



Warehousing, E-Commerce, and Evolving Trade Patterns in **San Joaquin County**

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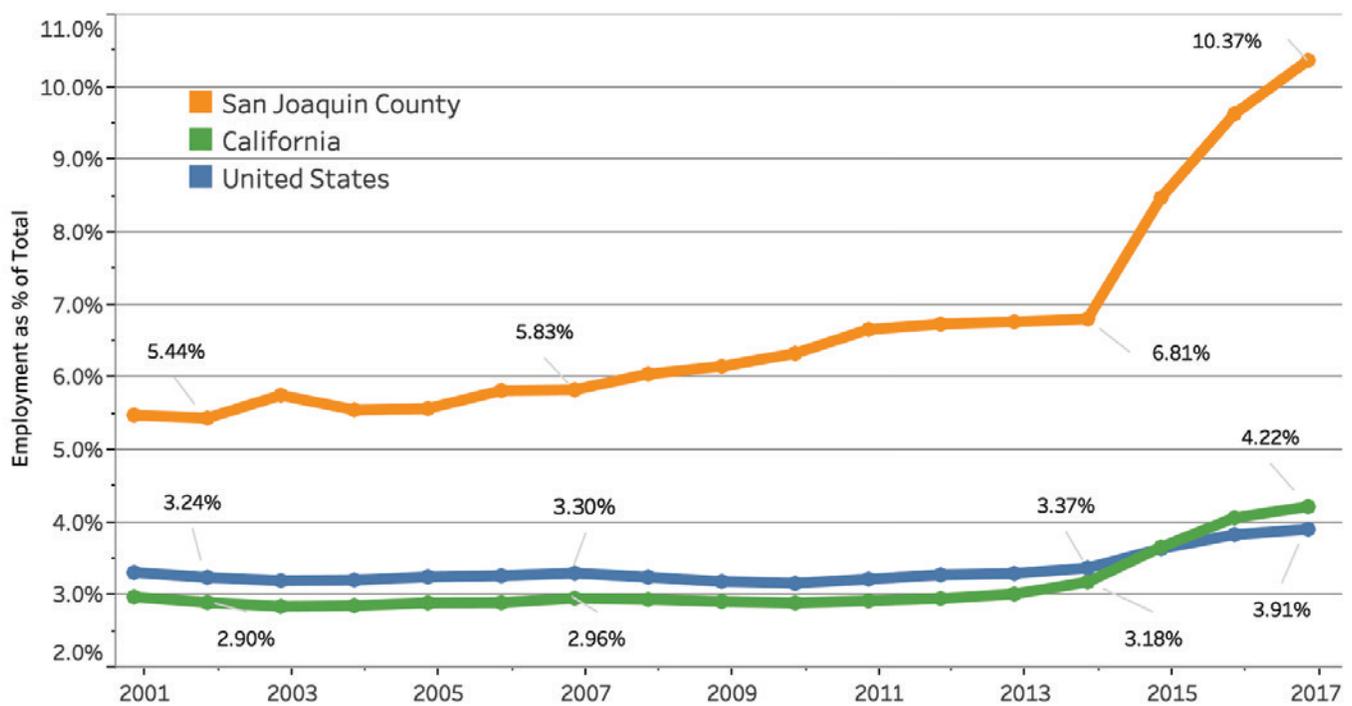
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Introduction

A short drive across San Joaquin County in any direction is quite likely to take you past some part of its expansive goods movement system. The County has been a center of Northern California trade at least since its founding 170 years ago. While the historic importance is well known, the past decade has brought dynamic change and accelerated growth. E-commerce, increasingly connected technologies more generally, and growing mega-regional coherence have played important roles in this change.

In 2017, the San Joaquin County metropolitan statistical area (the Stockton-Lodi MSA) became only the third area in the nation to see its employment in the transportation and warehousing sector exceed employment in the retail sector. Since 2014, transportation and warehousing employment has been growing nationwide due to the growth in e-commerce and ridesharing, and Figure 1 shows an even more dramatic rise for San Joaquin County. However, San Joaquin County's share of transportation and warehousing employment was already growing in advance of 2014, which reflects growing economic integration across the Northern California Megaregion that preceded the rise of e-commerce.

Figure 1: Comparative Employment Shares of the Transportation and Warehousing Sector



Source: Bureau of Economic Analysis, Total Full-Time and Part-Time Employment by Industry (CAEMP25) database.

