all the region's businesses have fewer than five employees, which is very similar to the proportion of Silicon Valley businesses with fewer than five employees.

Tri-Valley Business Establishments by Number of Employees



Source: U.S. Census Bureau, County Business Patterns: Zip Code Business Patterns by Employment Size Class

Analysis: Bay Area Council Economic Institute

TRI-VALLEY AT A GLANCE

Spotlight on Tri-Valley Ventures

Silicon Valley investors are increasingly turning their sights toward the Tri-Valley, but the area has also cultivated its own source of venture capital. One such example is **Tri-Valley Ventures**, a pooled investment fund that targets experienced entrepreneurs in the Tri-Valley region for its investments.

The firm's partners utilize their local presence and experience to find promising Tri-Valley startups to invest in. As well as providing capital, they also leverage their ties to a variety of Tri-Valley firms to serve as a bridge between startups and other companies and investors. Some of the local startups that Tri-Valley Ventures initially invested in are:

- **Swarmsales**, provider of sales-as-a-service marketplace software;
- **Deep Sentinel**, a home security company; and

- **AEye**, a vision hardware and software company for autonomous vehicles.

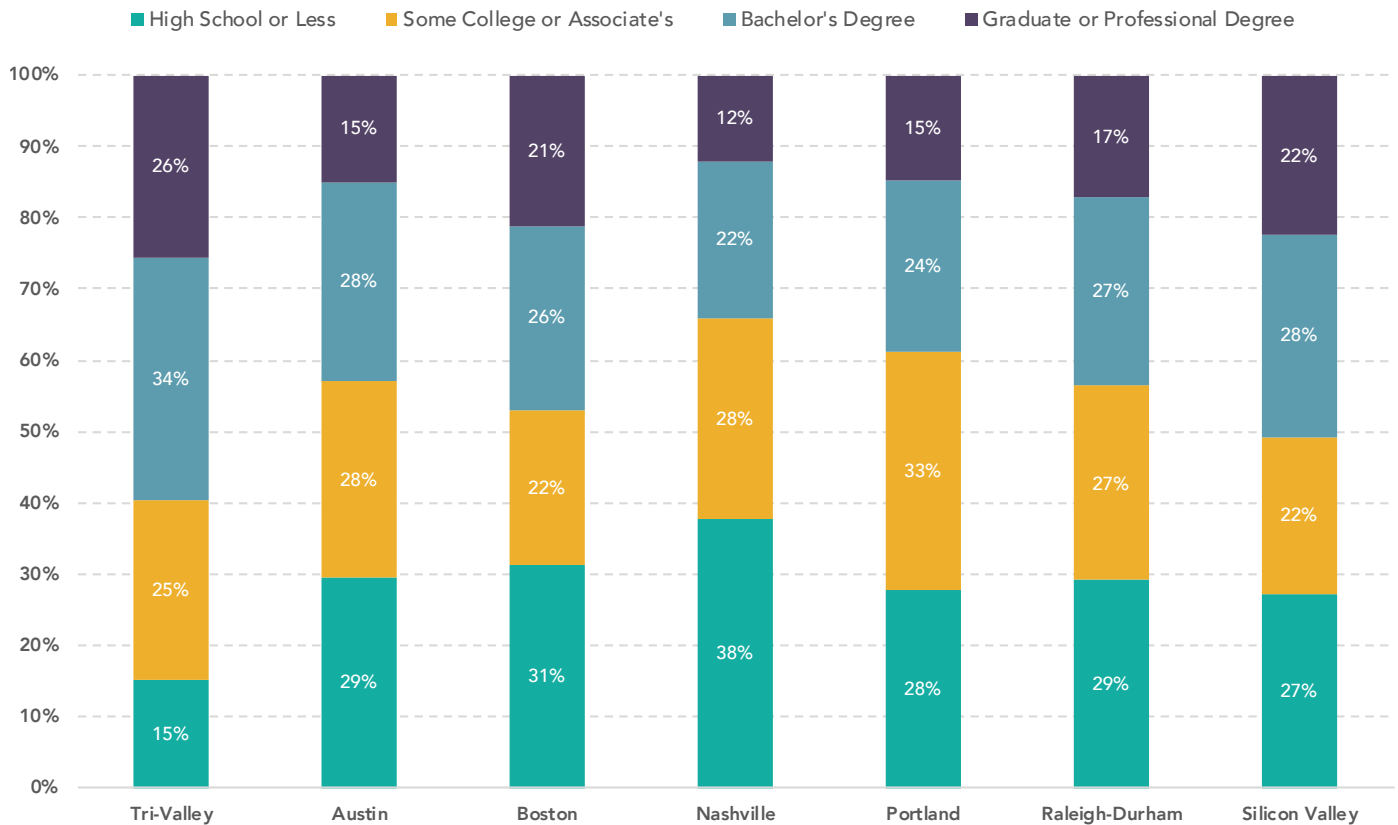
The story of AEye is particularly representative of the way in which the different elements of the Tri-Valley's innovation ecosystem work together to create entrepreneurial success and bring opportunities to the region. Research on AEye's technology originally began at the national labs, the company was incubated at i-GATE, and then it moved to commercial space in Pleasanton. AEye has developed cutting-edge vision sensing technology for autonomous vehicles, and in June 2017 it announced a \$16 million Series A funding round that included investments from Kleiner Perkins Caufield & Byers, Airbus Ventures, Intel Capital, and Tyche Partners. Early investment from Tri-Valley Ventures helped AEye achieve its success, as did the startup's ties to the region's many other innovation assets.



From Start-up to Scale-up: Competing Nationally

The previous sections have outlined many of the strengths of the Tri-Valley, and how it has successfully competed against other regional economic centers in San Francisco and Silicon Valley. As the Tri-Valley continues on its growth trajectory, it will begin to compete more with hubs of innovation across the country for jobs. In this section, we will examine how the Tri-Valley compares to other regions such as Austin, Boston, Nashville, Portland, and Raleigh-Durham. While these places are significantly larger in population and reach when compared to the Tri-Valley, they will increasingly be viewed as a competitive peer set.

Educational Attainment of High-Growth Regions, 2016



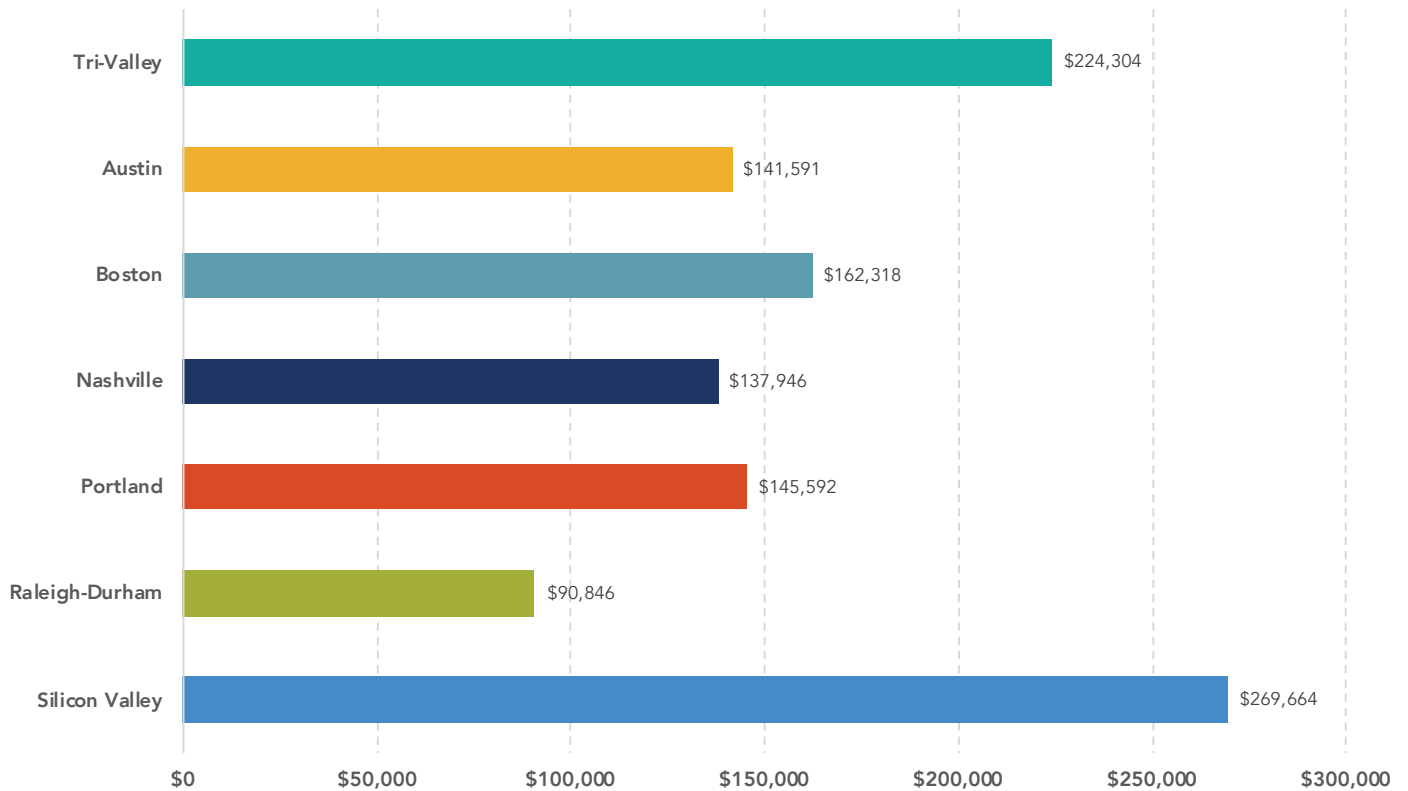
Source: U.S. Census Bureau, American Community Survey one-year estimates

Analysis: Bay Area Council Economic Institute

EDUCATIONAL ATTAINMENT:

Part of the Tri-Valley's competitive edge comes from its highly concentrated talent pool. While 60% of adult Tri-Valley residents have a bachelor's degree or higher, only 44% in the Raleigh-Durham-Chapel Hill Research Triangle do. Similarly, only 39% of the residents of Greater Portland do.

