National Center for Supply Chain Automation
RESOURCES FOR EDUCATION & INDUSTRY

Summary Report:

Supply Chain Industries and Occupation in the U.S.

Spring 2016

Commissioned by the NSF National Center for Supply Chain Automation at Norco College

Norco, California

Introduction

A report published by supply chain faculty at the University of Tennessee highlights the importance and urgency of supply chain talent management and preparation:

> *"Global economic growth since the recent recession is creating a crisis in supply chain talent management. Demand for top talent increases as supply chain volumes and complexity rise, but the supply of that talent is decreasing. According to the Bureau of Labor and Statistics, as of February 2015, only 62.8 percent of the American population had a job or were actively seeking work—the lowest level since 1978. This means shortages in every area of the supply chain, from blue-collar laborers to senior executives, and as more Baby Boomers reach retirement age those shortages are likely only to increase. The labor shortage presents a problem for the global economy across the board, but the crisis is particularly pertinent to supply chain talent."*[1]

This report summarizes the available literature on supply chain trends, and workforce as well as analyzes detailed labor market information for supply chain industries and technology-related occupations for the next ten years, 2015-2025.

The labor market statistics highlighted in this report were generated using data provide by EMSI, a private labor market data provider. The report focuses primarily on the national level data and supplies some state level information for the top 19 states with the most supply chain activity. These 19 states were selected using the findings from the previous employer study conducted by the National Center for Supply Chain Automation and the California Community Colleges Centers of Excellence[2].

[1] "Supply Chain Talent. Our Most Important Resource". A Report by Supply Chain Faculty at the University of Tennessee. April 2015.

[2] Fleming, K., Lindstrom, E., Walters, G. Supply Chain Technicians in the U.S.: Nationwide Employer Survey Results (2013). Published by the National Center for Supply Chain Automation.

Summary

Supply chain industries are projected to grow and create sustainable job opportunities for young people across the United States. A review of available literature, studies, and labor market data suggest the following key trends:

- Currently, there are estimated **11.1 million supply chain related jobs**. These jobs exist across traditional industry sectors. Transportation and warehousing sector accounts for almost half of these jobs (5.1mln), followed by retail trade and manufacturing that employ 1.6mln and 1.2mln, respectively. Other sectors with supply chain workforce include wholesale trade, construction, health care, and accommodation, among others. [3]
- The top 10 states with the most supply chain related employment are: California, Texas, New York, Florida, Illinois, Pennsylvania, Ohio, Georgia, New Jersey, and North Carolina.
- Supply chain employment in the U.S. is expected to grow by 9.1% creating about 1,014,000 new jobs across occupational categories in the next ten years, from 2015 to 2025.[4]
- The states with the fastest projected 10-year growth in supply chain employment include Texas (14% 10-year growth), Washington (14%), California (12%), Indiana (10%), Florida (9%), and Wisconsin (9%).
- Some segments of the supply chain industries are expanding at a faster rate than others. For example, the 3PL market is one of the fastest growing segments of the supply chain management segment. Its market net revenue was estimated to increase by 4.3% from $64.6 billion in 2013 to $67.4 billion in 2014.[5]
- Middle-skills jobs comprise an important part of the supply chain workforce. The Harvard Business School study of middle skills workers in America finds that of all online job advertisements in the U.S. in 2012, transportation and material handling was number four on the list (after sales, office, and healthcare), with about 611,000 job ads in this group.[6]
- Currently, supply chain technicians and mechanics are estimated to number nearly 2.4 million in the U.S. They are projected to grow by 11% by 2025. In addition to the new growth, companies are expected to replace about 22% of their current supply chain technician workforce, thus creating about 770,000 total technician-level job openings (both new and replacement) in the next 10 years.[7]
- According to the University of Tennessee study, the United States trade schools are not producing enough supply chain mechanics and technicians with the requisite skills.[8]

[3] EMSI
[4] Ibid.
[5] "Trending Up: 3PL Market Predictions for 2014 and 2013 Results", by Armstrong & Associates. July 10, 2014.
[6] "Bridge the GAP: Rebuilding America's Middle Skills", Harvard Business School, 2013.
[7] EMSI
[8] "Supply Chain Talent. Our Most Important Resource". A Report by Supply Chain Faculty at the University of Tennessee. April 2015.