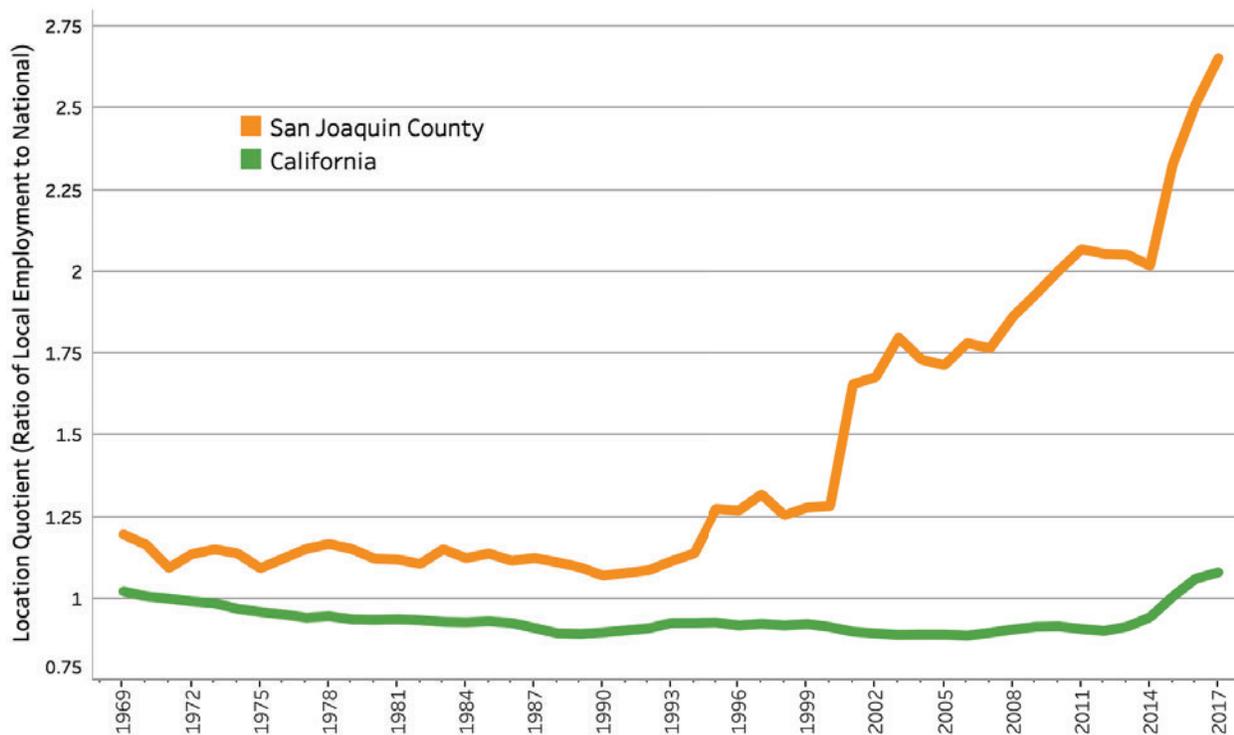
This paper traces the evolution and transformation of San Joaquin County's goods movement system. It highlights the system's new role within its own region as well as across historically linked but distinct regions in Northern California. The analysis also examines the contribution emerging technologies are bringing to the goods movement system and urban interdependencies with increasingly fused technologies and their accelerated development. Following a review of some indicators of the system's evolving competitiveness, the paper considers key dynamics affecting the system. It concludes with a discussion of the challenges and opportunities these changes are creating for the County's socio-economic development.

Competitiveness of the Goods Movement System

San Joaquin County is uniquely positioned as a logistics hub. It is a fast-growing county with relatively inexpensive real estate and is the geographic center of the Northern California Megaregion, a 21-county area with a population of over 12.6 million.¹ The County has an extensive multi-modal transportation infrastructure. Its four major freeways include primary access to the San Francisco Bay area region from the Central Valley along Interstates 205 and 580 as well as both of California's north-south highways, Interstate 5 and Highway 99. The County hosts the Port of Stockton which is a major inland deep-water port that connects the County via the Stockton Deep-water Shipping Channels to the Pacific Ocean at the Golden Gate Bridge in San Francisco 72 miles due east. The County is also a confluence of two national (Class-1) rail lines and hosts two major intermodal rail-freight terminals. In addition, it has a regional airport with rapidly growing air freight service.

With its central location and extensive transportation infrastructure the importance of the goods movement system to the local economy is well established. However, the significance of that system has dramatically changed in the past few decades. Figure 2 shows the transportation and warehousing sector's share of employment compared to the share it accounts for in the United States as a whole, a ratio known as a location quotient. A location quotient above 1 shows an industry is concentrated in a location. Figure 2 shows the distinct growth the County has experienced since the mid-1990s. San Joaquin County averaged a relatively stable ratio of around 1.12 times the national share of employment in the decades preceding 1995. Since then, its concentration in transportation and warehousing employment has grown dramatically, reaching 1.71 times the national concentration in 2005, 2.33 times in 2015, and 2.65 times in 2017 which is the last year comparable data is currently available.²

Figure 2: San Joaquin County's Transportation & Warehousing Location Quotient, 1969-2017



Source: Bureau of Economic Analysis, Total Full-Time and Part-Time Employment by Industry (CAEMP25) database

1 For a more detailed description of the Northern California Megaregion see the Bay Area Council Economic Institute's Report at: <http://www.bayareaeconomy.org/report/the-northern-california-megaregion/>

2 The BEA local area data for the period 1969-2000 includes communication and public utilities with the transportation and warehousing sector, but it is not included with transportation and warehousing in the data from 2001 onwards.

This growth has led to the County having the second highest concentration of transportation and warehousing employment in the entire United States. Table 1 shows that only Laredo, Texas, a logistics hub on the U.S.-Mexico border, has a higher concentration of transportation and warehousing employment than San Joaquin County.

