Innovate to compete

An assessment of Connecticut's supply chains in aerospace, shipbuilding, and medical devices

Prepared for CONNSTEP, Inc.

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EY

Building a better working world

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Executive summary

Manufacturing has been the backbone of Connecticut's economy since the early 19th century when Eli Whitney and Simeon North began to mass produce firearms with interchangeable parts.

Three sectors within the Connecticut manufacturing eco-system play a key role in the health of that system: aerospace, shipbuilding, and medical devices. In 2022, the three sectors directly employed more than 54,800 people and accounted for $16.3b in Connecticut GDP.[1] The three sectors represent approximately 3.1% of the state's workforce and 5.0% of total gross state product. The three sectors account for more than one-third of Connecticut's total manufacturing workforce (35%). As a result of their importance, the health of these strategic sectors is the foundation for growth and the creation of well-paying jobs in Connecticut's manufacturing sector. This report analyzes these three sectors using four factors of supply chain resilience: (1) innovation, (2) in-state sourcing of manufacturing inputs, (3) employment/workforce pipeline and (4) cost. It weighs Connecticut's experience against the performance of 15 other US states with the largest number of workers in each sector.

CONNSTEP engaged EY's Quantitative & Economics Statistics (QUEST) practice to provide this assessment. EY used a multi-method approach to assess the major characteristics of Connecticut's manufacturing supply chains in aerospace, ship building, and medical devices. The analysis is supported by an original CONNSTEP/EY survey of small- and medium-size manufacturing suppliers in Connecticut, semi-structured interviews with trade associations and industry representatives, and quantitative economic analysis of public and propriety data sources.

In addition to the CONNSTEP/EY survey and interviews EY used quantitative analysis of economic, employment and purchasing data which allowed us to provide a comparison of Connecticut's experience with other benchmark states and offer a historical analysis of each industry changed over the past decade.

The following are highlights of the data.

Overview of Connecticut's three key manufacturing sectors:

- **The three sectors are critical: They account for more than one-third of Connecticut's total manufacturing workforce (35%).** Employment in aerospace products and part manufacturing is the largest among the three sectors, with 29,431 workers or 18.5% of Connecticut's manufacturing employment. Shipbuilding employs 12,953 workers, which is 8.1% of state manufacturing employment, and medical devices manufacturing employs 12,486 workers, or 7.8% of manufacturing employment.
- **Connecticut manufacturing is highly concentrated in these sectors:**[2] Connecticut has one of the highest concentrations of workers across the three sectors. Connecticut has the 6th largest aerospace workforce and is the 3rd most concentrated, with 6% of US aerospace workers. Only Washington state and Kansas have a higher concentration of workers in this industry. Connecticut has the 5th largest workforce in shipbuilding and ranks 6th in employment concentration. In medical devices, Connecticut is the 6th most concentrated state in medical device manufacturing among benchmark states.
- **Despite its historical advantage, Connecticut employment is declining in two of the three sectors.** In aerospace, Connecticut employment declined 0.3% from 2011 to 2022, compared to national growth of 1.2%. In medical devices, Connecticut employment declined 1.6% compared to 0.4% nationwide. In contrast, in ship building, employment grew 4.0% compared to 2.0% nationwide, largely due to federal contracts of a single large OEM.

Innovation

- **California is ranked #1 overall among the states in the comparison based mostly on their focus in innovation. This high innovation ranking outweighs their poor ranking for cost factors.** Compared with benchmark states across the three sectors, California leads in terms innovative research, product innovation and a highly-skilled and innovative workforce. In addition, OEMs in the state also source the highest share of manufactured products from California suppliers which outweighs relatively high costs of doing business in the state.
- **Connecticut is a leader in innovative research, ranking third nationwide in patent activity per 1,000 workers in science, technology, engineering, and mathematics (STEM) fields.** Connecticut outperforms all but two states (California and Washington) in some innovation metrics such as patent activity per 1,000 STEM workers. While Connecticut is a leader in generating innovative research, its track record in commercializing this research and innovating products throughout the supply chain is weaker. Connecticut ranks 3rd nationwide in research activity but only 27th in terms of product innovation. This disparity suggests activities to embed innovation further down the supply chain may have high returns.
- **Led by the Office of the Chief Manufacturing Officer, Connecticut has started to implement Model Based Definition and Smart Manufacturing into the supply chain.** Model Based Definition (MBD) will help digitally connect OEMs and suppliers and accelerate the adoption of 3D models to define product components and assemblies.[3] These efforts, overtime, will help the supply chain incorporate innovative processes and develop new products.
- **Connecticut's supply chain for the key industries has a smaller share of knowledge-intensive suppliers than benchmark states.** As measured by measured by the share of employees with advanced STEM degrees, Connecticut ranks 11 for aerospace, 7 for ship building, and 15 for medical devices compared with benchmark states. This means that Connecticut suppliers are more likely to be supplying commoditized or low-complexity components to OEMs in the aerospace, ship building, and medical device sectors.
- **Connecticut OEMs source a smaller share of their high-complexity inputs from Connecticut suppliers than OEMs in other states source from within their states.** As an example, California OEMs in the aerospace industry source 21% of their high-complexity components from California suppliers, which in Connecticut this share is only 2%. While Connecticut's suppliers to aerospace, medical devices, and shipbuilding operate in a high-cost environment, many are supplying commoditized products such as machined metal products. These suppliers are an important segment of Connecticut's supply base, but commoditized products face significant pricing pressure from procurement functions at major OEMs, meaning over time sales will decrease unless product innovation occurs.

Supply-chain reliance, in-state sourcing

- **Overall, Connecticut aerospace OEMs source 20.1% of their inputs from Connecticut suppliers, which has decreased by 6.7 percentage points since 2011.** Based on the economic data and industry interviews, the aerospace industry's in-state sourcing is expected to remain flat in Connecticut while growing in competitor states.
- **The shipbuilding and medical device industries also have lower-than-average in-state sourcing.** Connecticut shipbuilders source 9.9% of their manufacturing inputs from Connecticut suppliers, compared with 10.7% sourced in-state in benchmark states. 9.0% of Connecticut medical device manufacturers source from Connecticut suppliers, compared with 11.7% in benchmark states.
- **Particular gaps have been observed in semiconductors, navigational and control instruments, and electronic components.** For these sectors, Connecticut OEM reliance is significantly less than benchmark states. This is largely due to a lack of supply of these commodities and components from Connecticut, rather than Connecticut OEMs choosing out-of-state suppliers above Connecticut vendors.
- **All three sectors require high-tech components from suppliers with industry- and OEM-specific certifications, a strong manufacturing pipeline of high- and semi-skilled labor, and access to innovation networks.** Despite unique differences across the three sectors, they access complementary supplier industries and industry ecosystems that compete for manufacturing skilled labor and talent.

Talent pipeline

- **Aging and retirement is an issue for Connecticut's key industries.** 24% to 37% of Connecticut's workers in the supply chains of three strategic industries is over 55 years old, compared to 10% to 36% in the benchmark states. This issue is most pronounced in aerospace and medical devices, where 36% is over 55 years old, compared to 31% for benchmark states.

- **Despite the aging of the Connecticut supplier workforce, new talent is entering the industries.** 31% of workers in the supplier industries are under 35, compared to 28% in benchmark states.

Cost factors

- **Connecticut is a high-cost environment for employees, with costs 5.0% to 7.3% higher than benchmark states depending on the industry.** Among the top concerns for businesses is housing costs, which range from 5.0% to 14.0% more expensive in Connecticut than benchmark states. The state's high cost of living has the potential to drive wages demanded by employees higher, acutely influenced by Connecticut's high housing costs and lack of affordable workforce housing. For this reason, state intervention to incentivize workforce and affordable housing may have benefits for manufacturers.
- **Wage costs are 6.3% to 34.6% higher in Connecticut than benchmark states for the three key sectors.** The range in wage cost premia varies by industry based on the types of occupations demanded in each sector as well as the benchmark states, which are specific to each industry.

Economic impacts

- **Strengthening Connecticut's supply chain may generate hundreds of jobs if in-state sourcing rises to levels seen in benchmark states.** Connecticut has a strong manufacturing foundation but there is a gap with benchmark states. Narrowing this gap would benefit the state and the key driver will be innovation. If Connecticut increases its average reliance on in-state suppliers to 23.1% of inputs for aerospace, shipbuilding, and medical device manufacturing, that would equate to nearly $340 million of incremental purchases from Connecticut suppliers, which would support more than an estimated 800 jobs at those suppliers and nearly 1,800 jobs in the state.
- **This level of economic activity from increased supplier purchases would support nearly $300 million in state GDP.** Additionally, payments of wages, salaries, and benefits to Connecticut employees of suppliers would total an estimated $185 million.

Classification of aerospace, medical devices, and shipbuilding

In this report, we leverage the North American Industry Classification System (NAICS) at the four-digit level to classify employment and establishments based on their primary activity:

- **Aerospace products and parts manufacturing** (NAICS 3364), "aerospace", which includes aircraft manufacturing, aircraft engine and engine parts manufacturing, other aircraft parts and auxiliary equipment manufacturing, guided missile and space vehicle manufacturing, Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing, and Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing.
- **"Medical devices"** manufacturing includes two four-digit NAICS codes, Navigational, Measuring, Electromedical, and Control Instruments Manufacturing (3345) and Medical Equipment Manufacturing (3391), which is consistent with classifications of "medical device boundary" used by AdvaMed (Advanced Medical Technology Association).
- **Ship and boat building** (NAICS 3366), "shipbuilding", encompasses both shipbuilding and repair and boat building, which includes watercraft for personal use.

Benchmark states

- The benchmark set for the analysis was selected by choosing the state for each industry that had the greatest employment.

Aerospace	Shipbuilding	Medical Devices
Alabama	Alabama	California
Arizona	Alaska	Colorado
Arkansas	Arkansas	**Connecticut**
California	**Connecticut**	Delaware
Connecticut	Florida	Indiana
Georgia	Hawaii	Iowa
Kansas	Indiana	Maryland
Maine	Louisiana	Massachusetts
Missouri	Maine	Minnesota
Oklahoma	Mississippi	New Hampshire
Texas	Rhode Island	New Jersey
Utah	South Carolina	Rhode Island
Vermont	Tennessee	South Dakota
Washington	Virginia	Utah
West Virginia	Washington	Vermont

Employment growth and industry concentration

Connecticut's supplier resiliency depends, in large part, on the growth of sector employment and a strong manufacturing talent pipeline in the state. Overall, total state employment in Connecticut has seen little net increase since 2011.