Productivity: GDP per Worker, 2016



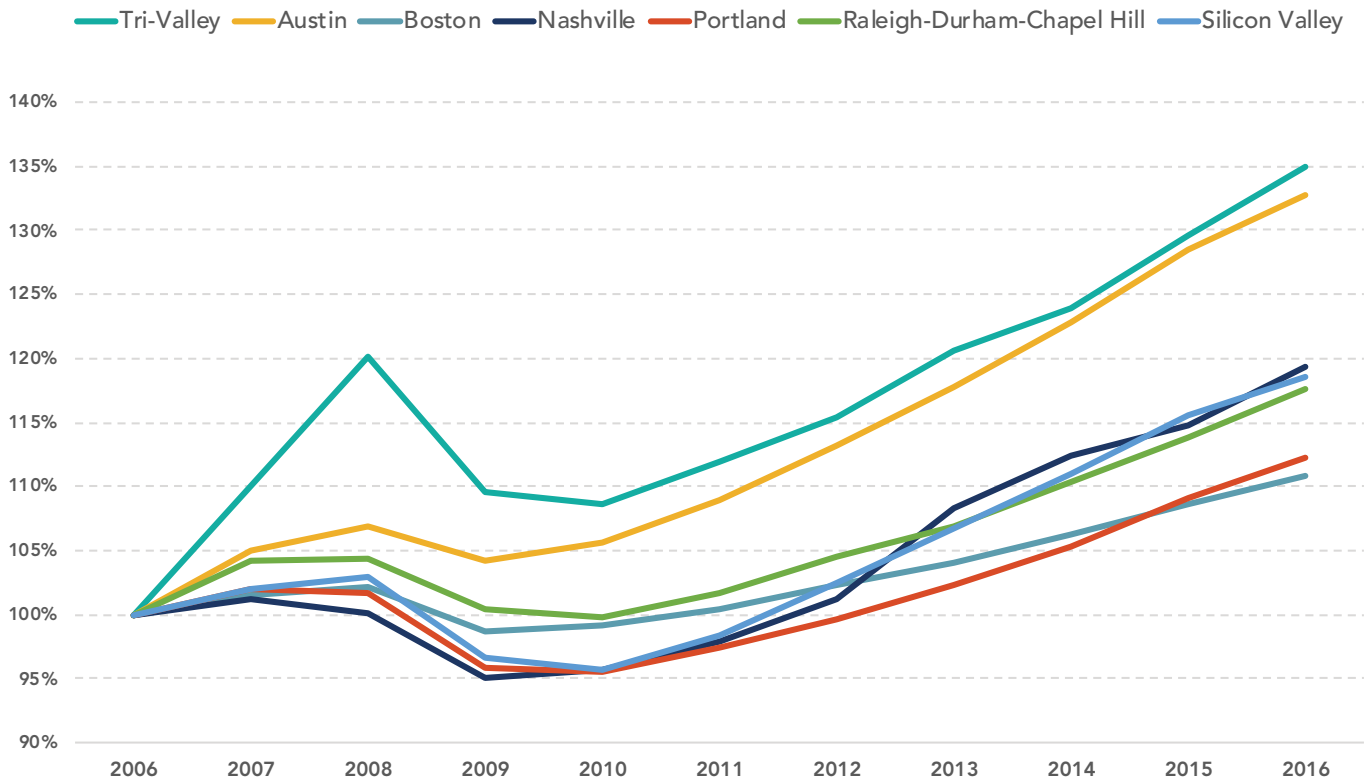
Source: U.S. Department of Commerce Bureau of Economic Analysis; U.S. Census Bureau, County Business Patterns

Analysis: Bay Area Council Economic Institute

PRODUCTIVITY:

Tri-Valley workers are also highly productive compared to these other areas. Though the Tri-Valley has employment of under 200,000 workers, its regional GDP in 2016 was \$42 billion. Only three other comparison regions have employment of under 1 million—Portland (979,000), Nashville (798,000), and Austin (774,000). Of the comparison regions, the Tri-Valley's GDP per worker is only lower than Silicon Valley's, and higher than the rest of the peer set.

Percentage Employment Growth Since 2006



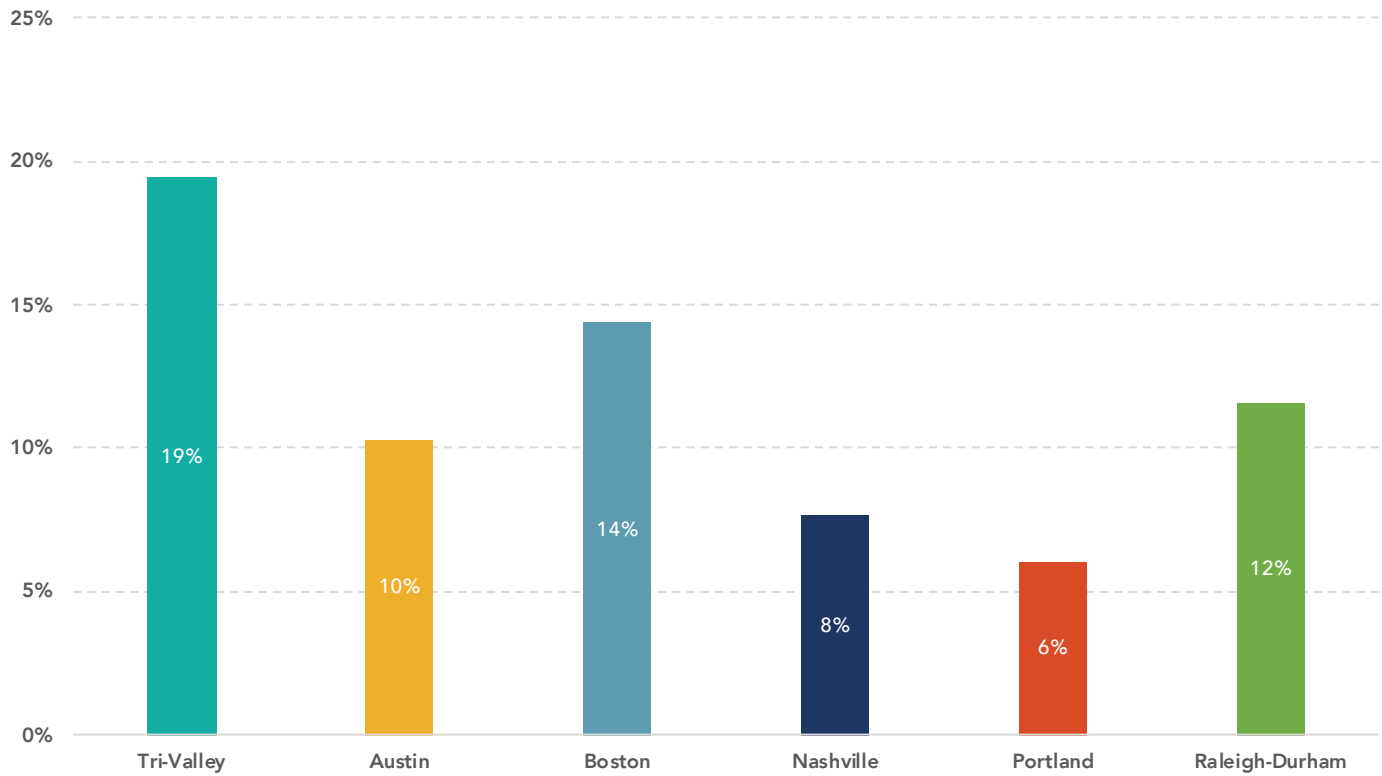
Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages; California Economic Development Department

Analysis: Bay Area Council Economic Institute

JOB GROWTH:

The Tri-Valley also stands out among economically vibrant regions for its job growth. The area's employment grew more quickly from 2006 to 2016 than in any of the other six regions, at 35% growth. Of the comparison regions, the next highest employment growth occurred in Austin, at 33%, and after that in Nashville, at 20%. The Tri-Valley has also experienced a strong recovery from the recession, with employment growth of 24% from 2010-2016, slower only than Austin and Nashville.

Percentage of Regional Employment in High-Tech Sectors, 2017



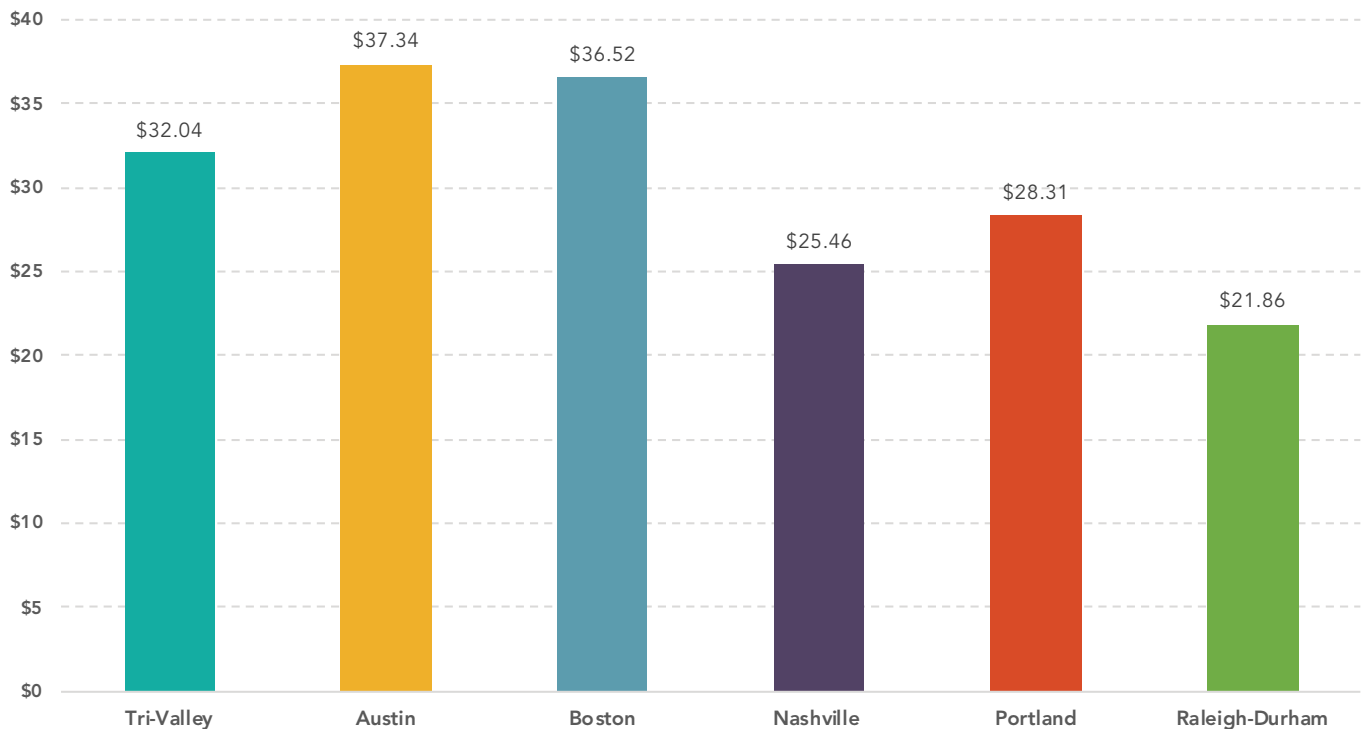
Source: Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Analysis: Bay Area Council Economic Institute

HIGH-TECH EMPLOYMENT CONCENTRATION:

Approximately 19% of Tri-Valley jobs are in high-tech sectors as defined by the Bureau of Labor Statistics. This high concentration of these high-wage, fast-growing jobs is a large part of the reason why the Tri-Valley economy has seen so much recent success. Of the peer region set, only Boston comes close to the Tri-Valley's concentration of high-tech jobs, while fast-growing economies in Austin and Nashville are more reliant on local-population-serving jobs in government, education, and healthcare.