As an alternative to the share of total jobs, we can also consider the intensity of the sector in terms of new hiring. Using job posting details for all of 2018, Table 2 ranks the top-10 MSAs in the nation according to the number of new jobs in transportation and warehousing they had relative to total employment. San Joaquin County is the seventh most intensive MSA in the nation in its transportation and warehousing hiring, and the only MSA in the Far West to rank in the top-10.

Table 1: TOP-10 Transportation & Warehousing MSAs in the USA by Share of Total Employment, 2017

Metropolitan Statistical Area	Employment	T&W as % of Total
Laredo, TX	20,271	14.3%
Stockton-Lodi, CA	34,202	10.4%
Memphis, TN-MS-AR	79,977	9.4%
Houma-Thibodaux, LA	10,249	9.0%
Chambersburg-Waynesboro, PA	6,733	8.4%
Harrisburg-Carlisle, PA	32,235	7.7%
Riverside-San Bernardino-Ontario, CA	155,837	7.6%
Joplin, MO	7,693	7.5%
Scranton--Wilkes-Barre—Hazleton, PA	23,722	7.3%
Reno, NV	21,309	7.0%

Source: Bureau of Economic Analysis, Total Full-Time and Part-Time Employment by Industry (CAEMP25) database.

Table 2: TOP-10 Transportation & Warehousing MSAs in USA by new jobs per person employed, 2018

Metropolitan Statistical Area	Job Postings	Postings per 10,000 people employed
Monroe, MI	1,354	319
Toledo, OH	6,877	247
Fort Wayne, IN	4,581	243
Laredo, TX	2,037	240
Memphis, TN-MS-AR	13,140	232
Greeley, CO	2,335	225
Stockton-Lodi, CA	4,451	212
Cedar Rapids, IA	3,054	205
Davenport-Moline-Rock Island, IA-IL	3,707	191
Greensboro-High Point, NC	6,110	185

Source: Labor Insight Jobs (Burning Glass Technologies).

Table 3 shows the relative importance of the County’s goods movement system to the Northern California Megaregion. None of the 11 other MSAs in the mega-region have a transportation and warehousing employment concentration over 5%, and Stockton-Lodi is more than double the next closest concentration. The Stockton-Lodi MSA also has the highest growth rate for this sector, showing its emergence as a unique hub of goods movement in the Megaregion.

Table 3: Shares of Transportation & Warehousing Jobs 2013 and 2017

Area		2013	2017	% Change 2013-2017
Northern California Megaregion	Stockton-Lodi MSA	6.8%	10.4%	53.2%
	Merced MSA	4.2%	5.0%	19.0%
	Modesto MSA	4.5%	4.8%	8.8%
	Vallejo-Fairfield MSA	2.7%	4.1%	51.1%
	Sacramento--Roseville--Arden-Arcade MSA	2.8%	3.7%	29.3%
	Napa MSA	2.1%	2.8%	29.4%
	San Jose-Sunnyvale-Santa Clara MSA	1.6%	2.4%	53.0%
	Salinas MSA	2.0%	2.3%	14.1%
	Santa Rosa MSA	1.9%	2.1%	13.0%
	San Francisco-Oakland-Hayward MSA	3.1%	N/A	N/A
Santa Cruz-Watsonville MSA	N/A	N/A	N/A	
California	3.0%	4.2%	40.0%	
United States	3.3%	3.9%	18.5%	

Source: Bureau of Economic Analysis, Total Full-Time and Part-Time Employment by Industry (CAEMP25) database.

Dynamics of the Goods Movement System

While many factors could be attributed to the recent development of the County’s goods movement system, we believe it is largely related to four components: 1) e-commerce and the rise of interconnected technologies more generally, 2) increasing intra- and inter-regional integration across the Northern California Megaregion, 3) the County’s extensive transportation infrastructure and locational advantage, and 4) the County’s workforce profile and its complementarities with the system’s needs.

The rise of e-commerce has disrupted the employment profile of the trade sector. Historically, the highest concentration of jobs has been in retail trade, but e-commerce has reduced the role of retail and shifted employment to logistics and delivery. As shown in Table 4, the ratio of retail to transportation and warehousing jobs in the U.S. declined from 3.35 in 2008 to 3.01 in 2018. However, in the Stockton-Lodi MSA, this ratio declined from 1.79 to 0.93, and the Stockton-Lodi MSA is now one of only three areas in the United States with fewer jobs in retail trade than transportation and warehousing. The other two statistical areas are Laredo, Texas which is located just across the border with Mexico and serves as an international trade hub and storage center for Mexican companies shipping goods to the United States; and Memphis, Tennessee which is where FedEx headquarters is located.

The growth in online shopping and increasing challenges to traditional brick-and-mortar retail is well documented. Between 2014 and 2018, E-commerce retail sales have increased by 72%, from \$297 billion to \$513 billion. While this still makes up only 9.6% of total retail sales in the United States, its increase accounts for 31% of all retail sales growth in the period.³

3 Source: U.S. Census Bureau’s 4th Quarter 2018 Retail E-Commerce Sales Report, Seasonally Adjusted Sales release of March 13, 2019.