The key three manufacturing sectors account for more than one-third of Connecticut's total manufacturing workforce (35%). As shown in Table 1, employment in aerospace products and part manufacturing is the largest among the three sectors, with 29,431 workers or 18.5% of Connecticut's manufacturing employment. Shipbuilding employs 12,953 workers, which is 8.1% of state manufacturing employment, and medical devices manufacturing employs 12,486 workers, or 7.8% of manufacturing employment. In total, these sectors account for nearly 55,000 jobs, or 35% of Connecticut's manufacturing employment.

Table 1. Employment in Connecticut's key manufacturing sectors (2022)

Industry	Employment	Share
Shipbuilding	29,431	1.7%
Aerospace	12,953	0.7%
Medical devices	12,486	0.7%
Combined industries	54,870	3.1%
Total CT manufacturing	159,227	9.4%
Total CT employment	1,750,000	100%

Source: EY analysis of Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW), 2011-2022.

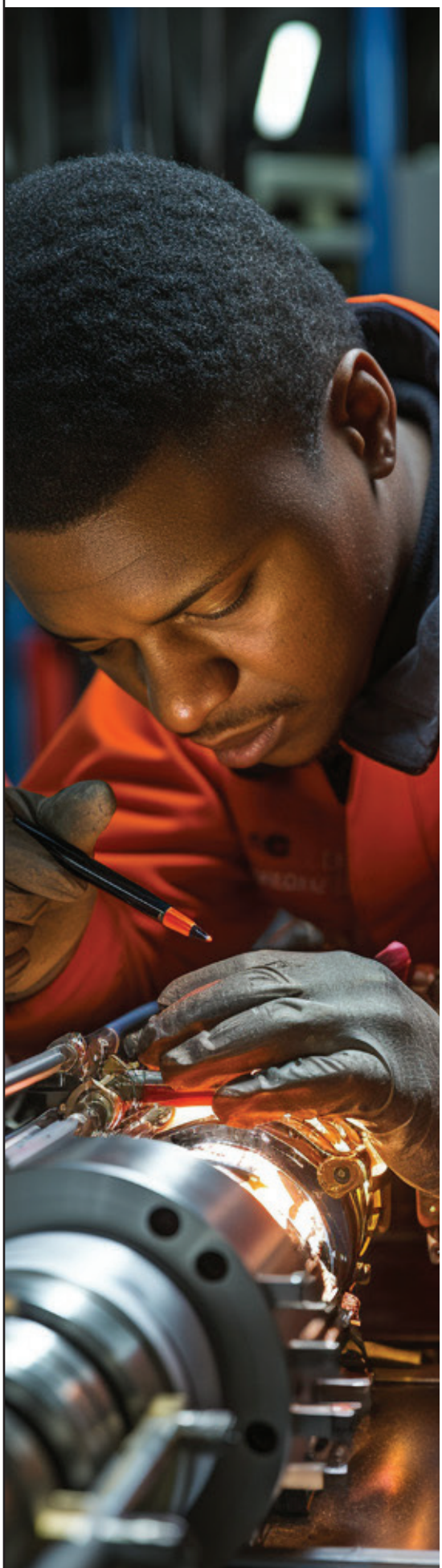
Connecticut employment growth in two of the key sectors has lagged benchmark states. As shown in Table 2, while the three key industries are strong in Connecticut, Connecticut lags benchmark states in aerospace and medical device industry employment growth with aerospace employment that has contracted 0.3% since 2011 and medical device employment that has contracted by 1.6%.

Table 2. Employment growth gap between Connecticut and benchmark states, 2011-2022

% Percentage point difference between CT and top 15 states with largest employment in sector

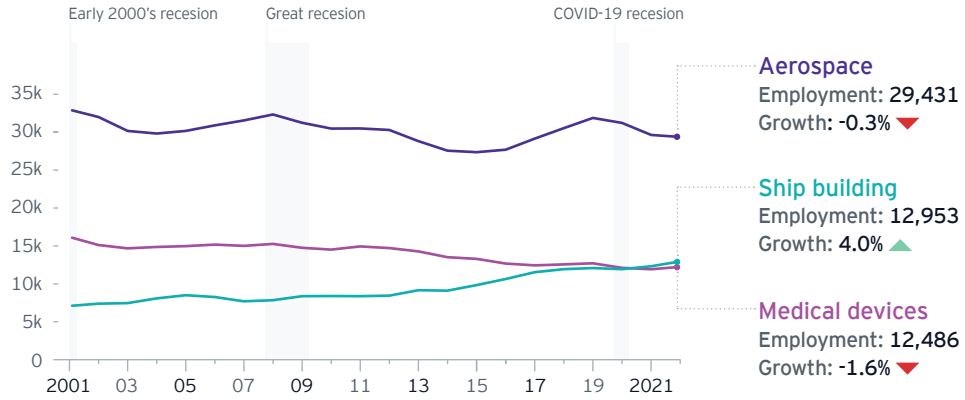
Industry	Connecticut growth rate	Benchmark state average growth rate	Difference (CT-Benchmark states avg.)
Aerospace	-0.3% ▼	1.2%	-1.5 pp ▼
Medical devices	-1.6% ▼	0.4%	-2.0 pp ▼
Shipbuilding	4.0% ▲	2.0%	+2.0 pp ▲
Total state employment	0.1% ▲	1.3%	-1.2 pp ▲

Note: Top 15 states average refers to the 15 states with the largest employment in the sector.



Employment growth across the three sectors has been uneven. The pandemic contracted employment in the state by 128,500 jobs or 7% of total employment, which was fully recovered by 2022. Against this backdrop of slow growth, employment patterns for aerospace, shipbuilding, and medical device have not been uniform. As shown in Figure 1, Aerospace is the largest and most cyclical of the three sectors while shipbuilding has traditionally been the smallest but fastest growing. The medical devices industry has been more stable, but in steady decline.

Figure 1. Employment levels by sector in Connecticut, 2011-2022



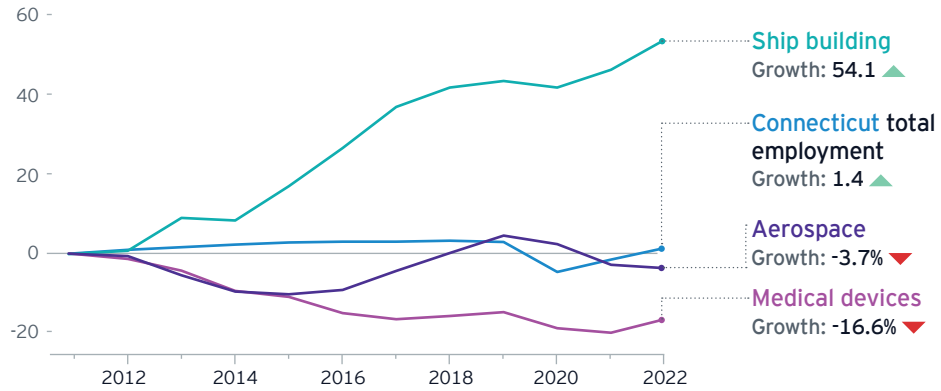
Note: Shading depict recession periods as defined by the NBER business cycle dating, https://www.nber.org/research/business-cycle-dating.

Source: EY analysis of Bureau of Labor Statistics Quarterly Census of Employment and Wages (BLS QCEW).

As depicted in Figure 2, shipbuilding has posted accelerated growth in the past decade with employment levels 54% higher than in 2011; in contrast, employment in medical device has contracted to become 17% smaller than its 2011 level, with aerospace experiencing uneven growth to end 4% smaller.

Figure 2. Employment growth by sector in Connecticut from 2011 levels

% Index: 0 = 2011

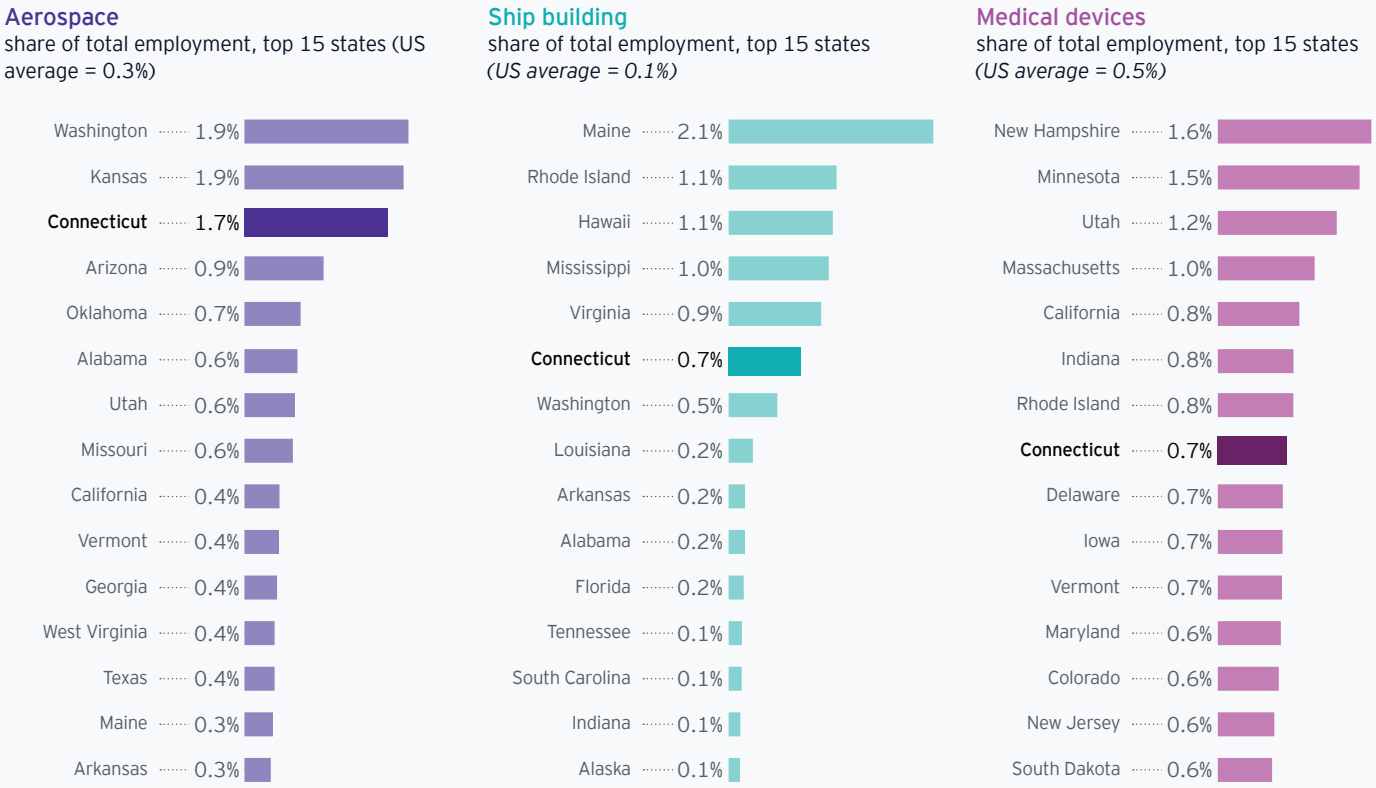


Source: EY analysis of Bureau of Labor Statistics Quarterly Census of Employment and Wages (BLS QCEW).