Office Space Average Rent per Square Foot, 2017



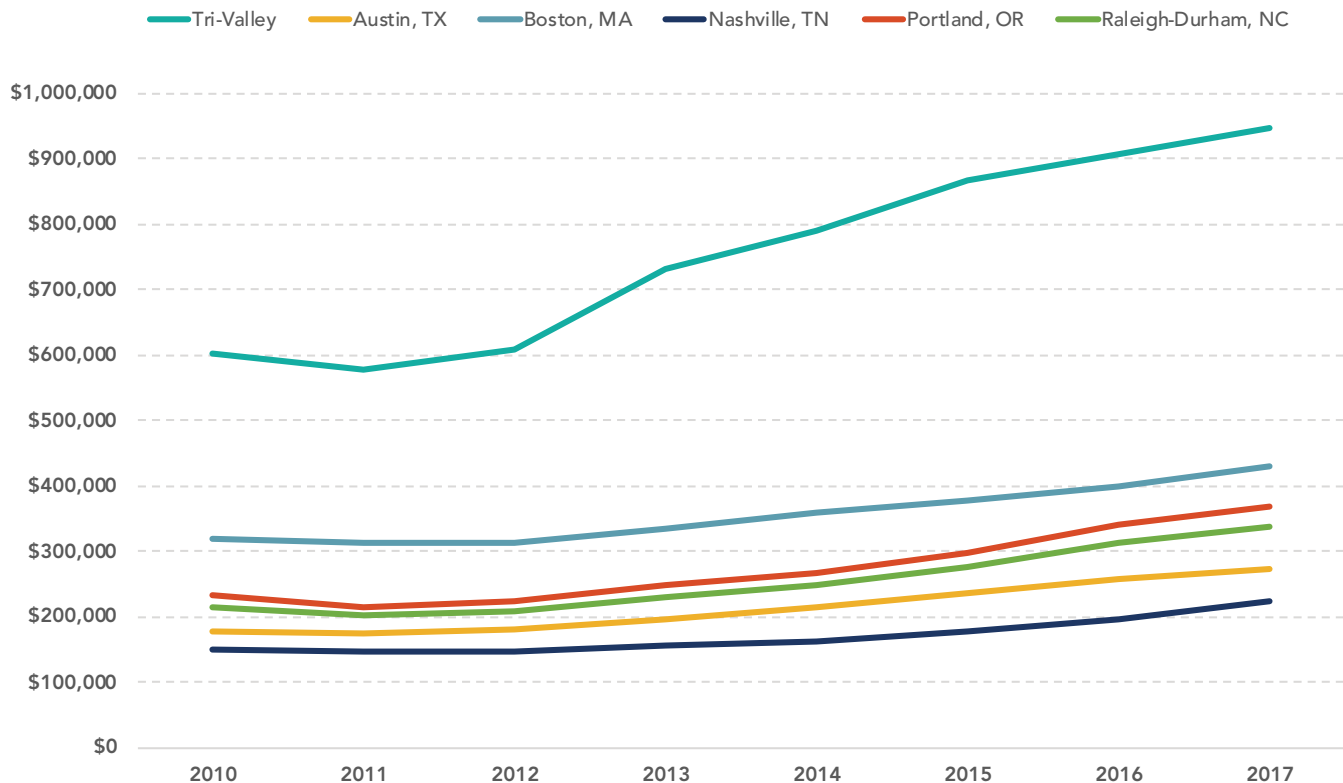
Source: Colliers International Research and Forecast Reports; Jones Lang LaSalle United States Office Outlook

Analysis: Bay Area Council Economic Institute

COMMERCIAL RENT:

Commercial real estate is significantly less expensive in the Tri-Valley than in much of the rest of the Bay Area. Though its office space is cheaper than Austin's or Boston's, the Tri-Valley is more expensive than Nashville, Portland, and the Raleigh-Durham area. The Tri-Valley still has a strong local advantage when it comes to companies wanting to open offices in the Bay Area region, but it faces pressure from innovation centers like Portland and the Raleigh-Durham Research Triangle that can offer more affordable office space.

Median Home Value by Region (Based on Zillow Home Value Index)



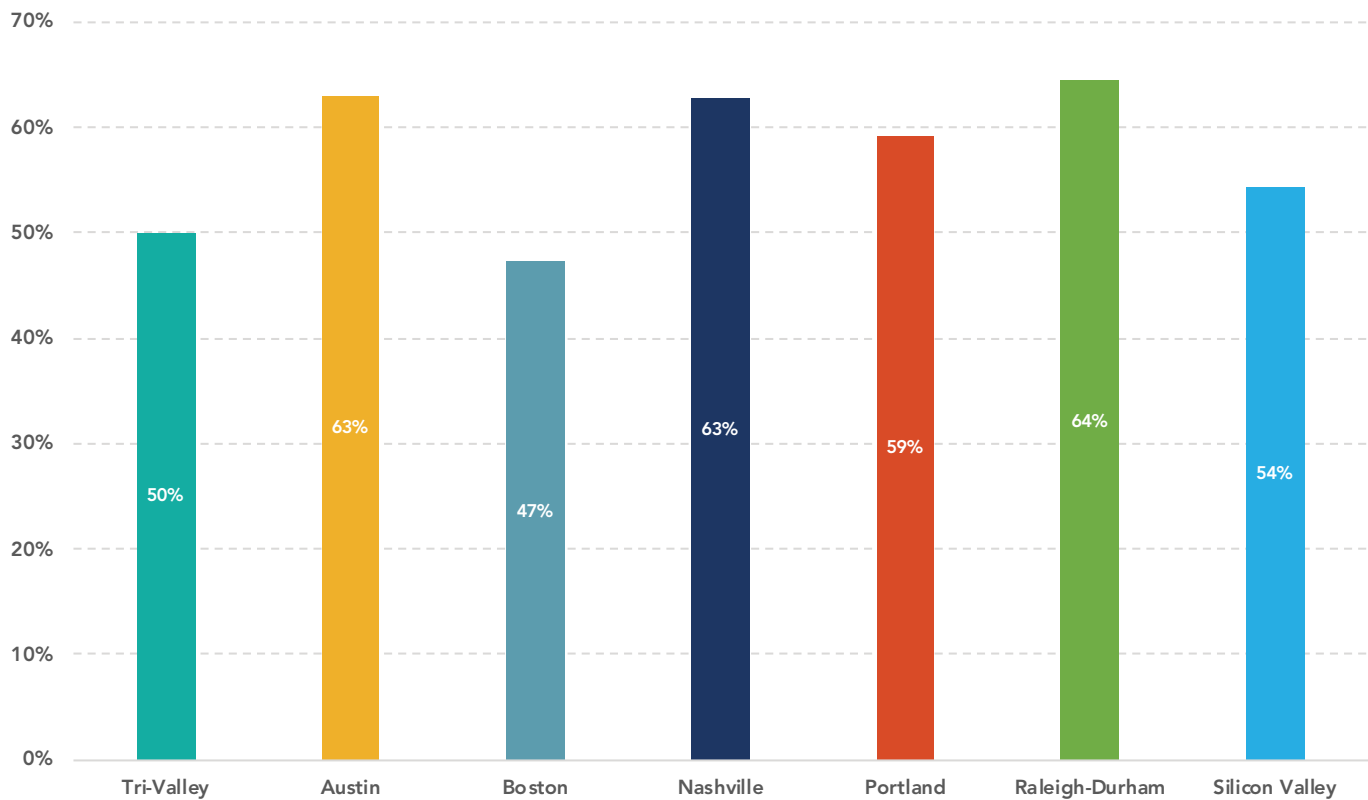
Source: Zillow Research

Analysis: Bay Area Council Economic Institute

HOUSING AFFORDABILITY:

The median home value in the Tri-Valley is more than twice as high as it is in the Boston area, and more than three times as high as in the Austin area. Having such a high cost of living impacts the ability of Tri-Valley companies to hire, since talented people may not want to move to such an expensive area when they have other options. With a median home value of over \$900,000, the Tri-Valley is a difficult place to afford for even middle-class families.

Percent of Residents with Commutes Under 30 Minutes, 2016



Source: U.S. Census Bureau, American Community Survey Five-Year Estimates
Analysis: Bay Area Council Economic Institute

COMMUTE TIME:

While the Tri-Valley's mix of employment opportunities and residential development lends itself well to short commutes, many Tri-Valley residents are commuting into San Francisco and Silicon Valley each day. Additionally, fast transit options in the area are limited, meaning that half of all residents have commutes over 30 minutes in duration. Commute times in Austin, Nashville, Portland, and Raleigh-Durham are generally shorter given employment concentrations in downtown areas in these regions and dense downtown housing development.



Confronting Challenges to the Tri-Valley's Future Economic Development

Part of the Tri-Valley's past success has been in its ability to draw in Bay Area residents with the promise of more affordable housing options and a relatively short commute to work. However, as the Tri-Valley continues to prosper, some of the same challenges that face the rest of the Bay Area—housing, transportation, and workforce availability—are already beginning to hinder the Tri-Valley's ability to grow. As the Tri-Valley becomes more and more integrated with the core of the Bay Area, it becomes less immune to the larger region's challenges. Thus, it will be vitally important for the Tri-Valley to maintain its livability by proactively addressing these issues. Key among them are:

- **Rising costs of housing as demand surges faster than supply**
- **Increases in road traffic**
- **Greater strain on public transit systems**

Housing Development is Needed to Stem Rise in Cost of Living

As housing costs in the Tri-Valley have continued their rise, wages have generally followed pace. Since 2007, average wages in the Tri-Valley increased by 25%,

and the cost of living increased by 26%. The two have grown at similar rates for most years since 2007. In San Francisco, by contrast, growth in wages did not catch up with the growth in cost of living until recently.

Though the growing cost of living can be made up for with higher wages in the Tri-Valley, the high barrier to entry can deter those from outside of the Bay Area that may be looking to move in. Additionally, growth in wages at this pace does not seem sustainable, as companies that are competing nationally will face significant labor cost pressures that their peers in other regions may not. This trend may already be playing out in 2015 and 2016 as wages in the Tri-Valley grew slightly more slowly than the cost of living.

This trend in cost of living does show that the Tri-Valley maintains its desirability as a place to live—both for its access to nearby jobs but also as a gateway to San Francisco and Silicon Valley. To keep Tri-Valley housing relatively affordable, it will be important to ensure that enough new units are built to keep up with demand.

The region's cities have made progress toward this goal, though more new units are still needed. Dublin, especially, has built a large amount of housing in recent years; from 2007 to 2015, it issued 4,645 permits. About 9% of these were for below-market-rate (affordable

housing) units. For comparison purposes, the City of Oakland, about seven times larger than Dublin in terms of population, issued roughly the same number of housing permits over the period from 2007 to 2015.