Table 4: Ratio of Retail Trade to Transportation & Warehousing Jobs: 2008, 2013 and 2018

Area	2008 Ratio	2013 Ratio	2018 Ratio
Laredo, TX	1.02	0.93	0.77
Memphis, TN-MS-AR	1.08	0.99	0.96
Stockton-Lodi, CA	1.79	1.52	0.93
California	3.21	3.15	2.63
United States	3.35	3.28	3.01

Source: Bureau of Labor Statistics, Current Employment Statistics database

However, the rise of e-commerce is more than just a retail story and is also a significant feature in manufacturing, wholesale and service industry sales.⁴ Increasingly, e-commerce and other technologies are being combined into more dynamic converged business models. San Joaquin County has seen growth in these other areas as the line between manufacturing, wholesale, distribution and consumer sales becomes increasingly blurry. Some examples of these business models emerging in San Joaquin County include new types of construction companies.⁵ These businesses are integrating supply chains and marketing direct to consumers without the range of middle-men. Another example of this type of business with operations in San Joaquin County is Tesla, which endeavors to transform automotive and energy products sales and distribution by eliminating traditional retail channels. Other new business models transforming rather than just replacing traditional retail activities include Gobble, a meal delivery kit company, and Le Tote, a clothing subscription service that incorporates personalized style choices. Of course, the County hosts distribution centers for Amazon and Wayfair, which are more traditional e-commerce companies that represent most of the recent employment growth. All these firms embody the intersection of technologies that typify what some experts describe as the fourth industrial revolution. Therefore, in part the growth of the County's goods movement system is part of the more general development of this transformative business era.



The Bay Area is a hub for global trade. The problem is, there is very little real estate in the Bay Area to support that activity. There is very little affordable housing. There is, frankly, very little quality labor to support this kind of economic development. Tracy offers all those things in one location.”

– Hamid Moghadam, Prologis chairman and Co-CEO (in Celaschi, R. Comstock's September 2012)

The concentration of these industries in San Joaquin County is also related to increasing interdependencies among the Megaregion's economies. As we discussed previously, growth of the County's transportation and warehousing sector first started to exceed general economic growth in the mid-1990s. This growth was associated with traditional distribution center businesses, and growing megaregional integration acted as a significant force driving this growth. During this time, growing property values in the San Francisco Bay Area played an important role as the large spaces needed for distribution became increasingly prohibitive in the Bay Area as property prices rose. An example of this shifting locational choice and inter-regional integration was the movement

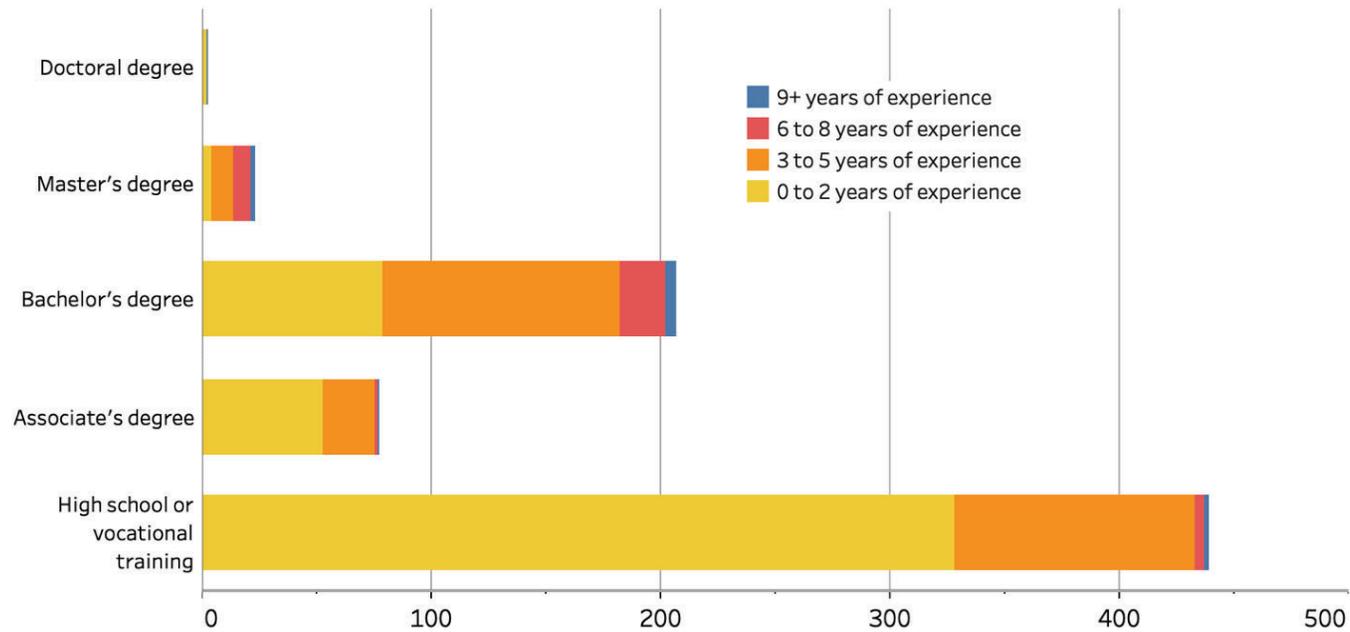
4 For further details see the U.S. Census Bureau's E-Commerce Statistics Reports at: <https://www.census.gov/programs-surveys/e-stats.html>