Connecticut is about 3.5x more concentrated in aerospace, shipbuilding, and medical devices than the rest of the country.[4] As shown in Figure 3, Connecticut has one of the highest concentrations of workers across the three sectors. All three sectors require high-tech components from suppliers with industry- and OEM-specific certifications, a strong manufacturing pipeline of high- and semi-skilled labor, and access to innovation networks. Despite unique differences across the three sectors, they access complementary supplier industries and industry ecosystems that compete for manufacturing skilled labor and talent. Within aerospace, Connecticut is third most concentrated, for shipbuilding it is sixth, and for medical devices it is eighth.

Figure 3. Concentration of employment in key industries; top 15 states

Connecticut and benchmark states (2022)



Source: JobsEQ and EY analysis

Among the top 15 states with the largest employment in aerospace, Connecticut has the 6th largest workforce and is the 3rd most concentrated. Propelled by several market-leading aerospace manufacturers, Connecticut accounts for nearly 6% of about 500,000 aerospace workers in the US. The state is highly concentrated, as indicated by its location quotient of 5.4, which is only behind Washington (6.2) and Kansas (6.0).

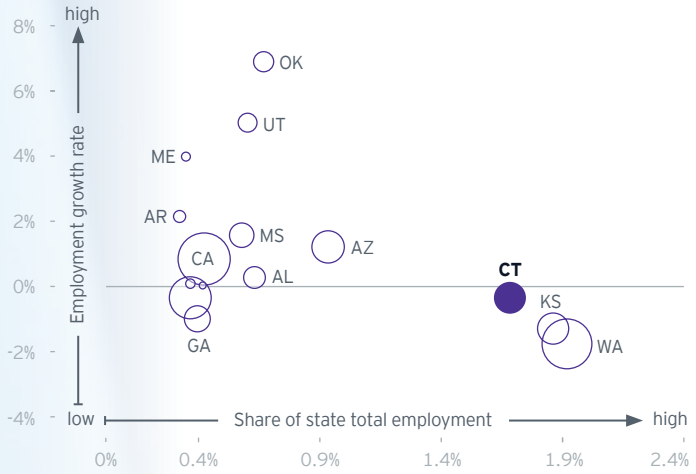
Connecticut's employment growth in aerospace has risen and fallen with "boom-and-bust" business cycles. While the largest of the three sectors in the state, Connecticut's aerospace employment has experienced surges and declines since 2001. The most recent expansionary period from 2016-2019 aligned with a "super cycle" of global economic

> "Pre-COVID, the workforce was stable, but during the pandemic, a significant portion of hourly employees, particularly those in their upper 50's or 60's was lost.... Post-COVID there was shift toward a younger, trainable but less stable workforce.
>
> Supplier to medical devices and aerospace industries

growth in the aerospace sector from accelerated demand for air travel from emerging markets and large increases in US defense spending. However, the Connecticut aerospace sector has recently seen declines during the COVID-19 pandemic, with suppliers reporting a slower recovery than the OEMS in terms of employment.[5] As explained by one aerospace supplier, normally demand for MRO and new production can capture the entire business cycle – when one is up; the other is down, but during the pandemic there was decline in both and suppliers are still struggling to get back to 2019 profitable levels.[6] Additionally, an unsuccessful pursuit to build next-generation vertical lift helicopters[7] in 2022 have exacerbated the decline in sector employment. Since 2011, the state's aerospace workforce has decreased at an annual rate of 0.3

Connecticut's aerospace industry has been contracting while its benchmark states are growing. As shown in Figure 4, Connecticut has seen negative growth over the past decade at an average rate of -0.3% compared with modest growth of 1.2% among benchmark states. Connecticut employment in aerospace has contracted faster than the state's overall employment growth rate. Despite this trend, more heavily concentrated states such as Washington and Kansas saw deeper declines in employment than Connecticut.

Figure 4. Aerospace: Employment growth and share of total employment, 2011-2022



Note: Applies to Figures 4–6. Top 15 states average refers to the in-state sourcing percentage of the 15 states with the largest employment in the sector.

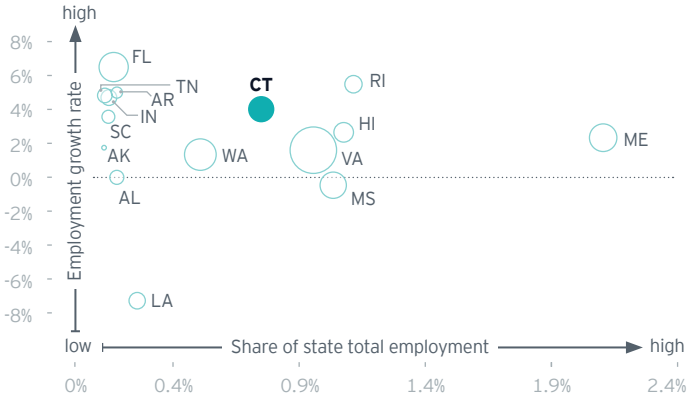
Source: EY analysis of Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW), 2011-2022.

While overall employment in the sectors has lagged benchmark states, Connecticut's shipbuilding industry has grown jobs twice as fast as in benchmark states since 2011. As shown in Figure 5, Connecticut's employment in shipbuilding has outperformed the top 15 states ranked by employment. Connecticut has grown at an annual rate of 4.0% compared with 2.0% across benchmark states. Connecticut's shipbuilding growth has been nearly four times the rate of overall employment growth in the state. Of the states with a similar employment concentration in shipbuilding, only Rhode Island has grown faster than Connecticut due largely in part to the presence of one large shipbuilding OEM. Benchmark states such as Virginia, Maine, and Hawaii have experienced slower sector employment growth. Other states with as many jobs in shipbuilding such as Mississippi, Alabama and Texas have experienced negative growth in the past decade. Employment growth in shipbuilding has accelerated from 7,154 workers in 2011 to 12,953 workers in 2022 or at a compound annual growth rate (CAGR) of 4.0%. This has been supported by "once-in-a-generation" expansion of a large shipbuilder's workforce to support new defense contracts for Virginia- and Columbia-class submarine manufacturing with thousands of new jobs for skilled trade workers, engineers and subject matter experts.[8]

Despite employing fewer workers than aerospace, Connecticut's shipbuilding captures a greater share of all US shipbuilding employment. Anchored by one large shipbuilder, Connecticut has the 5th largest workforce in shipbuilding in the U.S. It ranks 6th in employment concentration with a location quotient of 6.3, with more highly concentrated states being states with smaller populations: Maine (17.8; Rhode Island (9.4) with the Quonset Point location of s large shipbuilder, and Hawaii (9.1).

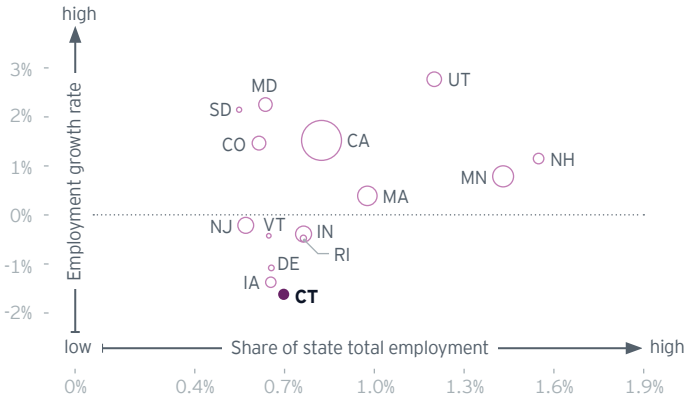
Connecticut is the 6th most concentrated state in medical device manufacturing among benchmark states. Medical device manufacturing in Connecticut has a higher-than-average concentration in medical device manufacturing with a location quotient of 1.5. This demonstrates the sizable presence of companies such as major medical devices manufacturers. Among the nearly 12,500 workers in the sector, 54% are employed in surgical and medical manufacturing instrument manufacturing and the remaining in electromedical and electrotherapeutic manufacturing.

Figure 5. Shipbuilding: Employment growth and share of total employment, 2011-2022



Medical devices manufacturing has seen a secular decline in employment since the 2008-2009 Great Recession. While still employing nearly 12,500 workers, medical devices jobs in Connecticut have fallen at an annual rate of -1.6% since 2011. Business restructuring by major employers and recent plans to reduce the number of suppliers by OEMs have been associated with a gradual decline in employment in the state.[9]

Figure 6. Medical devices: Employment growth and share of total employment, 2011-2022



Connecticut employment in medical devices has lagged all benchmark states over the past decade and growth trends are not associated with overall state employment growth. In contrast to shipbuilding, the state's employment growth in medical devices has been slowest among benchmark states with an annual decline of -1.6% since 2011. Other states with a high concentration in medical devices such as Minnesota, Massachusetts, California and Utah all experienced positive growth, with the exception of Indiana where employment modestly declined.