- The supply chain field gets overlooked by new graduates, who think of supply-chain work as "a guy driving a forklift in a dusty old factory." That outdated image is a huge hurdle for an industry that badly needs new talent in high tech, analytics, robotics, and engineering.[9]

Supply Chain Industry Trends

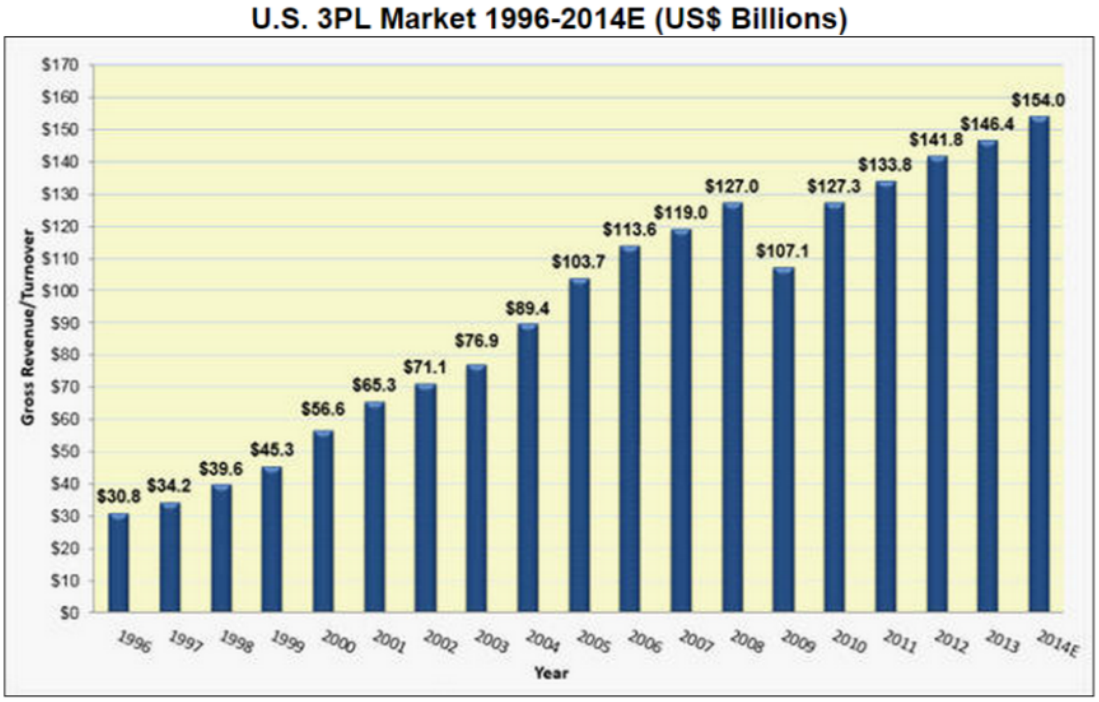
Supply chain markets have seen a robust and dynamic growth in the last decade. By some estimates, the logistics industries alone (which are part of supply chain management) made up 8.5% of Gross Domestic Product (GDP) in 2014. The system delivers 48 million tons of freight that is worth about $48 billion daily and employs about 6 million people.[10]

Some segments of the supply chain industries are expanding at a faster rate than others. For example, the third-party logistics providers (3PL) market is one of the fastest growing segments of the supply chain management segment. Its market net revenue was estimated to increase by 4.3% from $64.6 billion in 2013 to $67.4 billion in 2014.

> *"Growth in Domestic Transportation Management (DTM) continues to be fed by the expansion of the base of customers using third-party logistics providers (3PLs). It is common now for customers with as little as $3 million in transportation spending to use at least one 3PL. Similarly, third-party logistics services provided are more systems-driven rather than just load-by-load transactions. Systems based "Enterprise Accounts" constitute a significant part of the business for all major domestic transportation managers.*[11]

[9] "Wanted: 1.4 million New Supply Chain Workers by 2018", by Ann Fisher, Fortune, May 1, 2014.
[10] "Wanted: 1.4 million New Supply Chain Workers by 2018", by Ann Fisher, Fortune, May 1, 2014.
[11] "Trending Up: 3PL Market Predictions for 2014 and 2013 Results", by Armstrong & Associates. July 10, 2014.

Since 1996, the 3PL market expanded from $30 billion to $154 billion in gross revenue (see the chart below). [12]



Technological advances, changes in consumer preferences, and a shift towards more integrated management of supply chain are just some of the trends creating not only the impetus for fast industry growth, but also new requirements for the trained and competent workforce.

The 10 Trends

1. Service chains will become more important than product chains.
2. Companies will need to fully report corporate externalities.
3. Supply chains must be designed to serve the "base of the pyramid."
4. Knowledge work and workers will become global in nature.
5. SCM will have a standard certification process similar to that for CPAs.
6. Product clockspeeds will determine the number and nature of the supply chains.
7. Micro segmentation will be key to success.
8. Technology to support SCM will primarily be "on tap."
9. Leaders will leverage social media in a closed loop feedback process.
10. Artificial intelligence will be embedded in mainstream supply chain activities.