5 Examples include California Modulars: <https://californiamodulars.com/>; Integra: <http://integraconstruction.com/>; and Katerra: <https://www.katerra.com/>

of the Safeway Stores' dry goods storage facility to Tracy following a fire at its Richmond facility in 1988. In 1992 Safeway recognized the fundamental logistics advantages of San Joaquin County when it consolidated distribution at its Tracy Campus.⁶ The Safeway move marked the beginning of this growth period, and other recognizable names added distribution centers to the County in the following years, including Costco, FedEx, Ford Motors, and The Home Depot, among others.

The established transportation infrastructure was clearly significant in reinforcing the locational decisions of the other firms. The workforce to support those jobs was another important factor to consider. Figure 3 uses data from Burning Glass to show that most jobs in the sector are looking for individuals with just high school or vocational training. Further, over two-thirds of employers are looking for individuals with less than a bachelor's degree level qualification. In addition, nearly 95% of jobs are looking for individuals with five or less years of experience. Therefore, these jobs are a strong match to San Joaquin County's relatively young workforce with below average educational attainment, similar to other logistics hubs as shown in Figure 4.

Figure 3: Experience & Education Levels in San Joaquin County Transportation & Warehousing Jobs, 2018



Source: Labor Insight Jobs (Burning Glass Technologies)

The posted salaries for jobs in the sector are limited on the higher end, but Figure 5 shows that more than three-quarters of job postings in 2018 were offering salaries over \$35,000 per year. Figure 6 shows a change in the occupational structure of transportation and material moving employment in recent years. Laborers and freight movers have increased from 27% in 2013 to 37% in 2018. In contrast, packers and packagers have declined from 9% of the overall category in 2013 to 5% in 2018. Heavy truck drivers have dropped by a similar share from 25% in 2013 to 21% in 2018. These changes suggest that the forces driving the growth of the sector are also transforming the nature of work in the sector. Rising labor and freight movers with declining packers suggesting some of the potential transformative change occurring with the new players in the County's logistics operations.

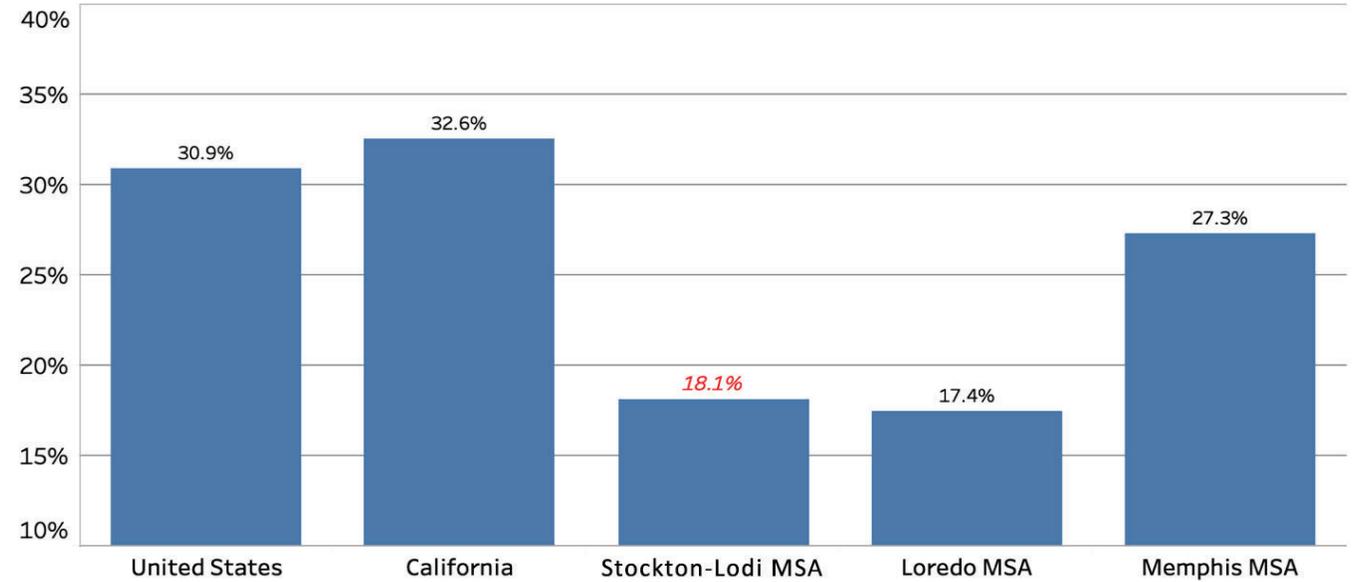
In addition, Table 5 shows there have been changes in the real annual wage of these occupations during the same period. Laborers and freight movers not only experienced the largest gains in employment but led growth in their real wage with an increase of over \$7,600 or 25% during the period. Despite moderate growth in employment, both light truck/delivery drivers and industrial truck and tractor operators saw their average annual real wages decline between 2013 and 2018, which

⁶ For further details see Robert Celaschi's story: "Time & Place: With Bay Area economies growing, Tracy stands to prosper" in the September 2012 edition of Comstock's magazine, pages 53-58.

means that wages did not keep pace with general price inflation. Nonetheless, the gains in occupations like laborers and freight movers offset these declines and contributed to an overall increase in the occupational wage of 10.6% from \$37,005 in 2013 to \$40,940 in 2018. Wages should continue to rise since nearly half of current job postings in the sector advertise salaries over \$50,000 per year.