> Suppliers may continue to be in the middle of the value chain if they cannot innovate.
>
> Supplier to aerospace industry

Innovation

Innovation is critical for building resilience and adaptability for Connecticut's manufacturing supply chains but the innovation data for Connecticut is mixed.

A diverse talent pool of scientists and engineers and high patent activity in the state put Connecticut at the vanguard of innovation in certain respects. But this innovation activity is not being realized as product innovation across the supply chain. For example, Connecticut companies purchase relatively small shares of high-tech inputs from Connecticut suppliers and, in general, Connecticut businesses engage in less product innovation than companies in benchmark states or the US overall. This section reviews different measures of innovation, including state-level patent activity and the types of products being purchased by Connecticut manufacturers.

Connecticut ranks third highest out of 50 states nationally in patent activity per 1,000 workers in science, technology, engineering, and mathematics (STEM) fields. Connecticut outperforms all but two states (California and Washington) in some innovation metrics such as patent activity per 1,000 STEM workers. According to 2021 US PTO data, Connecticut had 116 patents issued per 1,000 STEM workers compared to 149 patents in California and 132 in Washington. While recent patent data does not allow for an industry-level breakdown of patents in Connecticut, prior research shows that Connecticut's Advanced Manufacturing Region's share of US patent output in aerospace and shipbuilding components was growing prior to 2011, while "shrinking or stagnate in ships and aeronautics".[10]

However, Connecticut ranks lower than benchmark states on introducing new or (significantly) improved products. According to the US Census Annual Business Survey data, Connecticut ranked 27th out of 50 states in product innovation from 2017-2020. 9.4% of Connecticut companies introduce new products to the market, which is slightly below the US average of 10%.[11] Across all states, businesses cited the lack of partners and lack of access to external knowledge as the top barriers to innovating new products, which suggests that there is an opportunity to further develop industry ecosystems in Connecticut.

Table 3: Connecticut aerospace sourcing of manufactured products by complexity

Aerospace	CT aerospace industry input purchases ($)		% of inputs sourced from CT		
	From all locations	From CT	2011	2021	Difference from 2011
High complexity					
Semiconductors and Electronic Component	$190.7 M	$0.9 M	0.7%	0.5%	-0.2 pp ▼
Navigational, Measuring, Control Instruments	$72.2 M	$0.8 M	2.1%	1.1%	-1.1 pp ▼
Other Electrical Equipment and Component	$40.4 M	$1.3 M	11.5%	3.2%	-8.3 pp ▼
Other General-Purpose Machinery	$24.7 M	$0.2 M	1.8%	1.0%	-0.8 pp ▼
Petroleum and Coal Products	$11.9 M	$1.5 M	2.6%	12.5%	9.9 pp ▲
Other industries	$29.9 M	$2.7 M	6.8%	9.2%	2.4 pp ▲
High complexity inputs	$369.7 M	$7.5 M	2.8%	2.0%	-0.8 pp ▼
Medium complexity					
Iron and Steel Mills and Ferroalloy	$85.9 M	$6.0 M	5.9%	7.0%	1.1 pp ▲
Plastics Product	$47.6 M	$3.7 M	6.3%	7.8%	1.5 pp ▲
Spring and Wire Product	$45.0 M	$16.3 M	47.9%	36.1%	-11.8 pp ▼
Forging and Stamping	$44.8 M	$19.0 M	43.6%	42.5%	-1.1 pp ▼
Hardware	$39.5 M	$7.5 M	16.1%	18.9%	2.8 pp ▲
Other industries	$188.1 M	$18.1 M	12.3%	9.6%	-2.7 pp ▼
Medium complexity inputs	$450.9 M	$70.6 M	2.8%	15.7%	12.9 pp ▲
Low complexity					
Machine Shops; Turned Product; Screws	$24.5 M	$8.4 M	31.4%	34.3%	2.8 pp ▲
Converted Paper Product	$12.7 M	$2.2 M	19.3%	17.1%	-2.3 pp ▼
Coating, Engraving, Heat Treating	$6.1 M	$2.3 M	39.2%	38.4%	-0.8 pp ▼
Textile Furnishings Mills	$4.9 M	$0.3 M	0.7%	6.3%	5.7 pp ▲
Other Nonmetallic Mineral Product	$1.7 M	$0.5 M	31.1%	29.5%	-1.5 pp ▼
Other industries	$0.7 M	$0.0 M	14.2%	1.9%	-12.3 pp ▼
Low complexity inputs	$50.6 M	$13.7 M	17.6%	27.2%	9.6 pp ▲
Inputs from within aerospace industry	$5.5 B	$1.2 B	35.4%	21.6%	-13.8 pp ▼
Total manufacturing inputs	$6.4 B	$1.3B	26.8%	20.1%	-6.7 pp ▼

Source: EY analysis of IMPLAN industry commodity demand data, 2021, BLS Occupation Employment and Wage Statistics, and O*NET job classifications.

The Connecticut supply chain for aerospace companies is concentrated in less advanced sectors than benchmark states. To proxy for the level of advancement and innovation within Connecticut's supply chain, EY examined the supply base by industry, evaluating the share of workers in each supplier industry employed in STEM occupations which allowed us to classify supplier industries in Connecticut into three groups: high-knowledge intensive industries which represents 10% or more of the workforce in STEM jobs; somewhat-knowledge intensive industries which represents 5% to 10% of workers in STEM jobs; and low-knowledge intensive industries which is less than 5% in STEM. As indicated in Table 1a, the Connecticut aerospace supply chain is concentrated in less knowledge-intensive sectors than other states. Due to Connecticut's concentration in less knowledge intensive sectors, aerospace companies in Connecticut source only 2% of high-knowledge intensive products such as semiconductors and electrical equipment from Connecticut. In contrast, they purchase 16% of somewhat-knowledge intensive products such as spring and wire products and 30% of less-knowledge-intensive products such as turned product and converted paper products from other Connecticut companies.

The Connecticut shipbuilding supply chain is also concentrated in less knowledge-intensive sectors. Connecticut's supply chain for shipbuilding is also geared toward low complexity goods, similar to aerospace. Connecticut shipbuilders purchase large shares of forging and stamping as well as turned metal products from Connecticut suppliers, which are classified as somewhat- and less-knowledge intensive industries, respectively.

Table 4: Connecticut shipbuilding sourcing for manufactured products by complexity

Shipbuilding	CT aerospace industry input purchases ($)		% of inputs sourced from CT		
	From all locations	From CT	2011	2021	Difference from 2011
High complexity					
Engine, Turbine, and Power Transmission	$191.1 M	$2.1 M	6.1%	1.1%	-5 pp ▼
Semiconductors and Electronic Component	$46.2 M	$0.2 M	0.7%	0.5%	-0.2 pp ▼
Navigational, Measuring, Control Instruments	$43.0 M	$0.5 M	2.1%	1.1%	-1.1 pp ▼
Other General-Purpose Machinery	$11.9 M	$0.1 M	1.8%	1.0%	-0.8 pp ▼
Electrical Equipment	$6.4 M	$0.1 M	2.3%	1.0%	-1.2 pp ▼
Other industries	$11.8 M	$1.3 M	5.5%	11.3%	5.8 pp ▲
High complexity inputs	$313.9 M	$4.7 M	17.6%	1.5%	-16.1 pp ▼
Medium complexity					
Nonferrous Metal Processing	$93.2 M	$3.7 M	2.2%	3.9%	1.7 pp ▲
Iron and Steel Mills and Ferroalloy	$69.4 M	$4.8 M	5.9%	7.0%	1.1 pp ▲
Alumina and Aluminum Processing	$55.3 M	$1.4 M	3.2%	2.5%	-0.7 pp ▼
Plastics Product	$53.8 M	$4.2 M	6.3%	7.8%	1.4 pp ▲
Forging and Stamping	$34.8 M	$14.8 M	43.6%	42.5%	-1.2 pp ▼
Other industries	$111.8 M	$15.6 M	18.3%	13.9%	-4.4 pp ▼
Medium complexity inputs	$451.7 M	$48.5 M	13.9%	10.7%	-3.2 pp ▼
Low complexity					
Glass and Glass Product	$18.6 M	$0.4 M	2.2%	2.3%	0.1 pp ▲
Other Furniture Related Product	$12.4 M	$1.2 M	5.9%	9.4%	3.5 pp ▲
Other Wood Product	$10.8 M	$2.6 M	3.2%	24.2%	21.1 pp ▲
Converted Paper Product	$8.7 M	$1.5 M	6.3%	17.1%	10.8 pp ▲
Machine Shops; Turned Product; Screws	$7.5 M	$2.6 M	43.6%	34.3%	-9.4 pp ▼
Other industries	$15.1 M	$1.5 M	10.9%	10.3%	-0.7 pp ▼
Low complexity inputs	$80.1 M	$10.0 M	13.9%	12.4%	-1.5 pp ▼
Inputs from within shipbuilding industry	$34.6 M	$24.2 M	79.7%	69.8%	-9.9 pp ▼
Total manufacturing inputs	$836.3M	$82.8M	12.3%	9.9%	-2.4 pp ▼

Source: EY analysis of IMPLAN industry commodity demand data, 2021, BLS Occupation Employment and Wage Statistics, and O*NET job classifications.

A higher share of workers in STEM-related occupations are correlated with research innovation, but Connecticut underperforms the US and benchmark state average for two of the three focus industries. Figure 1 depicts in-state suppliers by their estimated share of workers in STEM occupations, based on their industry. Suppliers in Connecticut and six benchmark states (Massachusetts, Georgia, Oklahoma, South Carolina, Utah, and Alabama) have less than 15% of products sourced from in-state companies with a high share of knowledge intensive workers. Connecticut supplier workforce in aerospace is more concentrated in middle-skill/ somewhat knowledge intensive sectors.

Shipbuilding has a similar profile as aerospace with 11% of products purchased from high-knowledge intensity industries, but Connecticut's ranking improves because fewer ship builders in benchmark states purchase large shares of high knowledge intensity products from within state.

Medical devices companies' reliance on in-state sourcing varies across benchmark states, with Connecticut having the lowest reliance on high-knowledge intensive products of only 6%. In contrast, Arizona and California buy more than 42% of their in-state purchases from high-knowledge intensive industries.