Source: "10 Supply Chain Trends for the Next 10 Years." By Sumantra Sengupta. SupplyChain274. July 9, 2013.

[12] Ibid.

Supply Chain Industry Employment

Currently, there are estimated **11.1 million supply chain related jobs in the U.S.** By 2025, the employment is projected to increase to 12.1 million, or 9.1% growth. This will create roughly 1,014,000 new jobs across occupational categories in the next ten years (Exhibit 1). [13]

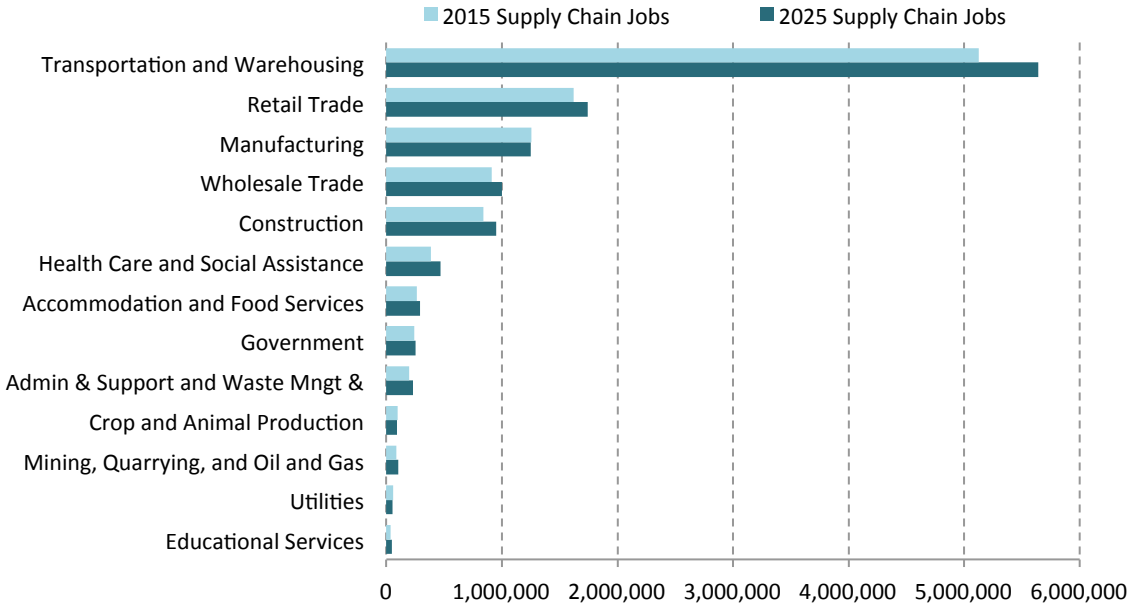
Exhibit 1 –Supply Chain Employment & Growth in the U.S. by Industry Sector, 2015-2025

NAICS Code	Industry Sector	2015 Supply Chain Jobs	2025 Supply Chain Jobs	10 Year Growth/ Decline	10 year % Growth/ Decline
48-49	Transportation and Warehousing	5,124,478	5,638,970	514,492	10.0%
44-45	Retail Trade	1,622,301	1,743,539	121,238	7.5%
31-33	Manufacturing	1,252,184	1,249,371	(2,813)	(0.2%)
42	Wholesale Trade	909,047	998,604	89,558	9.9%
23	Construction	836,940	947,500	110,559	13.2%
62	Health Care and Social Assistance	386,960	469,478	82,518	21.3%
72	Accommodation and Food Services	262,047	291,943	29,896	11.4%
90	Government	241,359	252,552	11,192	4.6%
56	Admin & Support and Waste Mngt & Remediation Serv.	195,890	230,130	34,240	17.5%
11	Crop and Animal Production	94,760	93,012	(1,748)	(1.8%)
21	Mining, Quarrying, and Oil and Gas Extraction	86,358	103,794	17,437	20.2%
22	Utilities	55,659	55,483	(176)	(0.3%)
61	Educational Services	38,990	46,206	7,216	18.5%
	Total	**11,106,974**	**12,120,582**	**1,013,608**	**9.1%**

Supply chain industry jobs exist across many traditional industry sectors as many businesses utilize transportation and material management workforce in their operations. The transportation and warehousing industry sector accounts for almost half of all supply chain jobs (5.1 million) and is expected to add the most number of jobs (514,000) in the next ten years. Other sectors with supply chain workforce include retail trade, manufacturing, wholesale trade, construction, health care, and accommodation, among others (Exhibit 2).