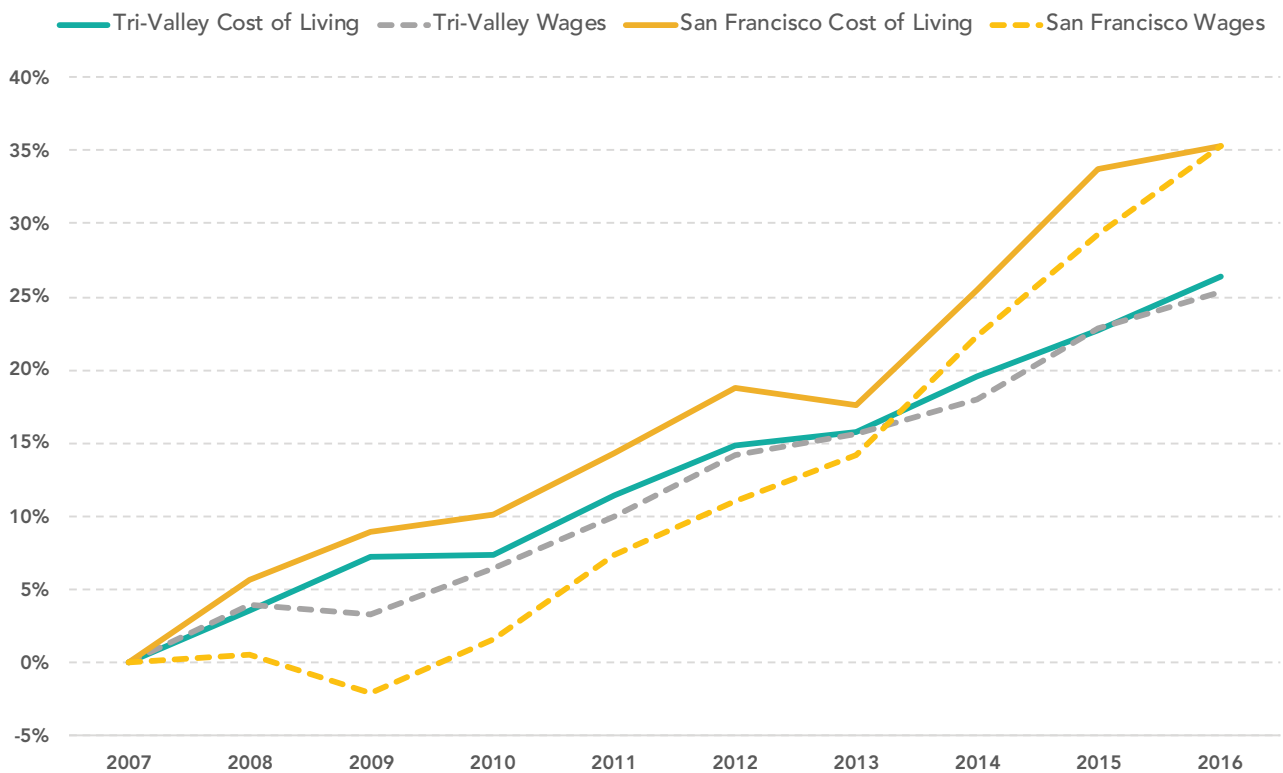
San Ramon also added a fairly large number of new housing units, 22% of which were below market-rate. For the period from 2007 to 2014, Dublin and San Ramon were the cities with the seventh- and eighth-largest number of housing permits issued in the entire Bay Area. Other than Milpitas, the cities that issued more housing permits were all much larger than Dublin and San Ramon, with populations over 100,000.

Approximately 27% of all housing permits issued in Alameda County and Contra Costa County between 2007 and 2015 came from the Tri-Valley, though only 17% of the jobs in the two counties are located in the area. The Tri-Valley issued a total of 13,591 housing permits from 2007 to 2016, while adding about 34,400

jobs over the same time period. As a comparison, nearby San Joaquin County permitted 13,617 housing units during that time period, while adding 14,500 jobs—a jobs-to-housing balance that has pushed many San Joaquin residents to commute over the Altamont Pass. Though the Tri-Valley added fewer housing units relative to jobs than San Joaquin County, it added far more than San Francisco, which had a jobs-to-housing ratio around 5:1 for the same time period.

Though the Tri-Valley has added a fairly large amount of housing in recent years compared to other parts of the Bay Area, it has not permitted nearly as many housing units as it is projected to need to keep up with demand. The state of California mandates that each jurisdiction identifies a Regional Housing Needs Allocation (RHNA), or the number of housing units it must accommodate over a given time period, based on population projections. For the Tri-Valley, this number was 14,047 new units from 2007 to 2014.

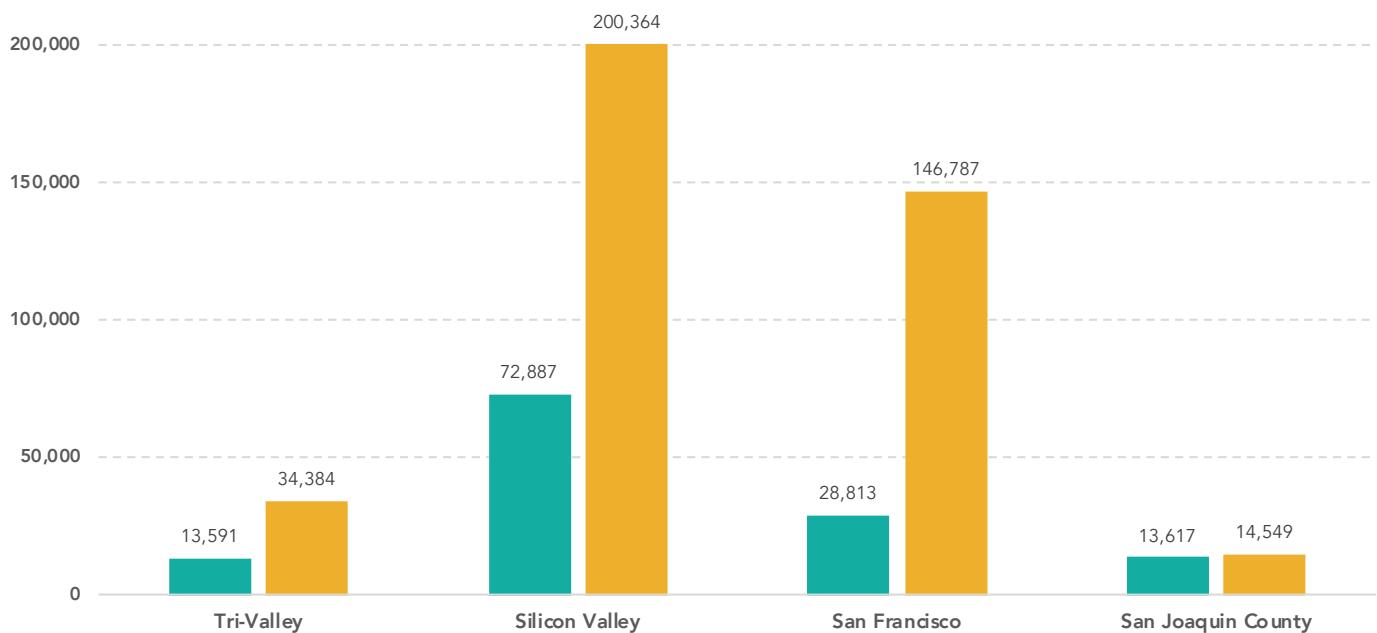
Percent Increase in Cost of Living and Average Wages



Source: Bureau of Labor Statistics, Consumer Price Index; Zillow Home Value Index; California Employment Development Department

Analysis: Bay Area Council Economic Institute

Jobs Added vs. Housing Units Permitted, 2007-2016



Note: San Joaquin County data goes only to 2015

Source: Association of Bay Area Governments, Regional Housing Need Allocation Progress Reports; U.S. Department of Housing and Urban Development, State of the Cities Data Systems; Bureau of Labor Statistics, Quarterly Census of Employment and Wages; California Employment Development Department; U.S. Census Bureau, Building Permits Survey

Analysis: Bay Area Council Economic Institute

Tri-Valley cities issued permits for 9,127 new housing units from 2007 to 2014, which was about 65% of its total RHNA. The region did quite well in accommodating the need for market-rate housing, permitting more than 200% of its market-rate RHNA. However, it was less successful in building adequate affordable housing. The Tri-Valley issued permits for 1,768 below-market-rate units, meeting only about 17% of its RHNA for that category.

Failure to fully meet RHNA needs for the 2007-2014 period was not a problem unique to the Tri-Valley; very few California jurisdictions did. A combination of factors including the recession and loss of redevelopment funds for affordable housing made it especially difficult to produce enough units. The Tri-Valley surpassed many jurisdictions in its production of market-rate housing, though it shared the rest of the state's challenges with building sufficient affordable housing. With that being

said, RHNA is a less useful tool for measuring how many housing units are needed than an analysis of a region's jobs-to-housing balance. In order to tackle the housing affordability challenge, the Tri-Valley will need to keep pace with its job creation by building more housing at a variety of sizes and affordability levels.

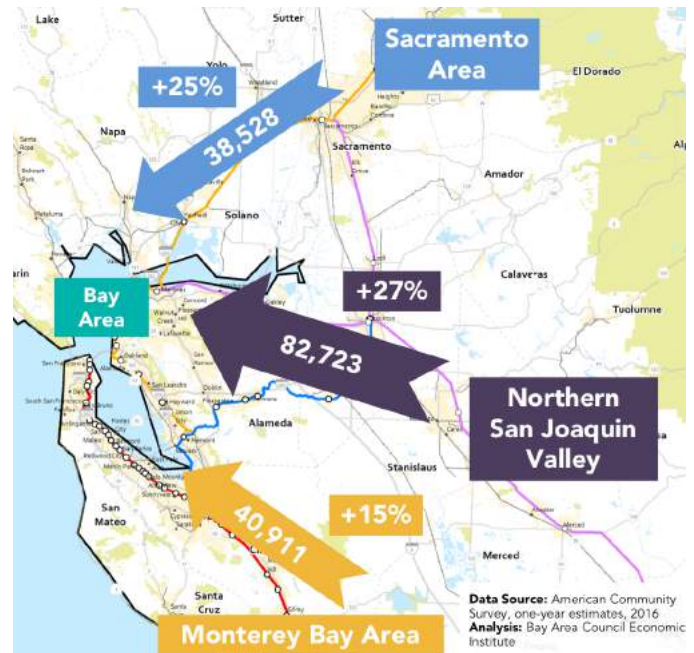
Transportation is the Key Bottleneck for the Tri-Valley's Growth

The increasing cost of Bay Area housing has also contributed to another of the Tri-Valley's major challenges: transportation. As people working in the Bay Area move to more far flung places around the megaregion, they must travel longer distances to get to their jobs, which are still largely located in the core employment hubs of the area.

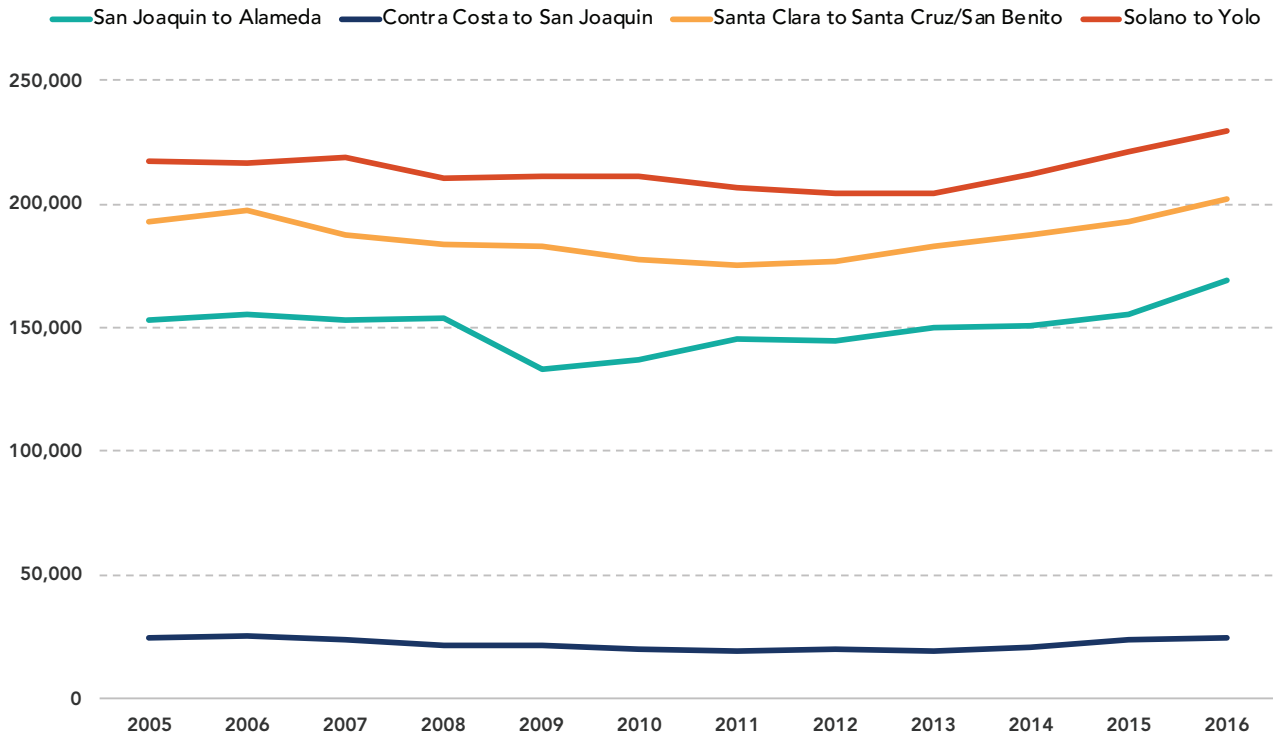
Transportation connectivity continues to be one of the key public policy issues for the Tri-Valley in order for it to sustain its economic growth trajectory. Even with a highly-educated workforce and a growing innovation ecosystem, the Tri-Valley remains somewhat isolated from other core job centers in the Bay Area.