> "Suppliers needs to automate, develop lean processes in order to compete.
>
> Supplier to medical devices industry

Table 5: Connecticut medical devices sourcing for manufactured products by complexity

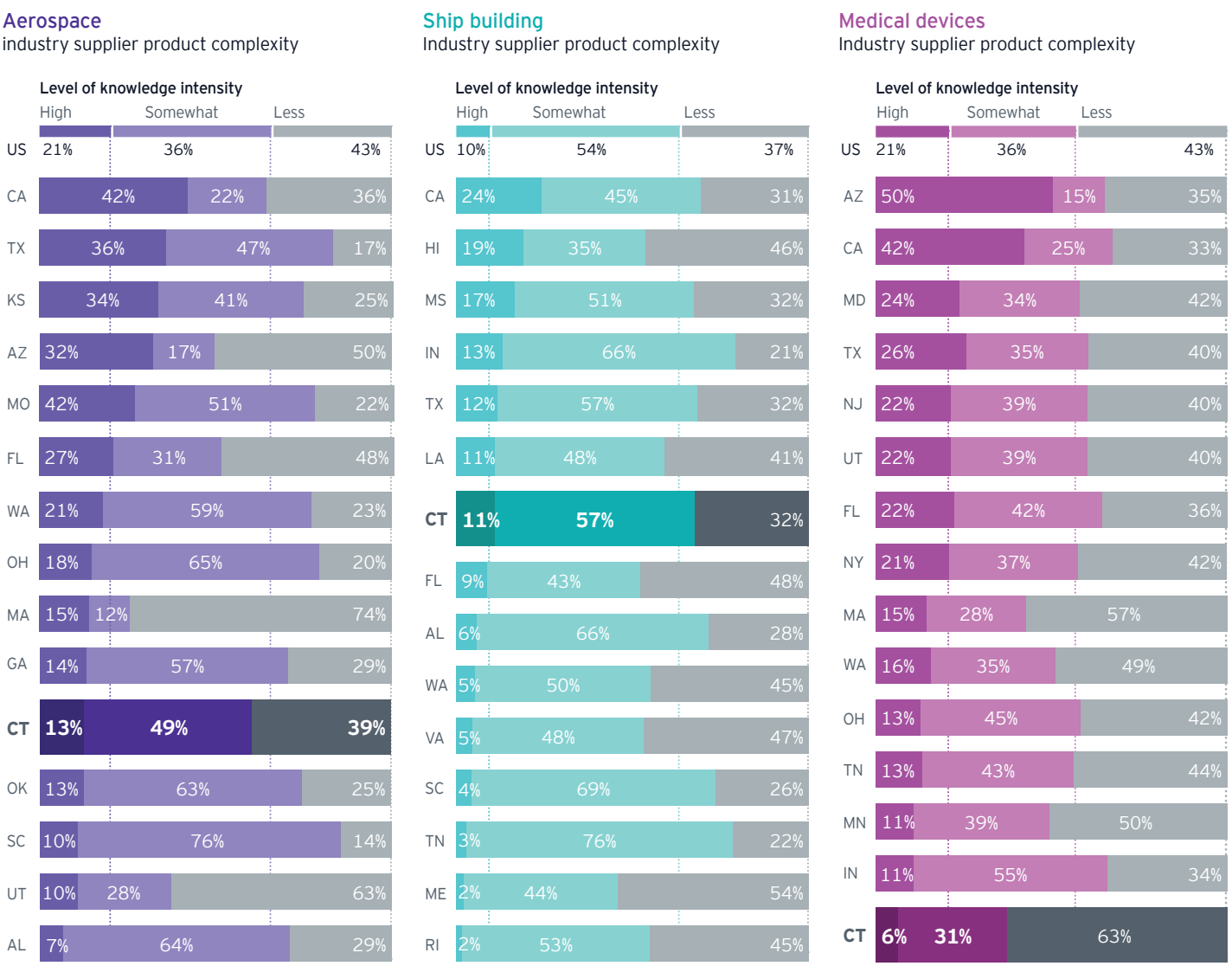
Medical devices	CT aerospace industry input purchases ($)		% of inputs sourced from CT		
	From all locations	From CT	2011	2021	Difference from 2011
High complexity					
Semiconductors and Electronic Component	$260.3 M	$1.3 M	0.7%	0.5%	-0.2 pp ▼
Resin, Synthetic Rubber, Artificial Fibers	$58.9 M	$0.6 M	1.6%	1.0%	-0.6 pp ▼
Other Electrical Equipment and Component	$25.3 M	$0.8 M	11.5%	3.2%	-8.3 pp ▼
Electrical Equipment	$19.9 M	$0.2 M	2.3%	1.0%	-1.2 pp ▼
Petroleum and Coal Products	$11.0 M	$1.4 M	2.6%	12.5%	9.9 pp ▲
Other industries	$31.9 M	$2.5 M	7.4%	7.9%	0.6 pp ▲
High complexity inputs	$416.2 M	$8.4 M	3.1%	1.8%	-1.4 pp ▼
Medium complexity					
Plastics Product	$144.8 M	$11.2 M	6.3%	7.8%	1.4 pp ▲
Forging and Stamping	$43.1 M	$18.3 M	43.6%	42.5%	-1.2 pp ▼
Iron and Steel Mills and Ferroalloy	$40.2 M	$2.8 M	5.9%	7.0%	1.1 pp ▲
Nonferrous Metal Processing	$38.4 M	$1.5 M	2.2%	3.9%	1.7 pp ▲
Architectural and Structural Metals	$22.3 M	$3.3 M	16.0%	14.8%	-1.2 pp ▼
Other industries	$79.4 M	$9.5 M	14.2%	12.0%	-2.2 pp ▼
Medium complexity inputs	$385.6 M	$48.9 M	12.0%	12.7%	+0.7 pp ▲
Low complexity					
Machine Shops; Turned Product; Screws	$77.5 M	$26.6 M	31.4%	34.3%	2.8 pp ▲
Converted Paper Product	$27.5 M	$4.7 M	19.3%	17.1%	-2.3 pp ▼
Coating, Engraving, Heat Treating, Allied	$20.4 M	$7.8 M	39.2%	38.4%	-0.8 pp ▼
Textile and Fabric Finishing / Fabric Coating	$16.0 M	$0.4 M	1.8%	2.2%	0.4 pp ▲
Fabric Mills	$14.0 M	$0.0 M	0.3%	0.2%	-0.1 pp ▼
Other industries	$19.2 M	$1.7 M	12.9%	8.9%	-4 pp ▼
Low complexity inputs	$180.7 M	$41.3 M	24.4%	23.6%	-0.8 pp ▼
Inputs from within medical devices industry	$131.0 M	$2.9 M	3.1%	2.2%	-0.9 pp ▼
Total medical devices manufacturing inputs	$1.1B	$97.2M	8.5%	9.0%	+0.5% ▲

Source: EY analysis of IMPLAN industry commodity demand data, 2021, BLS Occupation Employment and Wage Statistics, and O*NET job classifications.

> In order to win in supplier componentry in Connecticut, you must innovate and drive through automation and design. The companies in this state who have driven innovation are able to continue…they marched down the road with us, some of the companies, who haven't really driven innovation and maybe are facing financial pressures…their spending is decreasing.
>
> Medical devices industry OEM

Figure 7. In-state supplier workforce levels, 2022

Average % of suppliers by STEM capabilities (weighted by the value of in-state products)



Supply chain in-state sourcing

Connecticut's aerospace, medical devices, and shipbuilding supply chains have downstream linkages to multiple industries that provide distinct economic benefits to other businesses and communities. Proximity between suppliers and OEMs can create advantages in the exchange of knowledge, skills, technology and innovation. The degree of OEM reliance on Connecticut suppliers varies by industry depending on product composition, resources and costs.

Connecticut aerospace sources a greater share of manufacturing products from within state than the average benchmark state, however, this percentage has declined 7 percentage points since 2011. An OEM representative stated that at best they see this percentage staying flat. As shown in Table 6, Connecticut's aerospace sector purchases more than 20% of their manufacturing inputs (excluding intra-industry trade) from within state, which is the 3rd highest across 15 benchmark states. Only larger states such as California (30%) and Texas (21%) source more inputs within state. On the other hand, five states (Kansas, Oklahoma, Missouri, Georgia, Alabama and South Carolina) out of 15 source less than 10% of their aerospace inputs from within state.

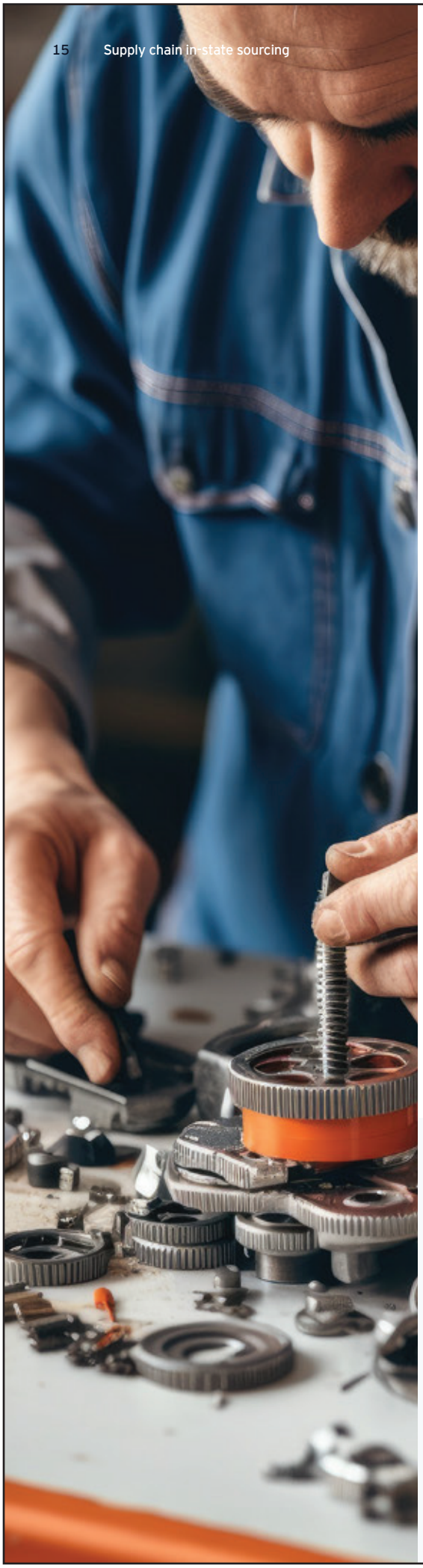
Connecticut suppliers to aerospace specialize in composites and sheet metal manufacturing rather than electronic components and advanced manufacturing parts. Connecticut-based suppliers supply more than 30% of gross inputs from three industries: $19M from forging and stamping (42% of total industry demand for gross products), $16M from spring and wire product manufacturing (36%), and $8M from machine shops and turned product (34%).