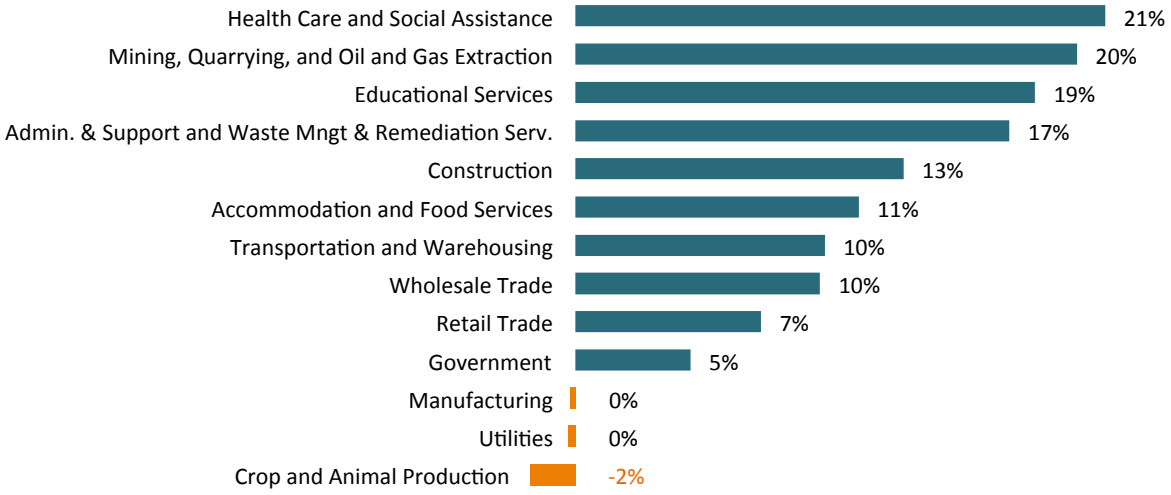
[13] EMSI, economicmodeling.com

Exhibit 2 – Projected Supply Chain Employment Growth by Industry Sector, 2015-2025



The industry sectors that are projected to increase supply chain employment at the fastest pace are health care (21% 10-year growth), Mining (20%), Education Services (19%), and Administrative and Support Services (17%). See Exhibit 3.

Exhibit 3 – Fastest Growing Supply Chain Related Industry Sectors, 2015-2025



The top 10 states with the most supply chain related employment are: California, Texas, New York, Florida, Illinois, Pennsylvania, Ohio, Georgia, New Jersey, and North Carolina. The states with the fastest projected 10-year growth in supply chain employment include Texas (14% 10-year growth), Washington (14%), California (12%), Indiana (10%), Florida (9%), and Wisconsin (9%). Exhibit 4 summarizes the supply chain industry employment data for the top 19 states, including current and projected jobs, number of new jobs estimated for the next 10 years, percentage growth and regional concentration of supply chain employment relative to the national average. Regional concentration is measured using location quotient. Location quotient of over 1.00 indicates that a state has a regional specialization in supply chain.[14]

Exhibit 4 –Supply Chain Employment and Growth in Top 19 States, 2015-2025

State	2015 Supply Chain Jobs	2025 Supply Chain Jobs	10-year Growth/ Decline	10-year % Growth/ Decline	2015 Location Quotient	2025 Location Quotient
California	1,205,739	1,348,940	143,202	12%	0.95	0.93
Texas	1,020,677	1,166,709	146,031	14%	1.08	1.05
New York	605,914	643,413	37,499	6%	0.92	0.90
Florida	590,543	641,582	51,039	9%	0.96	0.94
Illinois	509,003	546,693	37,689	7%	1.14	1.14
Pennsylvania	492,220	526,283	34,063	7%	1.10	1.11
Ohio	435,350	465,254	29,905	7%	1.04	1.03
Georgia	373,515	395,427	21,912	6%	1.12	1.10
New Jersey	326,895	349,207	22,311	7%	1.11	1.12
North Carolina	316,023	333,210	17,186	5%	0.91	0.87
Michigan	309,683	319,852	10,169	3%	0.93	0.92
Indiana	285,173	312,625	27,452	10%	1.16	1.15
Tennessee	284,188	306,918	22,730	8%	1.22	1.21
Virginia	263,979	284,304	20,325	8%	0.92	0.90
Washington	239,569	272,180	32,611	14%	0.94	0.94
Wisconsin	235,521	255,733	20,212	9%	1.04	1.04
Missouri	221,506	235,846	14,340	6%	1.01	1.01
Minnesota	215,756	226,787	11,031	5%	0.99	0.96
Massachusetts	212,229	223,128	10,899	5%	0.83	0.79