HIGHWAY CONGESTION: People commute through the Tri-Valley to and from San Francisco, the East Bay, Silicon Valley, and San Joaquin Valley. Additionally, a significant number of Tri-Valley residents commute to San Francisco and Silicon Valley, with about 10,000 commuting to San Francisco and 23,000 commuting to Silicon Valley. More importantly, the number of commuters traveling through the Tri-Valley from the Northern San Joaquin Valley (San Joaquin, Stanislaus, and Merced counties) has grown as the population of that area has increased. In 2016, megaregional commuters from the Northern San Joaquin Valley totaled 82,723, and showed growth of 27.4% since 2013. Those who make this commute mainly drive and utilize I-580.

Megaregional Commuters and Percentage Change from 2013 to 2016



Average Daily Vehicle Trips: Top 4 Busiest Bay Area Gateway Corridors

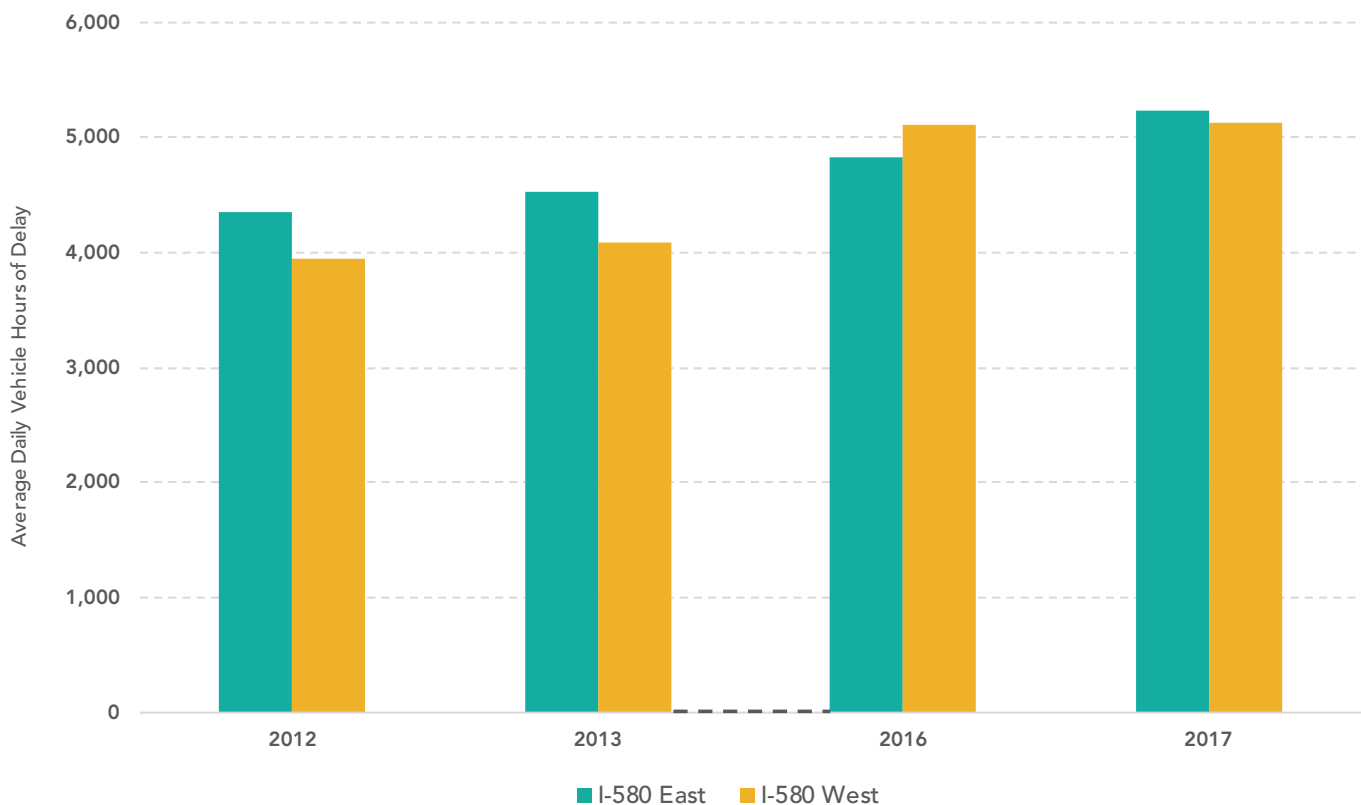


Source: Metropolitan Transportation Commission, Vital Signs
Analysis: Bay Area Council Economic Institute

Of all Bay Area gateway corridors, I-580 connecting Alameda and San Joaquin counties and cutting through the Tri-Valley experienced the greatest increase in vehicle traffic in the two most recent years of data available. I-580 added 18,100 daily vehicle trips just from 2014 to 2016. With these additional trips, several segments of I-580 in the Tri-Valley have been deemed “congested” by the Alameda County Transportation Commission, meaning that they have a level of service of F—the worst possible rating. Contra Costa County’s I-680 also experiences serious congestion through the Tri-Valley. In 2016, the evening northbound commute on the portion of the freeway between San Ramon and Pleasant Hill ranked among the top 10 most congested locations in the Bay Area.¹¹

This amount of traffic not only is a deterrent for businesses that might be interested in locating in the Tri-Valley, it is also a drag on productivity as Tri-Valley commuters spend a significant amount of time delayed by traffic. Drivers on the stretch of I-580 between the San Joaquin County-Alameda County border and San Ramon Road spent a collective total of over 5,000 hours stuck in traffic during an average day during 2017, and traffic is equally as bad in the westbound A.M. peak period as it is in the eastbound P.M. peak period. The situation is no better on I-680, where drivers between El Cerro Boulevard and Sunol Boulevard spent 3,635 hours in delayed traffic on the average day. In the northbound direction, the average daily vehicle hours of delay on I-680 grew by nearly 60% between 2013 and 2017.

Average Daily Vehicle Hours of Delay Measured as Highway Travel at Speeds Below 60 MPH



Source: California Department of Transportation, Caltrans Performance Measurement System

Analysis: Bay Area Council Economic Institute

THE TRI-VALLEY AND THE MEGAREGION

Growth in San Joaquin County Has Impact on Tri-Valley Roads

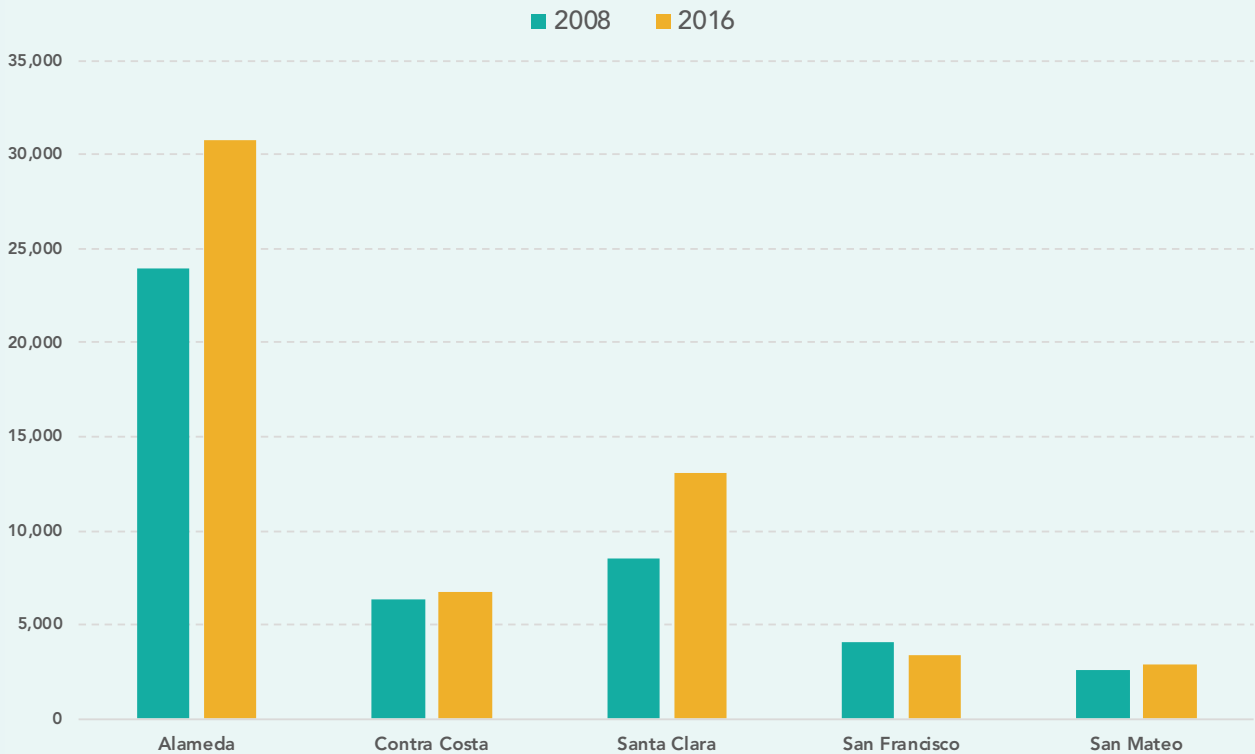
As housing becomes increasingly expensive in the core of the Bay Area, population has migrated farther and farther east. The Tri-Valley has absorbed some of this population growth, but as it becomes more expensive, more people are choosing San Joaquin County for its affordable proximity to the Bay Area. San Joaquin County’s population has grown at about the same rate as the Tri-Valley since 2010, though some of its commuter towns have grown very rapidly, especially those that are still being built. Mountain House, for example, grew by 70% from 2010 to 2015.

As more people move to the more affordable cities and towns of San Joaquin County, many still work in the job centers in the core of the Bay Area and must commute long distances, either on public transportation or on

I-580. Many work in the Tri-Valley, with some continuing on to Oakland, San Francisco, or Silicon Valley. About 26% of all San Joaquin County residents who work outside their homes commute to jobs in the Bay Area.