Connecticut's aerospace industry purchases some higher-tech products from within state such as hardware manufacturing (19% sourced within state), but other specialized components such as semiconductors and navigational instruments manufacturing are primarily purchased out of state. The state's suppliers specialize in fabrication, assembly and repair of machined metals within the aerospace industry.

Table 6. Reliance on in-state suppliers gap between Connecticut and benchmark states, 2021, % (Percentage point difference between CT and top 15 states with largest employment in sector)

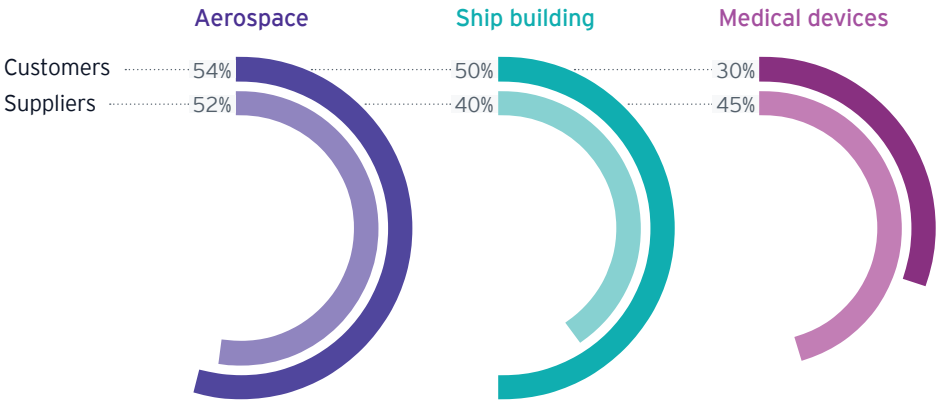
Industry	Connecticut growth rate	Benchmark state average growth rate	Difference (CT-Benchmark states avg.)
Aerospace	20.1%	12.4%	+7.7 pp ▲
Medical devices	9.0%	11.5%	-2.5 pp ▼
Shipbuilding	9.9%	10.6	-0.7 pp ▼

Note: Top 15 states average refers to the 15 states with the largest employment in the sector.



Across all three key industries, only about half of businesses report that the majority of their customers or suppliers are in Connecticut. As shown in Figure 8, aerospace is the most connected to other businesses in the state, with 54% of companies in the aerospace sector saying more than half of their customers are in Connecticut. At the other end of the spectrum, only 30% of medical device companies report a majority of their customers being located in state.

Figure 8. Share of Connecticut suppliers that reported the majority of their customers or suppliers were in Connecticut, %



Note: "Approximately what percentage of your customers/suppliers are located in Connecticut?"
Source: EY/CONNSTEP Supply Chain Resiliency Survey, 2023.

Medical devices manufacturers in Connecticut purchase slightly fewer inputs from other Connecticut companies than manufacturers in the average benchmark state. The state's medical devices industry sources about 9% of its inputs from Connecticut compared with 11% in benchmark states. In-state components for the industry are concentrated in processing turned product, screws, nuts and bolts manufacturing, forging and stamping, and converted paper product manufacturing. Nine states rely on a greater share of inputs from within the same state than Connecticut. For example, Indiana, which employs a similar share of workers in medical devices manufacturing as Connecticut, sources 12% of their inputs from within state compared with Connecticut's 9% share

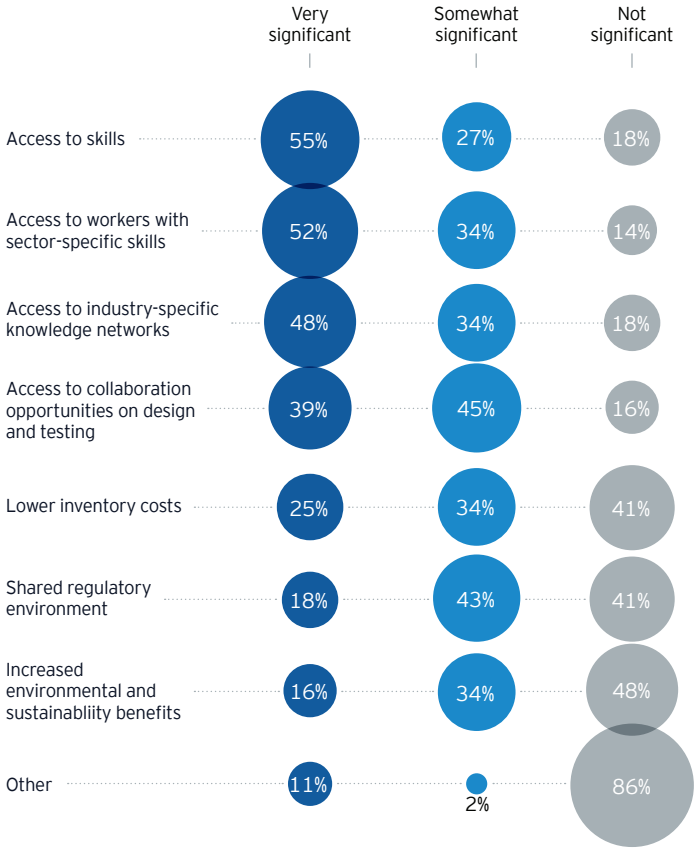
> "I think there will be fewer and fewer suppliers in Connecticut that receive our spend... Machine shops and casting and forging shops [in Connecticut] are generational businesses, where, in some cases, management may not be quite as efficient as you might see in a larger scale business in another state.
>
> Connecticut OEM

Connecticut's suppliers to the aerospace and shipbuilding industries have strong reliance on local supply chains within state. According to the CONNSTEP/EY Connecticut Supply Chain Resiliency Survey, 54% of aerospace suppliers reported more than half of their customers were within state. Nearly one in five aerospace suppliers reported that 75% or more of their customers were in state. 52% of the same companies reported that they rely on other Connecticut suppliers for more than half of their supply chain. Similar percentages for shipbuilding suppliers exist in Connecticut, with 50% of manufacturers reporting more than half of their customers are located within state but fewer companies (40%) reporting half of their suppliers in state. In contrast, medical devices reported a larger share of suppliers (45%) than customers (30%) within Connecticut.

Access to skills, knowledge networks, and collaboration are the among the greatest advantages of suppliers and customers being co-located in the same state. As shown in Figure 9, across all industries, 55% suppliers surveyed in the CT Supply Chain Resiliency reported access to skills as the top advantage of in-state supply chains, which underscores the importance of strengthening the manufacturing pipeline in Connecticut. Slightly less than half of respondents reported access to industry-specific knowledge networks (48%) as the top advantage, and a smaller but still sizable share of suppliers (39%) cited access to collaboration on design and testing as their top advantage. As one interviewee described, there are cost savings and convenience of suppliers both being in Connecticut for the ability to troubleshoot problems and collaborate on R&D.

Cost factors and a shared regulatory environment were less commonly cited advantages of proximity for suppliers. Approximately half of suppliers reported lower inventory costs and a shared regulatory as at least somewhat significant advantages of being co-located with their customers in Connecticut. Slightly less than half reported increased environmental or sustainability benefits from being in closer proximity to OEMs.

Figure 9. Largest advantages of suppliers and customers both being in Connecticut



Note: "9. Rate the significance of each of the following advantages of being located in the same state as your Connecticut customers?"

Source: EY/CONNSTEP Supply Chain Resiliency Survey, 2023.

"

The key competitive edge for Connecticut… is collaboration and networking [between OEMs and suppliers due to physical proximity], especially during the R&D stage… It's an 'innovate or die mentality'.

Connecticut OEM

"

Extremely difficult to know what certifications an OEM requires in order to join their supply chain.

Aerospace supplier

The importance of industry- and OEM-certifications for Connecticut's supply chains

Industry- and OEM-required certifications are one of the most important aspects of the OEM-supplier relationship across the three industries. Certifications ensure that products and processes meet stringent standards as well as maintaining safety, quality, and reliability across the aerospace, shipbuilding and medical devices manufacturing industries.

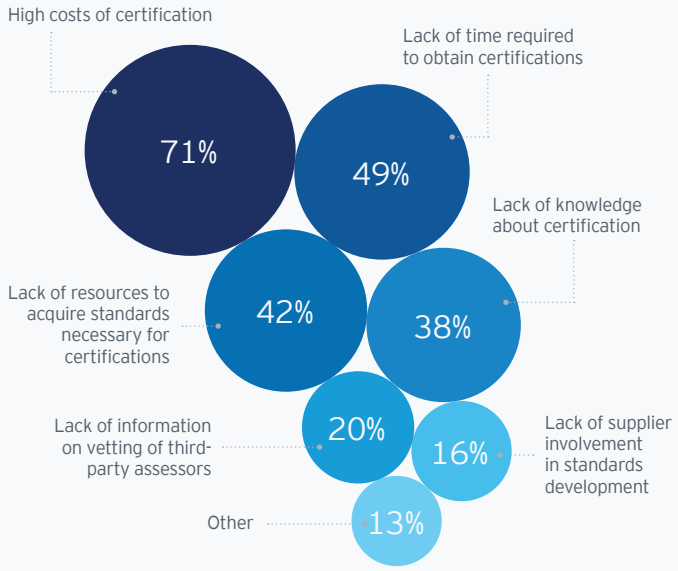
High costs, lack of time, resources and knowledge are barriers toward certification. As shown in Figure 10, when asked about their biggest challenges to obtaining certifications in their industry, 71% of suppliers in the CONNSTEP/EY survey noted high costs. Small businesses can face prohibitively high certification consultation costs for implementation as well as face ongoing costs to maintain certifications. Suppliers with less than 100 employees, which made up 89% of survey respondents, lack in-house resources and existing knowledge or experience in obtaining new certifications. Some suppliers mentioned guidance around new certifications such as the Cybersecurity Maturity Model Certification (CMMC) constantly evolving, which presents challenges around what data and resources are needed to obtain certification. As shown in Table 7, the medical device sector has the largest certification gap, as measured by the difference between the share of companies that perceive a certification as important and the share that have obtained the certification.