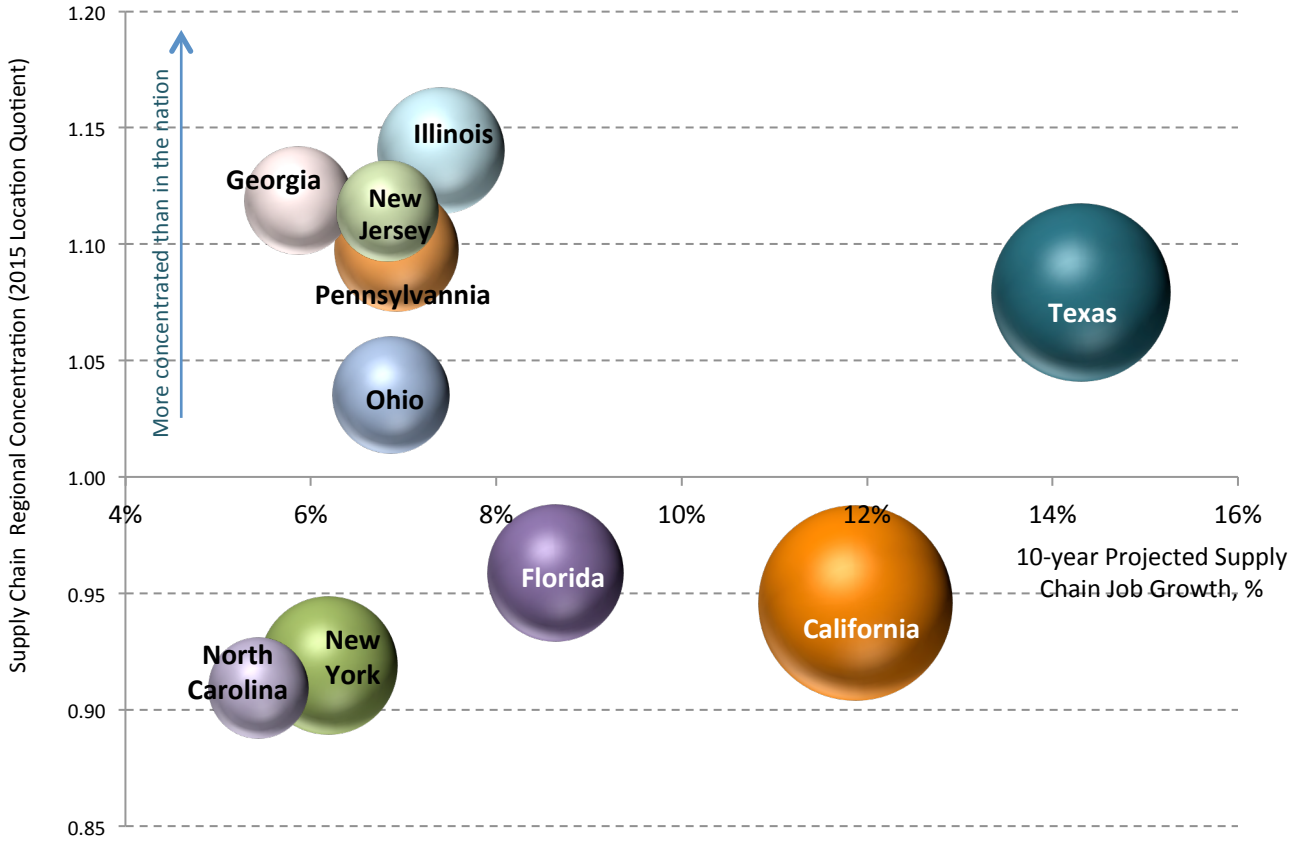
The analysis of the projected 10-year growth rates relative to the regional concentration indicators reveals that among the top ten states, Texas is projected to grow the fastest and has a regional specialization in supply chain. California, Florida, New York, and North Carolina all have significant supply chain activities that are expanding, but do not show regional concentration in supply chain compared to the national average, which might be due to a very diverse nature of their economies. Supply chain industries are especially important for the economies of Georgia, Illinois, New Jersey, and

[14] EMSI, economicmodeling.com

Pennsylvania, as they show 10-15% more concentration of supply chain jobs than the national average (Exhibit 5).

Exhibit 5 –Top 10 States: Supply Chain Job Growth & Regional Concentration, 2015-2025

Size of each bubble indicates 2015 Supply Chain Employment



Supply Chain Technicians Employment

Middle-skills jobs comprise a pivotal part of the supply chain workforce. The Harvard Business School study of middle skills workers in America finds that of all online job advertisements in the U.S. in 2012, transportation and material handling was number four on the list (after sales, office, and healthcare), with about 611,000 job ads in this group.[15]

Driver shortage has been the main workforce-related concern of companies engaged in the supply chain activities for a long time. This is shifting now, with more businesses also realizing the need for skilled supply chain technicians.