Over the past eight years, the largest increases in commuters coming from San Joaquin County occurred in Santa Clara and Alameda. From 2008 to 2016, the number of commuters to Santa Clara County increased by half. For Alameda County, the number increased by almost a third. With transit connectivity between San Joaquin County and the Tri-Valley relatively limited to four daily round trips on the Altamont Corridor Express train, these commuters will continue to put pressure on roadways as their numbers rise.

San Joaquin County Residents Commuting to the Bay Area



Source: IPUMS-USA, University of Minnesota
Analysis: Bay Area Council Economic Institute

Located just over the Altamont Pass from Livermore, the City of Tracy serves as a growing gateway community between the Tri-Valley and the San Joaquin Valley. Tracy's population grew by 7.1% from 2012 to 2017, faster than San Joaquin County as a whole.¹² The city has also seen very strong job growth, increasing its jobs numbers by 9% from 2010 to 2015, the most recent year that data is available.¹³ Some of this job growth is tied to the aggressive construction development of light industrial and manufacturing buildings that has happened in Tracy over the past few years.

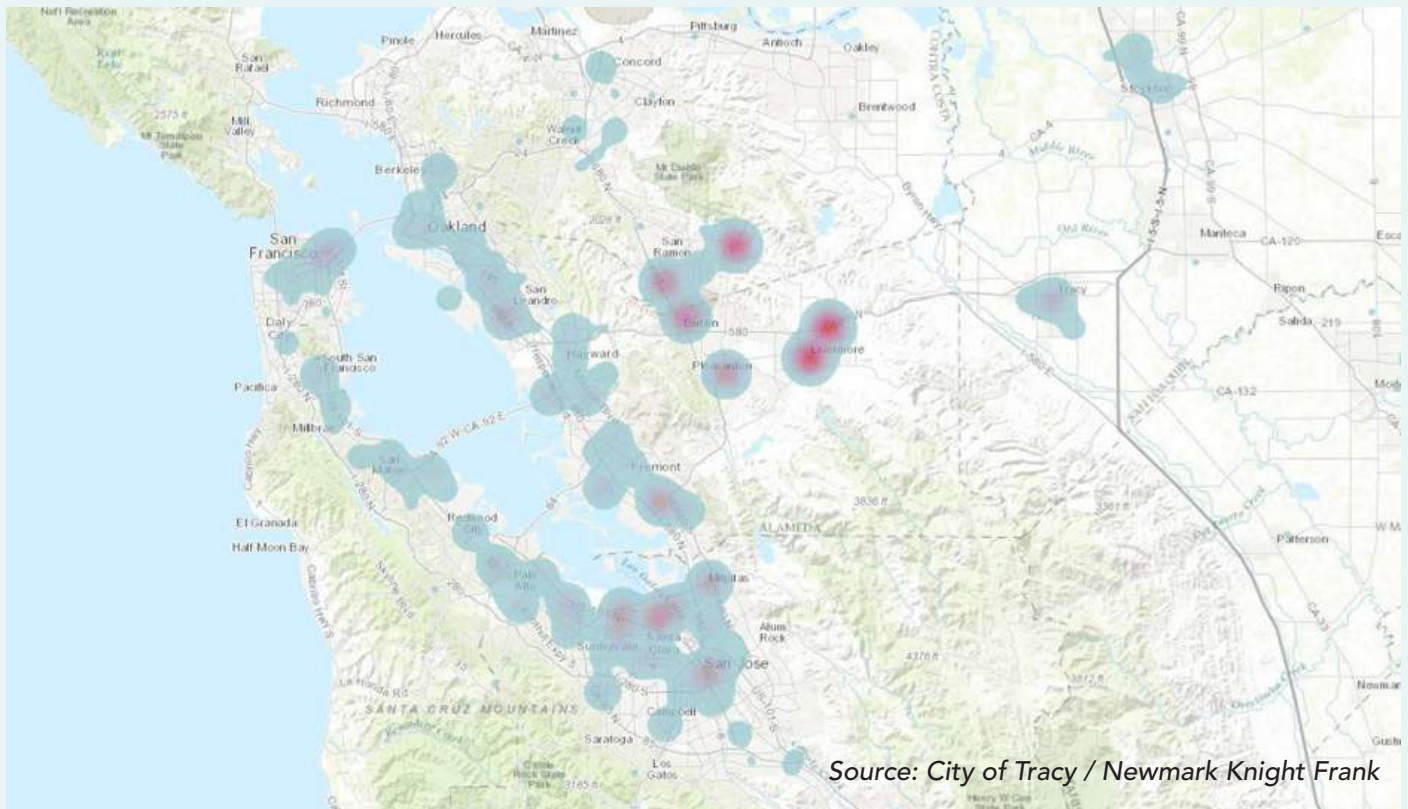
The median home value in Tracy is \$460,000, compared to a median of \$890,000 for the nine-county Bay Area.¹⁴ As it is much more affordable to buy a home in Tracy than it is in the core of the Bay Area, many people commute from Tracy to job hubs in the Tri-Valley, especially in Livermore, which is only 20 miles away.¹⁵

A Regional Commuter Workforce Survey conducted by Prologis found that Tracy respondents' work locations were most heavily concentrated in the Tri-Valley,

especially in Livermore. The first and third most popular work locations were Livermore and Pleasanton. Very few respondents worked in the Central Valley, meaning that a large number of commuters from Tracy are coming over the Altamont Pass on I-580 and through the Tri-Valley to get to work, even if they do not work in the Tri-Valley itself. Of these respondents, 69% drive alone to work, and 19% take the ACE train.

The availability of industrial space is another channel through which Tracy is connected to the Tri-Valley; companies in the Tri-Valley are able to locate their industrial operations nearby in Tracy. **Thermo Fisher Scientific**, for example, has locations in Pleasanton, Livermore, and Tracy. Other companies that have opened facilities in Tracy include **Amazon**, **Medline**, **Contract Metal Products**, **Zinus Furniture**, **DHL**, and **Synnex**. Entrepreneurial activity is happening in Tracy, too. **Skyrise**—a San Francisco-based startup that aims to build the world's first autonomous air transportation system—began leasing a hangar at Tracy Municipal Airport for research and development in 2017.

Employment Locations for Tracy and Mountain House Residents



Source: City of Tracy / Newmark Knight Frank

COMMUTING VIA RAIL: An alternative to driving, Bay Area Rapid Transit (BART) is utilized heavily by Tri-Valley commuters. Increasing ridership at the Dublin/Pleasanton station is reflected in packed parking lots in the early morning hours—another sign that commuters from across the Tri-Valley and the Northern San Joaquin Valley are looking to avoid the congestion of I-580. In 2016, Dublin/Pleasanton had an average of 8,016 weekday exits, and West Dublin/Pleasanton had 3,650. This compares to the BART median of 6,520.

In recent years, use of the two Tri-Valley BART stations has grown much faster than has use of the BART system as a whole. Since the opening of the West Dublin/Pleasanton station in 2011, total average weekday exits at the region's two stations have increased by 43%. Average weekday exits for the BART system as a whole, by contrast, increased by only 23% since 2011.

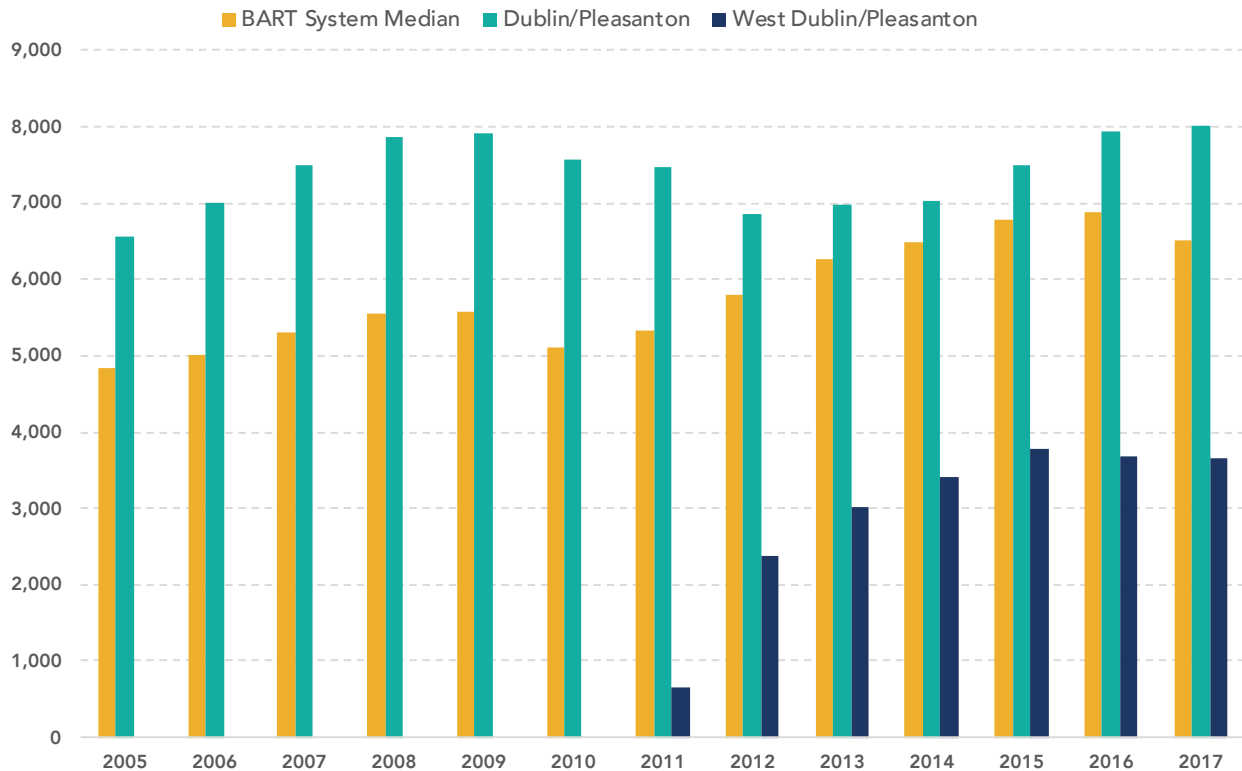
The Dublin/Pleasanton station is particularly important because, as the end of a BART line, it serves as a connection point for regional bus lines as well as the

Altamont Corridor Express (ACE) train. ACE brings commuters from San Joaquin County over the Altamont Pass to the Bay Area. Operating four round trips per day, the train runs from Stockton to San Jose, with 10 stops along the 86-mile route. There are three ACE stops in the Tri-Valley: Vasco Road, downtown Livermore, and downtown Pleasanton.

These stations serve as hubs for Central Valley commuters working in the Bay Area, especially the Pleasanton station, where riders can switch to a shuttle that takes them to Dublin/Pleasanton BART. ACE ridership has been increasing rapidly since 2009, rising from 655,890 to nearly 1.5 million annual passengers.

With megaregional ridership up, ACE has proposed to extend its service to Merced and then to Sacramento. Through the new Tri-Valley-San Joaquin Valley Regional Rail Authority, ACE and other stakeholders are studying how ACE can better connect to the BART system to provide a megaregional rail link, which will be discussed in more detail in the next section.