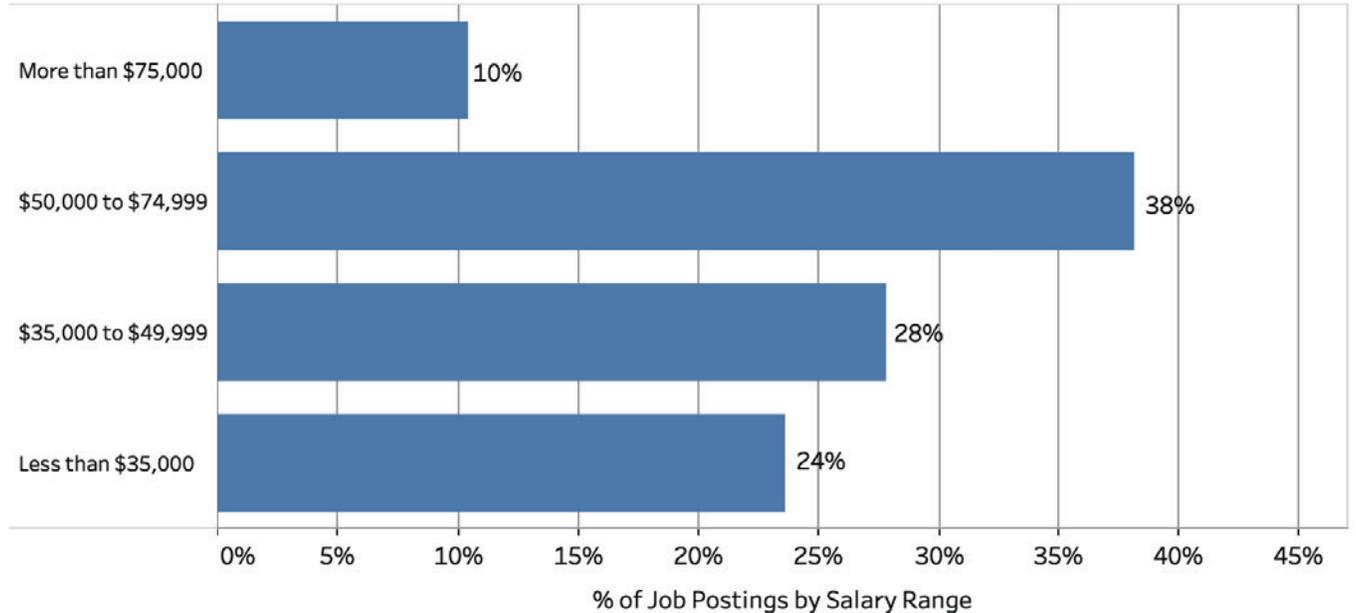
Investments made in the County’s goods movement infrastructure from the 1990s onwards have also been significant and supportive of the transformative growth the system has experienced. These include development and expansion of both the BNSF and Union Pacific intermodal rail facilities in the County. There have also been a host of freeway, street and road investments made by the San Joaquin Council of Governments, many of which have been supported the voter approved

Figure 4: Percentage of Population 25 and over with a Bachelor’s Degree or Higher