A slow and (sometimes) opaque certification assessment process frustrates some Connecticut suppliers. Some suppliers described an ambiguous process for learning about and obtaining OEM-specific certifications. Other suppliers were frustrated by delays in assessments by third parties, which they thought may put their existing certifications at risk of not being renewed. Suppliers also thought that OEMs lacked the necessary resources to conduct certification audits.

> "Extremely difficult to know what certifications an OEM requires in order to join their supply chain."
>
> Aerospace supplier

> "3rd party assessors take far too long, putting existing certs in jeopardy of expiring.
>
> Medical devices supplier

Figure 10. Largest challenges for obtaining industry certifications, % of respondents



Note: "Approximately what percentage of your customers/suppliers are located in Connecticut?"

Source: EY/CONNSTEP Supply Chain Resiliency Survey, 2023.

Table 7. Gap between suppliers reporting certifications were important in their industry vs. companies have acquired certification, %

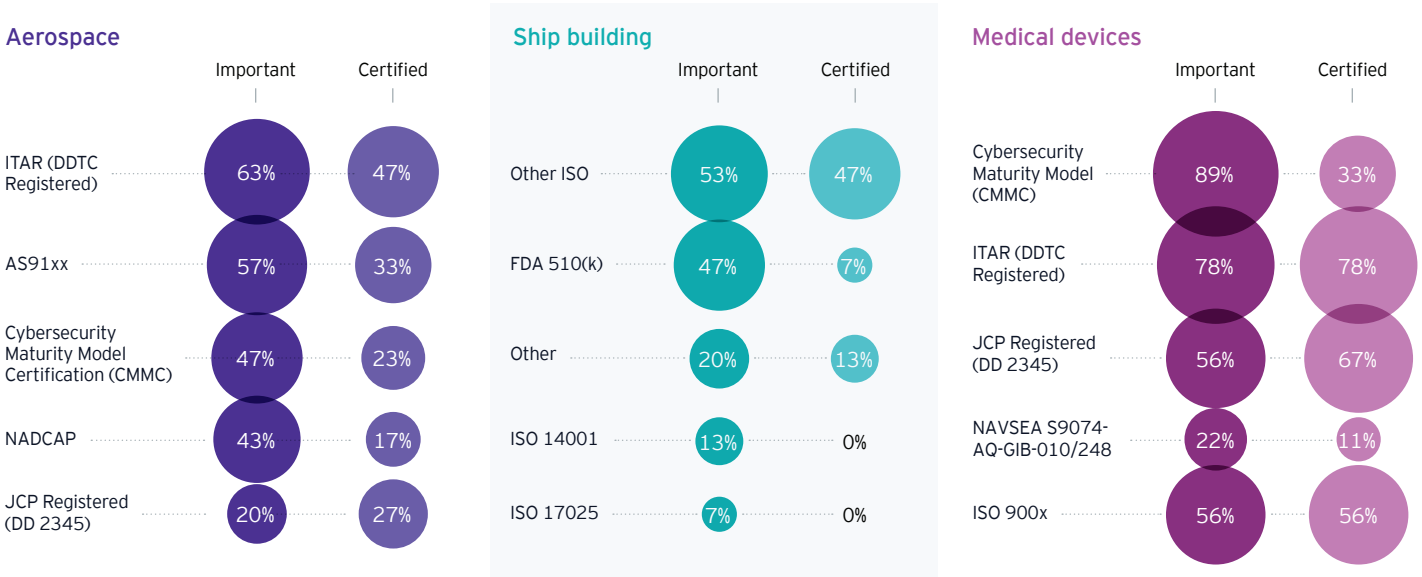
Industry	Important	Certified	Difference
Aerospace	21%	13%	-9 pp.
Medical devices	28%	12%	-15 pp.
Shipbuilding	52%	43%	-9 pp.

Note: 5. What industry certifications for ship building are important for suppliers to Connecticut-based OEMs in your sector, and does your company currently hold any of these certifications?

Source: EY/CONNSTEP Supply Chain Resiliency Survey, 2023

Many suppliers understand the importance of certifications but far fewer have attained them. As depicted in Figure 11, for industry certifications, Connecticut suppliers to medical devices in the survey had the largest difference those companies that said certification was important (28% of respondents) versus suppliers already certified (13%) as depicted in Figure 5. This 15 percentage-point difference is driven by nearly half of businesses citing FDA 510(k) clearances, a review by FDA regulators of safety and performance data for the device to market a "medium-risk" medical device, as important but less than 1 in 10 companies receiving clearance. In the aerospace and shipbuilding industries, there was a 9-percentage point difference between perceptions of importance and certification. In shipbuilding, there were few differences between the companies citing the International Traffic in Arms Regulations (ITAR), JCP Registration, and ISO900x as important and whether they were certified. In the aerospace industry, suppliers reported some perception gaps between importance and certification, even for mandatory defense-related certifications such as ITAR.

Figure 11. Supplier perspectives on industry certifications, % importance vs. certified, %Percent of suppliers reporting that the certification is important and if they are currently certified.

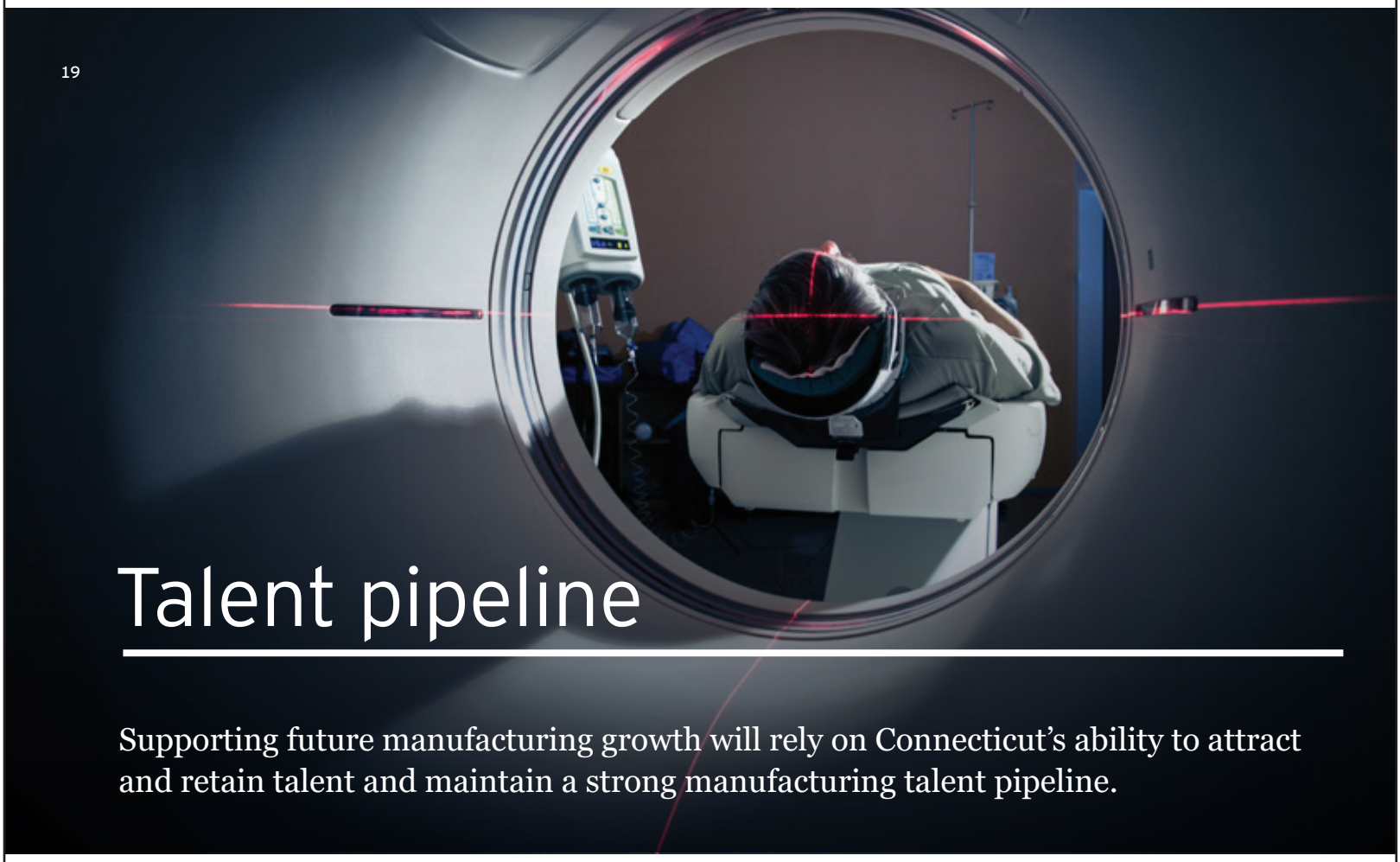


Note: 5. What industry certifications for ship building are important for suppliers to Connecticut-based OEMs in your sector, and does your company currently hold any of these certifications?

Source: EY/CONNSTEP Supply Chain Resiliency Survey, 2023.

The Cybersecurity Maturity Model (CMMC) is cited as the most important certification for both aerospace and shipbuilding, but there is confusion over whether companies can be certified yet. CMMC is a verification program that will be administered by the Department of Defense for all defense contractors to be certified in safeguarding the cybersecurity of unclassified data. 89% of shipbuilding suppliers and 47% of aerospace suppliers cited CMMC as important for their industry. While some suppliers reported they were already certified, the certification process has not yet been implemented. Once rolled out, there will be three tiers of safeguards associated with CMMC, with costs estimated to range from $6,000 for a small business to conduct a self-assessment for Level 1 to up to $2.7m in one-time costs and $490,000 in recurring costs for Level 3 for small firms. Large businesses may spend about $21.1m in one-time fees and $4.1 million in reoccurring costs for Level 3 safeguards.[12] Some interviewees mentioned that existing state-sponsored organizations can help SMMs with expertise and capacity development around certification requirements for CMM, especially the first 60 steps out the 120 required for certification.