BART Average Weekday Exits by Fiscal Year



Source: BART Monthly Ridership Report

Analysis: Bay Area Council Economic Institute

THE LAST MILE PROBLEM: Though it is relatively easy to get to many parts of the Tri-Valley from the East Bay, San Francisco, and even San Joaquin County on public transit, the region is faced by what has been called the last mile problem. While many commuters can easily travel long distances by rail, there is often no convenient way to get from the nearest transit stop to their final destination. Many major Tri-Valley employers are not within walking distance of the ACE or BART stations, which discourages commuters from using public transit to get to their workplaces.

However, both Bishop Ranch and Hacienda business parks have made inroads toward solving this problem. Bishop Ranch offers free County Connection bus passes to all employees working on its premises, including access to express buses between Bishop Ranch and Walnut Creek BART, Dublin/Pleasanton BART, and the Pleasanton ACE station. Bishop Ranch also has in place a bike share program called BRiteBikes, which allows tenants' employees to use any of the program's bikes. Similarly, Hacienda offers free passes to its employees for all Wheels buses, which run rapid routes between Hacienda and Dublin/Pleasanton BART and West Dublin/Pleasanton BART.

Other promising solutions include ridesharing programs and employer-operated shuttles. One example is the City of Pleasanton's partnership with the carpooling app Scoop to offer a discount to Pleasanton residents and workers. Another program guarantees morning parking at the Dublin/Pleasanton BART station for commuters who use Scoop. The Livermore Amador Valley Transit Authority (LAVTA) has also developed a pilot program in Dublin that provides commuters with a discount on shared rides within city limits through Uber and Lyft.

One particularly innovative potential solution to the last mile problem is Bishop Ranch's pilot run of driverless shuttles, operated in collaboration with the Contra Costa Transportation Authority. Called the EasyMile shuttle, it is the first driverless shuttle to be granted permission by the California DMV to operate on public roads. After running test drives around Bishop Ranch for a year, the shuttle entered public roads for the first time in March 2018. The goal is to have almost 100 of the autonomous buses on the road by 2020.¹⁶ Similarly, LAVTA began testing its shared autonomous vehicle program in July 2018. The testing and first phases of deployment will be to the Dublin/Pleasanton station from nearby transit-oriented development.

TRI-VALLEY AT A GLANCE

Air Travel and the Tri-Valley

It is important to the Tri-Valley's ability to function successfully as a business hub to have easy access to an airport with a wide range of long-haul international flights. Fortunately, the Tri-Valley is nearly equidistant to Oakland International Airport and San Jose International Airport. Though a bit farther, San Francisco International Airport is also still close enough to be accessible.

Oakland International Airport has recently announced large gains in international travel, which should provide improvement to this capacity. An extension to the International Arrivals Building in Terminal 1, completed in summer 2017, will double the number of arriving passengers the building can process per hour, from 300 to 600. International passenger traffic at Oakland rose 134% from October 2015 to October 2017,¹⁷

and the airport is adding nonstop service to Paris and Rome in 2018.¹⁸ Currently, Oakland offers flights to 14 international destinations.

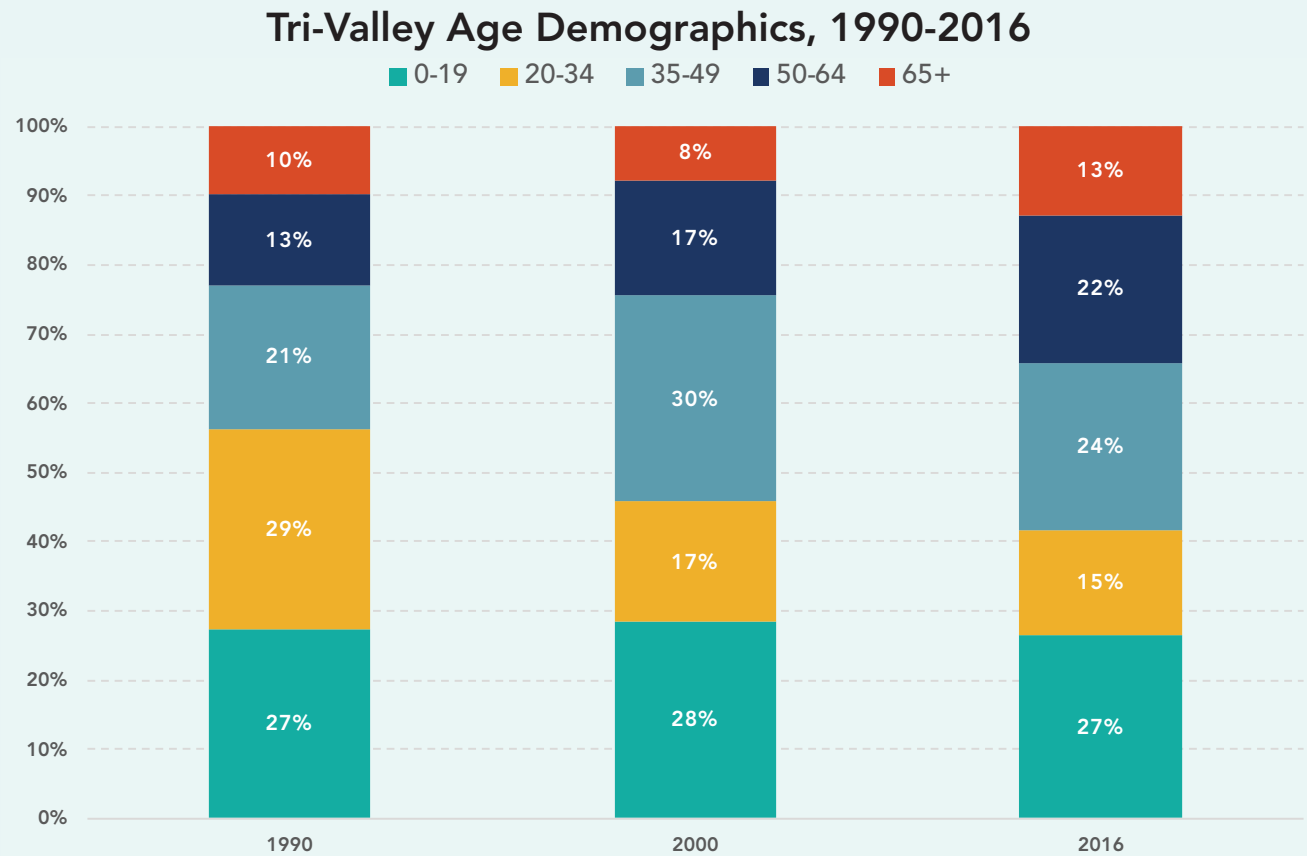
The ability to use all three major Bay Area airports is one of the many benefits of the Tri-Valley's central location, one that not many of the region's other business hubs share. The Tri-Valley also has its own municipal airport in Livermore, which has a private air terminal and hangar space. The airport is particularly useful for visiting executives and executives from companies headquartered within the Tri-Valley. For example, Gillig executives use the airport to access their facility in Livermore and the Costco regional headquarters is located adjacent to the airport.

TRI-VALLEY AT A GLANCE

Demographics are Shifting in the Tri-Valley, but in an Unexpected Way

The age demographics of the Tri-Valley differentiate the region from nearby San Francisco and Silicon Valley. Though about the same percentage of San Francisco and Tri-Valley residents are under the age of 35, the age breakdown within this group differs significantly between the two geographies. The Tri-Valley has far more children than San Francisco does, and San Francisco has significantly more young adults. Silicon Valley looks more like the Tri-Valley in terms of age, though with 22% of its population between 20 and 34, it still skews more toward young adults than the Tri-Valley.

As the Tri-Valley has grown into more of an economic hub, its population has been getting older—the reverse of what one might expect. Although the absolute number of people in the Tri-Valley between ages 20 and 34 has increased since 1990, it has done so more slowly than the overall population. As current Tri-Valley residents continue to age, the region must be careful to grow in a way that maintains a sufficiently large local workforce on which to draw. At Lawrence Livermore National Laboratory, 50% of employees will be eligible to retire in the next few years. To fill these positions will require a large influx of new workers—from within the Bay Area and from outside of it.



Source: IPUMS-USA, University of Minnesota
Analysis: Bay Area Council Economic Institute





Rising to the Challenge in the Tri-Valley

Although the Tri-Valley faces some of the same challenges as the rest of the Bay Area, its leaders and communities are taking steps to prepare for future growth and improve the quality of life for the Tri-Valley's residents and workers. Work will still need to be done on planning for the future of housing and transportation, but a variety of promising initiatives are currently underway to seize opportunities for improvement in these areas.

Transportation Investment and Policy Initiatives

Since 2014, when the original version of *Tri-Valley Rising* was published, the transportation challenges in the area have been tackled on a number of fronts, though congestion problems have only become worse as the economy has improved. On I-580 in the eastward direction between the Alameda-San Joaquin county line and the San Ramon Road exit, average daily hours of delay grew by 20% between 2012 and 2017.

EXPRESS LANE OPENING:

The Tri-Valley has been one of the first areas to benefit from the region's build out of an express lane network, reflecting its role as a gateway in the Bay Area and to the Northern California Megaregion. The Metropolitan Transportation Commission and partner agencies are in the process of building or converting 550 miles of highway into express lanes. The next generation of

congestion management, express lanes operate in much the same way that HOV lanes do, though they have the added piece of allowing single drivers at a price. Using FasTrak technology to track drivers, carpools of two or more are able to use the lanes for free, while solo drivers pay a toll that is set through dynamic pricing (at peak times, the toll is higher).

Opened in February 2016, the I-580 Express Lanes span approximately 11 miles from Hacienda Drive in Pleasanton to Greenville Road in Livermore in the eastbound direction, and approximately 14 miles from Greenville Road to just before San Ramon Road/Foothill Road in Dublin in the westbound direction. According to the August 2017 Express Lanes Update compiled by the Alameda County Transportation Commission, users of the express lanes experienced average speeds up to 27 miles per hour greater than speeds in the general



I-680 Express Lanes

Photo Credit: Noah Berger

purpose lanes. There were approximately 33,000 daily trips in the express lanes, making up approximately 11% of vehicles on the I-580 Tri-Valley corridor. In August 2017, 39% of all express lane users were single occupancy vehicles that chose to pay the toll.

The Tri-Valley also received investment in the Bay Area's newest express lanes, as the I-680 Contra Costa Express Lanes opened between Rudgear Road in Walnut Creek and Alcosta Boulevard in San Ramon in October 2017. According to Metropolitan Transportation Commission data, this segment of I-680 in the northbound direction during the evening was the eighth most congested corridor in the Bay Area during 2016. The previously-existing HOV lanes had offered some relief through the corridor—offering time savings of up to 16 minutes compared to the general purpose lanes—and the

converted express lanes are likely to offer more time savings, though it is too early to assess performance.

PASSAGE OF MEASURE BB IN ALAMEDA COUNTY:

In November 2014, Alameda County voters passed Measure BB, which augmented the existing half-cent sales tax to fund an \$8 billion transportation expenditure plan over 30 years. Included in the approved funding was \$400 million for the extension of BART to Isabel Avenue in Livermore. At the time of its passage, Measure BB's funding provided a key piece of financing for the project and signaled a high degree of local support to BART and the Metropolitan Transportation Commission.

BART MAKES DECISION FOR LIVERMORE EXTENSION:

BART issued the Draft Environmental Impact report (DEIR) for its Livermore extension in July 2017. It analyzed four alternatives for extending transit to Isabel Avenue: (1) Conventional BART; (2) Diesel Multiple Unit (DMU) or Electric Multiple Unit (EMU), both of which would require a transfer from BART's current terminus; (3) Bus Rapid Transit through the highway median; and (4) Enhanced bus service between the Dublin/Pleasanton BART station and Vasco Road in the eastern part of Livermore.