> *All of the focus in the media seems to be on the great driver shortage. But there are supply chain talent shortages across virtually every hourly associate resource group. One serious shortage is brewing with supply chain technicians and mechanics. With the improvements in the US, and*

[15] "Bridge the GAP: Rebuilding America's Middle Skills", Harvard Business School, 2013.

global, economy and the recent reshoring shift, the demand for these roles is increasing. Nationally, US trade schools are not producing enough mechanics and technicians with the requisite skills. Therefore demand is exceeding supply.[16]

Supply chain technician is an emergent occupation that does not currently exist in the federal Standard Occupational Classification (SOC) system. The industry leadership team for the National Center for SCTE defines the job of a Supply Chain Technician as, "a person who installs, operates, supports, upgrades or maintains the automated material handling equipment and systems that support the supply chain."[17]

To obtain labor market data for supply chain technicians, the following SOC codes were utilized:[18]

SOC Code	Occupation Description
17-3023	Electrical and Electronic Engineering Technicians
17-3024	Electro-Mechanical Technicians
17-3026	Industrial Engineering Technicians
17-3027	Mechanical Engineering Technicians
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment
49-9041	Industrial Machinery Mechanics
49-9043	Maintenance Workers, Machinery
49-9071	Maintenance and Repair Workers, General
49-9099	Installation, Maintenance, and Repair Workers, All Other

Currently, supply chain technicians and mechanics are estimated to number nearly 2.4 million across all industries in the U.S. They are projected to grow by 11% by 2025. In addition to the new growth, companies are expected to replace about 22% of their current supply chain technician workforce, thus creating about 770,000 total technician-level job openings (both new and replacement) in the next 10 years (Exhibit 6).[19]

Exhibit 6 - Employment Summary for Supply Chain Technicians in the U.S.

2015 Jobs	2,397,164
2025 Jobs	2,649,452
10-year Total Openings (new & replacement)	769,597
10-year New Jobs	252,288
10-year Replacement Jobs	517,309
10 year % Growth	11%
10-year % Replacement	22%

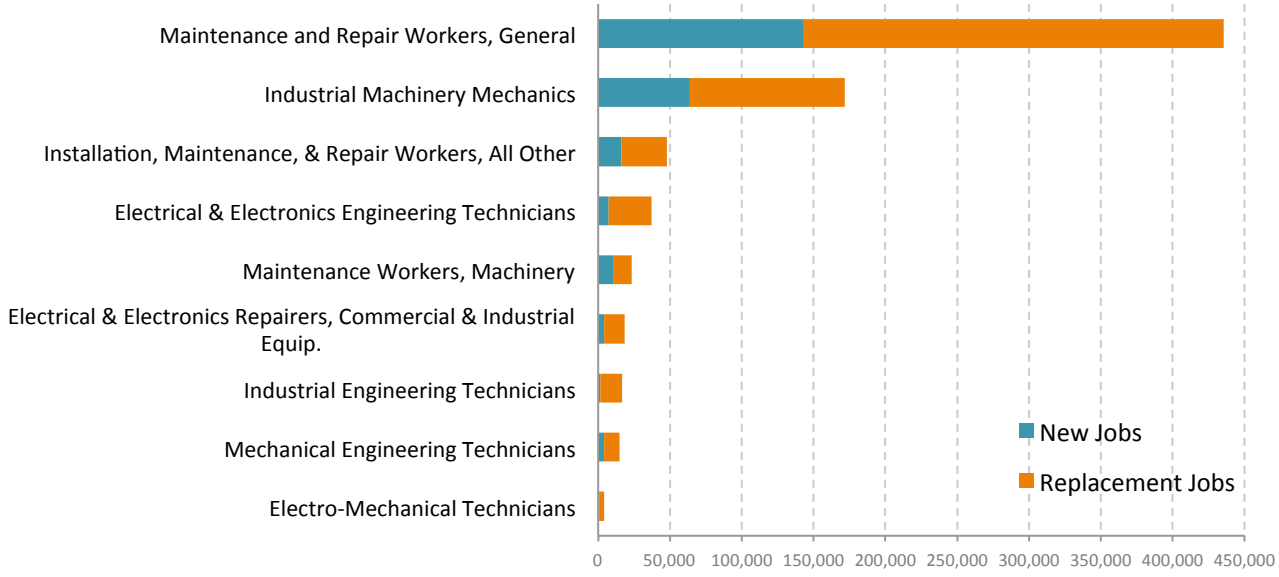
[16] "Supply Chain Talent. Our Most Important Resource". A Report by Supply Chain Faculty at the University of Tennessee. April 2015.
[17] Young, N. How Does Supply Chain Management Differ from Supply Chain Technology? Published by the National Center for Supply Chain Automation. 2013.
[18] "How to Obtain Labor Market Information on Supply Chain Technology Industries and Occupations: Guide for Education Practitioners." National Center for Supply Chain Automation. March 2015.
[19] EMSI, economicmodeling.com