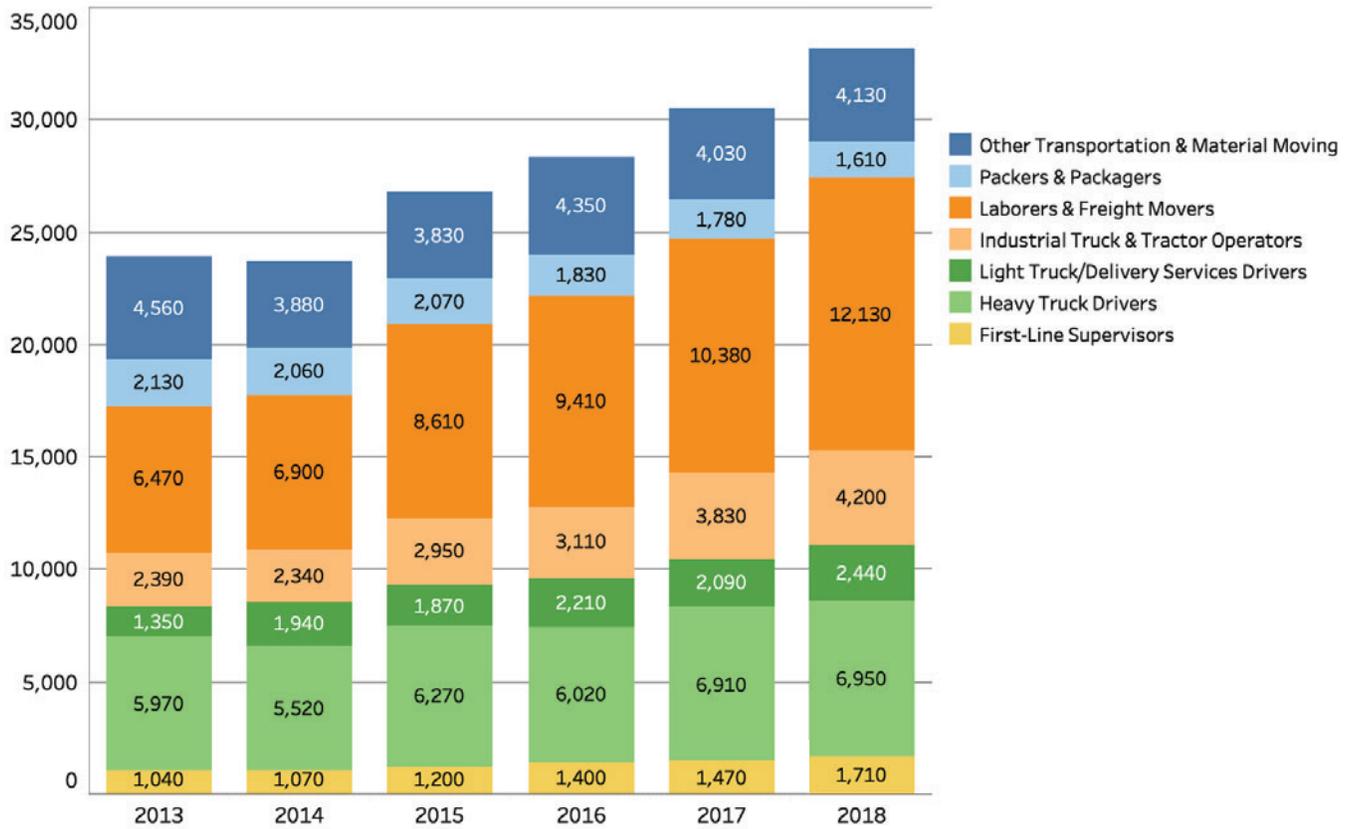
Source: Census Bureau, American Community Survey, 2017 5-Year Estimates (2013-17).

Figure 5: Annual Salaries for San Joaquin County Transportation & Warehousing Job Postings, 2018



Source: Labor Insight Jobs (Burning Glass Technologies).

Figure 6: Transportation and Material Moving Occupational Employment in San Joaquin County



Source: Bureau of Labor Statistics, Occupational Employment Statistics database.

Table 5: Real Annual Mean Wage of Transportation & Material Moving Occupations in 2013 & 2018

Occupation	2013 (Real\$ 2018)	2018
First-Line Supervisors	\$56,133	\$57,710
Heavy Truck Drivers	\$44,917	\$47,130
Light Truck/Delivery Services Drivers	\$38,665	\$38,010
Industrial Truck and Tractor Operators	\$37,673	\$36,520
Laborers & Freight Movers	\$30,817	\$38,480
Packers and Packagers	\$23,984	\$30,150
Other Transportation & Material Moving Occupations	\$36,303	\$41,237

Source: Bureau of Labor Statistics, Occupational Employment Statistics database & Consumer Price Index.

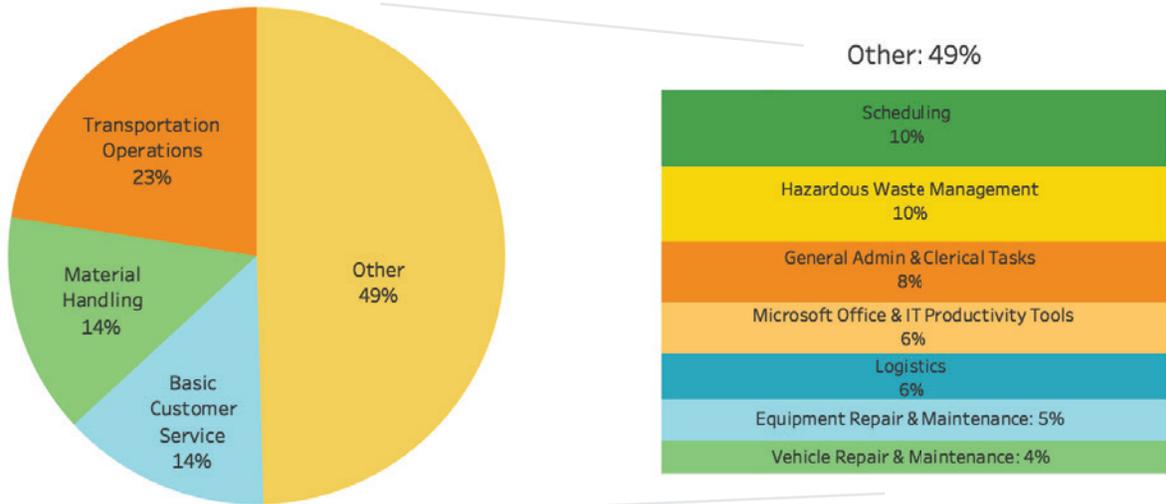
Measure K in 1990 which is a half-cent sales tax for transportation projects. The Port of Stockton was also substantially expanded with dockside and warehousing facilities with the transfer of the Rough and Ready Island Naval Supply Depot beginning in 2000 and it has continued to support that growth with tens of millions of additional transportation infrastructure investments. The Stockton Metropolitan Airport has also seen a large rise in air cargo with Amazon’s cargo flights now using the 10-acre cargo apron that was built in the early 2000s.