The DEIR projected that BART boardings will increase by 11,900 by 2040 under the conventional BART alternative. Incremental BART boardings for the DMU/EMU alternative are projected at 7,000, while the other two alternatives show projections for fairly minimal ridership gains. With an extension, congestion on the 5.5-mile stretch of I-580 between Isabel Avenue and the Dublin/Pleasanton BART station is projected to be reduced in the morning commute hours. The three rail alternatives ranged in cost from \$1.60 to \$1.67 billion.

The BART Board took action on the Livermore extension in its May 2018 meeting. The decision was made to not pursue any of the alternatives studied. While a conventional BART extension was preferred by many stakeholders in the Tri-Valley and across the region, BART's decision does not completely shut the door on transit investments in the I-580 corridor. A portion of the money programmed for a BART extension to Livermore will now be transferred to the Tri-Valley-San Joaquin Valley Regional Rail Authority.

Regional Express Lane Network



CREATION OF THE TRI-VALLEY - SAN JOAQUIN VALLEY REGIONAL RAIL AUTHORITY:

Probably the single most impactful event for Tri-Valley transportation occurred when Governor Brown signed Assembly Bill 758 into law in October 2017. Key stakeholders and transportation agencies in the Tri-Valley and San Joaquin Valley had been discussing possible transit connections between BART and ACE as part of the Altamont Regional Rail Working Group, but with limited authority to fund, design, or construct a connection, its main purpose was for political advocacy. With the creation of the Tri-Valley-San Joaquin Valley Regional Rail Authority, the authority to plan, develop, and deliver a connection between BART and ACE now sits fully with local stakeholders.

The governing board of the Tri-Valley-San Joaquin Valley Regional Rail Authority ("the Authority") consists of representation from cities across both regions, Alameda County, San Joaquin County, BART, the San Joaquin Regional Rail Commission, and the Livermore Amador Valley Transportation Authority. The Authority's first task is to deliver a project feasibility report by July 1, 2019, required by AB 758. This report will draw on a decade of BART environmental review and 2-3 years of ACEforward environmental work.

The Authority has already adopted a project concept and has released a schedule for project advancement that includes choosing a "preferred alternative" for advancement into project-level environmental clearance. Now that BART has foregone any of the extension plans to Livermore, the Authority can begin to study alternatives for connecting ACE and BART, a project now known as Valley Link.

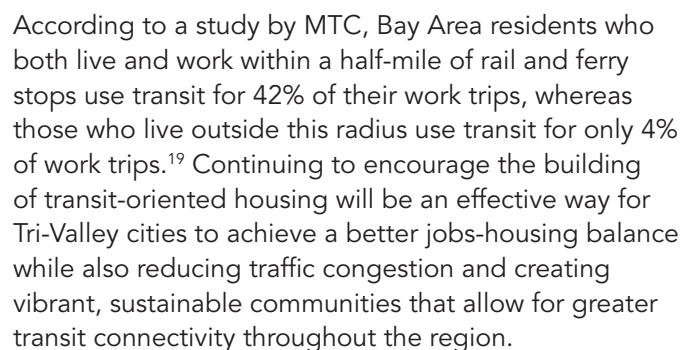
While all options will be studied, the Authority's adopted project concept entails extending a DMU/EMU rail line from the Lathrop area through Tracy and over the Altamont Pass, where it would then connect with the BART terminus in the Tri-Valley. The project concept includes using the route of the historic Transcontinental Railroad through the Altamont Pass. This approximately 12-mile right-of-way was deeded to Alameda County by Southern Pacific Railroad in 1984. Phase 1 of the project would preliminarily include stops at Lathrop, River Islands, Tracy, Mountain House, and Greenville Road and Isabel Avenue in Livermore.

Part of this expansion effort will study the construction of an even more extensive megaregional line that begins in Stockton before connecting up with the Phase 1 terminus in Lathrop/Manteca. ACE passengers could transfer to the Valley Link line at North Lathrop and at Greenville Road in Livermore. For passengers living between Stockton and Livermore, this route would finally provide a direct connection to BART.

Assembly Bill 758 recognizes that some sort of increased megaregional transit connectivity between the Tri-Valley and the Central Valley is necessary. Between 1990 and 2016, the number of people commuting daily from the Northern San Joaquin Valley to the Bay Area more than doubled and this number is expected to continue increasing. Building a better connection would allow workers in the Tri-Valley and the broader Bay Area to access more affordable housing in San Joaquin County, and it would reduce the environmental impact of their commutes. It would also reduce congestion for those who do choose to drive, and for those commuting on local roads. Additionally, it would make highway capacity available for expanded goods movement to the Bay Area's five ports and the inland Port of Stockton.

Transit-Oriented Development Can Solve Housing and Transportation Issues

One vision for a solution to both the problems of congestion and the need for more housing in the Tri-Valley is to create more transit-oriented housing. A transit-oriented development approach has been successful in Dublin, which has recently built a large amount of housing near the Dublin/Pleasanton BART station. One of these projects is Dublin Crossing, also called Boulevard, a development on the old Camp Parks military training base that is walking distance from BART. Still in development, the project will be pedestrian-oriented and will include six separate neighborhoods that range in density. The area will also feature commercial space and community parks. Such development has been helped by downtown Dublin's flexible zoning, by which zones are not tied to land parcels, so developers can move quickly through permitting processes as long as their developments comply with the city's specific plan.





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Looking to the Future of the Tri-Valley

The Tri-Valley has achieved a great deal of economic success in the past few decades while at the same time maintaining a very high quality of life. However, in order for this success to be sustainable, the Tri-Valley will need to plan for its future. **Challenges like housing and transportation—both of which contribute to workforce issues—will need to be addressed proactively, and having a vision for the future will help guide the Tri-Valley as it grows and changes.**

For this reason, the five Tri-Valley cities, two counties, business leaders, and other stakeholders should come together to create an “Innovation Tri-Valley Vision Plan.” Through the process of creating this long-term plan looking out to 2040, stakeholders should seek to

answer how they can best ensure the sustainability of their economies while continuing to attract businesses and the jobs that they bring. Such a plan can set the Tri-Valley on a path toward an even brighter future.

In addition to mapping out a general trajectory forward for the Tri-Valley, the Innovation Tri-Valley Vision Plan should also provide specific goals and guidance for addressing the most pressing issues facing the region:

- Enhanced megaregional transit connectivity will be necessary, and the Valley Link project concept for a DMU/EMU line that directly connects Tracy, Lathrop, and Stockton to the Dublin/Pleasanton BART station and to ACE achieves this goal. The new regional

THE TRI-VALLEY IN 2040

If current growth trends hold, the Tri-Valley’s population in 2040 will grow by nearly 100,000 people, to over 455,000. This population increase will require new spaces to live, enhanced infrastructure to move around, and more innovation in workforce training. Growth on the other side of the Altamont Pass will make greater megaregional transportation connectivity imperative by 2040, as trends in employment and population in the Northern San Joaquin Valley suggest that megaregional commuters to and through the Tri-Valley could grow in number from 82,000 in 2016 to over 143,000 by 2040.

rail authority needs to come to quick consensus among its many stakeholders as to the appropriate alignment and technology to push forward into planning stages.

- It will be especially important to consider the need for transportation infrastructure that can support a growing population and employment base. A plan for greater transit connectivity will be necessary, as will strategies for reducing traffic on local roads. This will be particularly crucial if more people who work in Bay Area job centers like the Tri-Valley continue to move east to San Joaquin County or elsewhere in the Central Valley. One possible solution would be to treat the existing BART line and the future Valley Link connection as the spine of a transit network that would be supported by bus rapid transit, autonomous transit, or other next-generation infrastructure for transit connectivity.
- Contemplating how future innovations in mobility (e.g., autonomous vehicles and buses) and the nature of work (e.g., greater propensity for telecommuting) will impact household decision-making on where to live and work must be an important part of the visioning process. Planning efforts should anticipate these changes and not expect the household preferences and norms of 2018 to remain status quo until 2040.
- The Tri-Valley cities should create a plan for how and where to build sufficient housing and keep it affordable for its future residents. In order to continue to attract young people to work for its companies, the Tri-Valley will need to have a more diverse housing stock that people of all income levels can afford.
- Transit-oriented development will be a key piece of a more connected, affordable, and vibrant Tri-Valley. Cities should coordinate on readying themselves for higher-density housing development near transit hubs, focusing on walkability, easily accessible entertainment and cultural amenities, and connection to workplaces. Identifying future land use strategies and areas of underutilized land will also be critical, as a lack of infill housing development will put more pressure on building into open spaces.

- Tri-Valley stakeholders should seek to emulate the model used in Livermore to successfully advocate for the creation of more affordable housing. When plans were being discussed for revitalizing Livermore's downtown, a coalition led by startups, winegrowers, artists, scientists, and Innovation Tri-Valley Leadership Group lobbied to add much-needed affordable housing to the plan, using city-owned property for 130 units. This sort of collaborative civic engagement and consensus building will be key in ensuring that the Tri-Valley builds enough housing to support its future economy and population.
- The Tri-Valley's biggest current workforce challenge is related to affordability. However, that does not mean the region should ignore training for the skills of the future economy. Continual partnerships between industry, K-12 institutions, and community colleges will ensure that the Tri-Valley educational system teaches a curriculum that is aligned to the workforce needs of local employers. Strengthened connections to the region's institutions of higher learning via satellite campuses and learning centers can further reinforce a pipeline of future talent.
- The region must continue to find ways to foster a robust culture of innovation. This can start with specialized education programs that can teach skills for the 2040 economy (e.g., robotics and coding), and can extend to more real estate resources being dedicated to the development of small businesses. Additional co-working spaces and incubators can do for the Tri-Valley what garages did for Silicon Valley.

Though some of these issues affect individual Tri-Valley cities more than others, the best way to tackle them will be as a collective group. This way, the cities can play to their individual strengths while creating a region-wide plan for future success. Planning as a coalesced group will allow the region to take better advantage of the potential for sharing resources, amenities, and ideas.

The Tri-Valley has achieved a great deal of success through its unique history of collaboration between city governments, businesses, innovation institutions, and community members. That collaboration will need to continue as the Tri-Valley now finds itself at the center of a growing and increasingly innovative megaregion.

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Stakeholder Interviews

Candace Andersen — *Supervisor Dist. 2, Contra Costa County*

Stephanie Beasley — *Livermore Valley Open Campus Partnerships Officer, Sandia National Laboratories*

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Eric Figueroa — *Assistant City Manager, City of San Ramon*

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Tim Harkness — *Founder and CEO, Unchained Labs*

Gregory Hitchan — *Managing Partner, Tri-Valley Ventures*

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Dan Leavitt — *Manager of Regional Initiatives, ACE*

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Veronica Vargas — *Mayor Pro Tem, City of Tracy*

Phil Wentz — *Vice Chairman, Wentz Vineyards*

Ron Wetter — *Government Relations Manager, Kaiser Permanente*

Tim Weyland — *Vice President, Human Resources, Topcon America Corporation*

Scott Wilson — *Community Relations Officer and State Government Liaison, LLNL*



Photo Credit: National Nuclear Security Administration

Notes



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