Analysis of the employment trends for each of the traditional occupations related to supply chain technology shows that general maintenance and repair workers represent the largest occupational category, with over 1.4 million current jobs. They are followed by industrial machinery mechanics (340,000 jobs) and all other installation, maintenance, and repair workers (180,000). Industrial machinery mechanics are also projected to grow the fastest (19%), with additional 64,000 positions created in the next 10 years. Occupations with the highest projected replacement rates due to retirements and other factors include industrial machinery mechanics (32% will need to be replaced by 2025), industrial engineering technicians (23%), and electro-mechanical technicians (22%), among others (Exhibits 7 and 8).

Exhibit 7 – Employment Projections for Supply Chain Technology Occupations in the U.S., 2015-2025

SOC Occupations	2015 Jobs	2025 Jobs	Total Job Openings (new & replacement)	New Jobs	Replacement Jobs	% Growth	% Replacement
Maintenance & Repair Workers, General	1,442,793	1,585,898	435,504	143,105	292,399	10%	20%
Industrial Machinery Mechanics	338,283	402,091	171,495	63,808	107,686	19%	32%
Installation, Maintenance, and Repair Workers, All Other	179,378	195,690	47,685	16,312	31,372	9%	17%
Electrical & Electronics Engineering Technicians	141,836	148,964	37,248	7,128	30,120	5%	21%
Maintenance Workers, Machinery	95,221	106,041	23,413	10,820	12,593	11%	13%
Electrical & Electronics Repairers, Commercial & Industrial Equipment	68,066	72,455	18,497	4,389	14,108	6%	21%
Industrial Engineering Technicians	67,436	68,913	16,747	1,477	15,270	2%	23%
Mechanical Engineering Technicians	49,486	53,607	14,722	4,121	10,601	8%	21%
Electro-Mechanical Technicians	14,665	15,792	4,288	1,128	3,160	8%	22%

Exhibit 8 – Projected 10-year Job Openings for Supply Chain Technology Occupations



California, Texas and New York currently account for the largest supply chain technician employment in the nation. The fastest 10-year growth for supply chain technician occupations is expected in Texas (18%), Washington (14%), California (13%), and Florida (11%). Texas is also projected to add the most new jobs by 2025 (Exhibit 9)[20].

Exhibit 9 – Supply Chain Technician Employment & Growth in Top States, 2015-2025

Sorted by 2015 Jobs

State	2015 Jobs	2025 Jobs	Total Openings (new & replacement)	Growth/ New Jobs	Replacement Jobs	% Growth	% Replacement
California	238,533	268,547	81,175	30,014	51,161	13%	21%
Texas	218,148	257,297	88,766	39,149	49,617	18%	23%
New York	139,532	148,751	38,346	9,219	28,980	7%	21%
Florida	126,548	140,695	40,982	14,147	26,836	11%	21%
Pennsylvania	104,026	111,410	29,655	7,384	22,270	7%	21%
Ohio	96,885	103,099	27,139	6,214	20,821	6%	21%
Indiana	90,894	98,913	27,325	8,019	19,305	9%	21%
Michigan	84,263	88,994	23,143	4,731	18,257	6%	22%
Georgia	78,137	83,623	22,141	5,486	16,551	7%	21%
North Carolina	73,609	81,457	23,826	7,848	15,978	11%	22%
Illinois	62,175	68,448	20,254	6,273	13,981	10%	22%
Virginia	59,506	65,357	18,646	5,851	12,788	10%	21%
New Jersey	56,617	60,038	15,305	3,421	11,869	6%	21%
Washington	54,831	62,267	19,458	7,436	12,024	14%	22%
Tennessee	54,184	58,354	15,671	4,170	11,457	8%	21%
Wisconsin	52,932	57,899	16,378	4,967	11,366	9%	21%
Missouri	48,471	51,872	13,586	3,401	10,185	7%	21%
Massachusetts	48,303	52,791	14,991	4,488	10,428	9%	22%
Minnesota	44,072	47,872	13,575	3,800	9,702	9%	22%

Supply chain technician wages in the U.S. range from $10 to $17 per hour for entry level employees with no experience. Wages for more experienced and trained employees range from $17 to $29 per hour while workers with the most experience and years on the job make up to $42 per hour (Exhibit 10).