Policy Opportunities and Challenges

While the County’s physical transportation infrastructure investments have been important, our analysis has shown that the dynamic growth it has enjoyed is also related to several other factors. These include the County’s human capital, its growing intra- and inter-regional integration with the Northern California Megaregion, and evolving business models such as e-commerce that are transforming the goods movement and integrating it with other parts of production and sales. Leveraging the phenomenal growth and transformation in the goods movement system to further improve the economic well-being of the County will require a host of policies.

The increased integration of San Joaquin County with the rest of the Northern California Megaregion is one of the most important contextual changes for future policy support of the goods movement system. This integration means that goods movement infrastructure investments should not be considered in isolation but as part of a broad Megaregion strategy and planning process. Increased commuting, migration and goods movement between the 11 MSAs in the Northern California Megaregion is a reality, and local planning and policies need to incorporate this development while simultaneously pushing for broader Megaregional planning and policy development.

Figure 7: Skill Clusters in San Joaquin County Transportation & Warehousing Jobs, 2018



Source: Labor Insight Jobs (Burning Glass Technologies).

In these initial years of the e-commerce boom, most of the jobs that have been created are relatively low paying. Thus, there is a great need to ensure that the employment opportunities the system’s growth has brought are translated into sustained opportunity for advancement by those who fill these positions. This has been a central feature of the Stockton Mayor’s Office recent Workforce Development Action Plan and the Skills PACT that emerged from that initiative.⁷ The growth in employment creates a tremendous opportunity to engage the County’s workforce in employment that could be leveraged for further gain, but these jobs are rapidly evolving and the skills they are providing need to be part of workers

⁷ See Stockton Mayor’s Office Skills Pact. Available at: https://www.pacific.edu/Documents/school-business/BFC/Workforce%20Development%20Action%20Plan_FINAL.pdf

preparation for other needs that emerge in the future. This kind of skills policy is necessary in part because of the dynamic nature of these job opportunities as automation, artificial intelligence and other technologies will likely lead to further and rapid changes to these work opportunities. An integral part of workforce development in this environment must involve the constant identification and codification of the skills workers have in their places of work. Figure 7 illustrates this concept in a representation of skills clusters for transportation and warehousing jobs in the County during 2018. This kind of location specific information should inform workforce development strategies and contextualize employment needs across the Megaregion.

Table 6: Profile of Select Transportation & Warehousing Occupations in San Joaquin County, 2018

Occupation	2018 Job Postings	Median Salary	Location Quotient	LQ Rank (CA)	Projected Growth '16-'26
Tractor-Trailer Truck Driver	4,284	\$59k	2.7	#1	11.9%
Laborer / Warehouse Worker	1,558	\$26k	2.7	#1	15.6%
Forklift / Pallet Jack Operator	567	\$28k	5.8	#1	17.9%
Light Truck Delivery Driver	488	\$31k	2.3	#1	12.1%
Packager	94	\$23k	2.2	#2	6.2%

Source: Labor Insight Jobs (Burning Glass Technologies).

Table 6 shows that San Joaquin County is leading California’s MSAs in goods movement job growth. As favorable entry level jobs for the County’s relatively young workforce with below average educational attainment, it is critical that these opportunities are built upon and lead the County and its workforce to further growth and economic development.

Given the increasing importance of e-commerce and convergent technologies in facilitating the integration of goods movement systems across the NCMR, the County’s policy and planning lessons are of relevance to a much broader audience than local stakeholders. The changing productive structure of the Megaregion is important for it maintaining its growth and competitiveness as a global mega-city. Similarly, with new integrated business models changing the functions and roles of the goods movement system, the County could be at the forefront of smart policy development that contributes to megaregional development as well as broader global policies to engage and leverage opportunities created by the fourth industrial revolution.

Conclusion

This analysis describes the substantial transformation of San Joaquin County’s goods movement system in the last few decades. Factors facilitating this change include sustained infrastructure investments, emerging technologies, the local human capital profile, and increasing integration of the NCMR. Planning as well as policy coordination are especially important for infrastructure and skills development to ensure that the opportunities created by this change generate sustainable and inclusive economic benefits.

The County’s goods movement system is playing a new role in an increasingly integrated NCMR that is transforming the urban geography of Northern California and creating opportunities to build and strengthen the NCMR’s competitiveness as a global mega-city. Realizing this competitiveness will require a change in planning and policy perspectives across the Megaregion. Driven by the changing economic geography of Northern California and transformative, technologically driven economic change, this analysis shows that San Joaquin County is a unique national center of logistics that has rapidly grown and transformed.



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