Exhibit 10 – 2015 Hourly Earnings for Supply Chain Technology Occupations in the U.S.

SOC Occupation	Entry-Level (10^{th} percentile)	With Some Experience (Median)	With Years of Experience (90^{th} percentile)
Electrical and Electronics Engineering Technicians	$17.33	$28.73	$42.06
Industrial Engineering Technicians	$16.05	$25.50	$39.61
Electrical & Electronics Repairers, Commercial & Industrial Equip.	$16.48	$25.64	$38.70

[20] EMSI, economicmodeling.com

Mechanical Engineering Technicians	$16.38	$25.72	$38.16
Electro-Mechanical Technicians	$16.40	$26.27	$37.12
Industrial Machinery Mechanics	$15.11	$23.19	$34.85
Maintenance Workers, Machinery	$12.72	$20.50	$30.01
Installation, Maintenance, & Repair Workers, All Other	$10.34	$17.39	$28.35
Maintenance and Repair Workers, General	$10.67	$17.00	$27.14

State-by-state comparison of wages is shown in Exhibit 11. On average, supply chain technicians are paid higher wages in Massachusetts, Washington, and Minnesota, whether they are entry-level or have some experience.

Exhibit 11 – Hourly Earnings of Supply Chain Technicians by State, 2015

State	Entry-Level (10^{th} percentile)	With Some Experience (Median)	With Years of Experience (90^{th} percentile)
Massachusetts	$14.84	$22.75	$32.46
Washington	$14.07	$21.97	$33.18
Minnesota	$13.66	$21.37	$31.04
Indiana	$12.16	$21.17	$33.32
California	$12.80	$21.11	$33.75
New Jersey	$12.81	$21.06	$33.20
New York	$12.36	$20.88	$32.37
Wisconsin	$12.84	$20.10	$29.18
Virginia	$12.55	$20.09	$30.61
Illinois	$12.54	$19.76	$30.01
Michigan	$12.00	$19.60	$30.12
Ohio	$12.11	$19.54	$29.57
Pennsylvania	$12.25	$19.54	$29.08
Tennessee	$11.85	$19.12	$29.23
North Carolina	$12.04	$19.08	$28.53
Texas	$11.63	$18.86	$30.66
Georgia	$11.22	$18.62	$28.95
Missouri	$11.32	$17.90	$28.09
Florida	$10.87	$16.77	$25.95

Experts report that the supply chain industry is yet to overcome its image challenges. Young graduates choose to go into other fields because logistics related activities seem to have less appeal to them. They think of supply-chain work as "a guy driving a forklift in a dusty old factory." As Fortune Magazine suggests that "**this outdated image is a huge hurdle for an industry that badly needs new talent in high tech, analytics, robotics, and engineering**".[21]

[21] "Wanted: 1.4 million New Supply Chain Workers by 2018", by Ann Fisher, Fortune, May 1, 2014.

References

"Bridge the GAP: Rebuilding America's Middle Skills", Harvard Business School, 2013.

"10 Supply Chain Trends for the Next 10 Years." By Sumantra Sengupta. SupplyChain274. July 9, 2013. http://www.supplychain247.com/article/10_supply_chain_trends_for_the_next_10_years/EVM_Partners

Economic Modeling Specialists International (EMSI) Q2 2015 Data Set, www.economicmodeling.com

Fleming, K., Lindstrom, E., Walters, G. Supply Chain Technicians in the U.S.: Nationwide Employer Survey Results (2013). Published by the National Center for Supply Chain Automation.

"How to Obtain Labor Market Information on Supply Chain Technology Industries and Occupations: Guide for Education Practitioners." National Center for Supply Chain Automation. March 2015. http://www.supplychainautomation.com/lmi.html

"Supply Chain Talent. Our Most Important Resource." A Report by Supply Chain Faculty at the University of Tennessee. April 2015. www.gsci.utk.edu

"Trending Up: 3PL Market Predictions for 2014 and 2013 Results," by Armstrong & Associates. July 10, 2014. http://www.3plogistics.com/PR_3PL_Financial-2014.htm

"Wanted: 1.4 million New Supply Chain Workers by 2018," by Ann Fisher, Fortune, May 1, 2014. http://fortune.com/2014/05/01/wanted-1-4-million-new-supply-chain-workers-by-2018/

Young, N. How Does Supply Chain Management Differ from Supply Chain Technology? Published by the National Center for Supply Chain Automation. 2013.

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