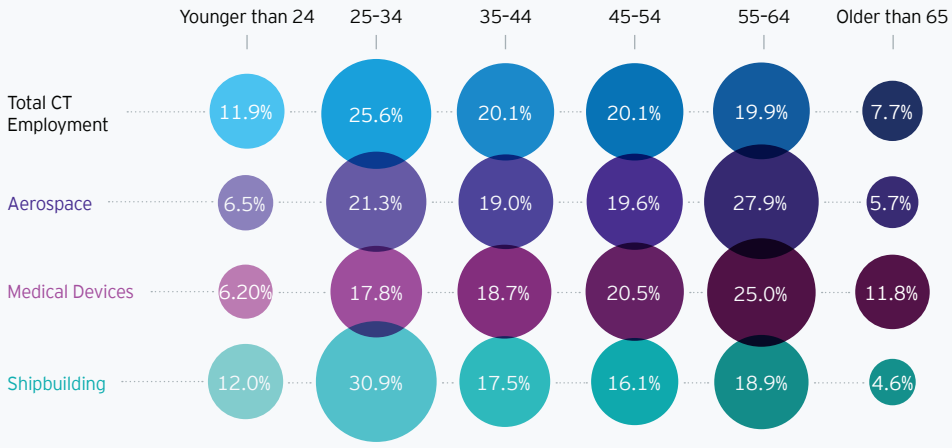
> "Compliance costs, especially for the Cybersecurity Maturity Model, amount to a substantial amount, and [our] businesses often had to hire expensive consultants to navigate these complexities.
>
> Supplier to medical devices and aerospace industries



Talent pipeline

Supporting future manufacturing growth will rely on Connecticut's ability to attract and retain talent and maintain a strong manufacturing talent pipeline.

Figure 12. Age distribution of workforce by industry (2022)



Source: EY analysis of US Census American Community Survey.

Connecticut's aerospace and medical devices workers skew older and have a higher share anticipated retirements over the next 5 years. As shown in Figure 12, more than a quarter of workers in aerospace and medical devices are between 55-64 years old, with anticipated requirements over the next ten years. Given the occupational mix of both aerospace and medical devices, companies will need to find available labor across a diverse range of skills requirement from assemblers to electricians to software developers.

Connecticut's shipbuilding industry has seen an acceleration of younger workers since 2017. Shipbuilding has become progressively younger in Connecticut since at least 2017, with the share of 25-34-year-old workers rising from approximately 18% in 2014 to nearly 31% in 2021. These gains started just prior

> I can't get professionals to come to Connecticut. They want to go to Boston, Boulder, Minneapolis, right? Believe it or not, there's people that would rather be in Minneapolis than Connecticut, we have a tough time keeping young, early in career engineers here.
>
> Medical devices industry OEM

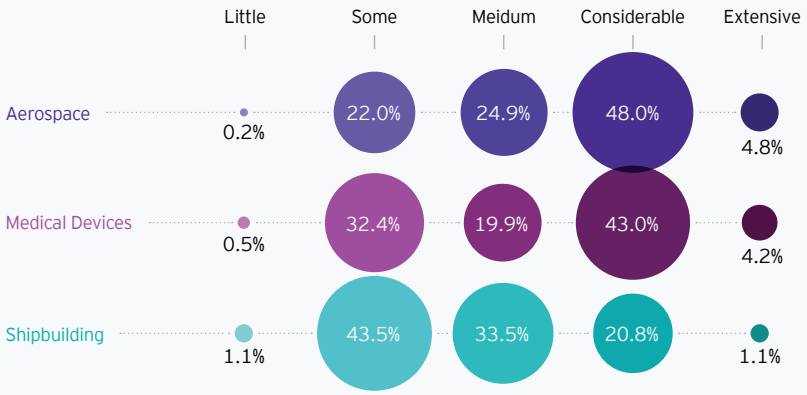
to the establishment of workforce development training programs such as the Manufacturing Pipeline Initiative (MPI) and Youth Manufacturing Pipeline Initiative (YMPI) in 2016. MPI/YMPI collaborate with the Eastern Connecticut Workforce Investment Board provide training to potential workers at no cost which feeds into the labor supply manufacturers in the Eastern Advanced Manufacturing Alliance. MPI and YMPI partner with three community colleges as well as 16 high schools.

Many suppliers report struggling to get people back after pandemic-induced retirements or layoffs. During interviews, suppliers reported difficulty to hiring less experienced workers due to wage competition from retailers and warehouse companies.

Compared with benchmark states, Connecticut skews older in medical devices but younger in shipbuilding and aerospace. The share of older workers in aerospace in Connecticut are nearly 10 percentage points lower than the benchmark state average. For example, more than 40% of the aerospace workforce in Florida, Missouri, and Utah, is 55 years or older. The share of older workers is slightly higher in Connecticut for shipbuilding and medical devices than the benchmark state average.

Aerospace, medical devices, and shipbuilding require a mix of skill and experience levels, but aerospace and medical devices require workers with more prior experience than shipbuilding. Aerospace employs large numbers of aerospace engineers, industrial engineers, and software developers, but similarly high shares of machinists, aircraft mechanics, and tool operators. The medical devices manufacturing industry is similarly mixed, with a high number of team assemblers, inspectors, sorts, and machinists but equally high shares of industrial engineers, software developers, and engineering managers. In contrast, shipbuilding in Connecticut skews more toward production labor, including team assemblers, first-line supervisors of production, welders, cutters, machinists, electricians and plumbers. As shown in Figure 13, 52.8% of aerospace jobs and 47.2% of medical device jobs require considerable or extensive preparation (training), while 21.9% shipbuilding require this training. This higher skill level for aerospace and medical device jobs means that the talent pipeline lead time is even longer with fewer options available to train unskilled workers on short notice.

Figure 13. Employment composition by industry and experience level,
% Percentages of employment in each industry by level of preparation necessary for job



Source: EY analysis of Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW), 2023 and O*NET Job ZoneClassifications.

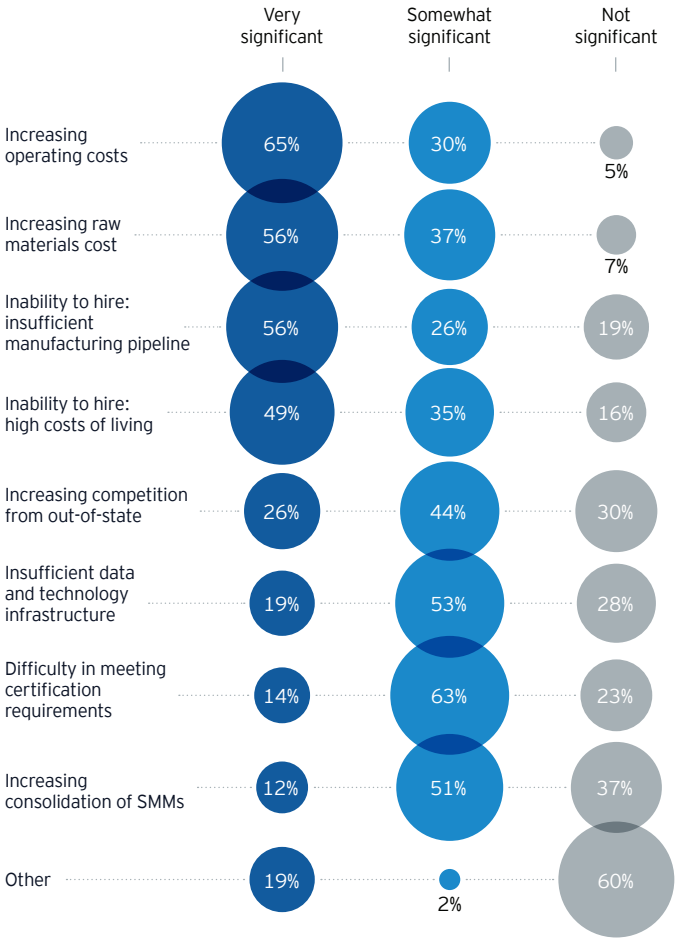
> “Suppliers are faced with headwinds from [a] material perspective; [the prices of] raw materials are going up.
>
> Medical devices OEM

Cost factors

Connecticut’s high cost of living and doing business puts pressure under small- and medium-manufacturers.

Connecticut suppliers cited increasing operating and raw material costs as the largest barrier to serving their Connecticut-based customers. According to the EY/CONNSETP survey and summarized in Figure 14, escalating operating and raw material costs present the greatest to challenge to suppliers’ operations in Connecticut with more of than half of respondents listing it as very significant challenge. In many cases, cost-of-living concerns and increasing competition from out-of-state also challenge the ability of suppliers to hire and compete for talent. Less common are concerns over insufficient data and technology infrastructure to meet customer technical requirements or difficulty meeting certification requirements.

Figure 14. Largest challenges of operating in Connecticut
Percent of suppliers



Note: " 8.Rate the following challenges for serving your Connecticut-based customers?"

Source: EY/CONNSTEP Supply Chain Resiliency Survey, 2023.

Connecticut is a relatively expensive place to live and conduct business. While Connecticut ranks 13th for education and technology, it ranks 43rd in the country for the cost of doing business.[13] Excluding housing, cost of living in Connecticut is 10.2% higher than the US average. When compared to average cost levels across top 15 benchmark states in each industry, Connecticut is relatively more expensive. Excluding housing costs, Connecticut is 7.3% more expensive than the benchmark states in aerospace for cost-of-living metrics such as groceries, utility costs, and healthcare. Connecticut is 5.6% more expensive than benchmark states in ship building and 5.0% more expensive that other states in medical devices manufacturing.

Table 7. Cost-of-living expenses in Connecticut compared with other US states

How much more or less expensive is Connecticut compared with the other top 15 states

	Aerospace	Shipbuilding	Medical devices
Cost-of-living (excluding housing)	7.3% more expensive	5.6% more expensive	5.0% more expensive
Housing costs	6.4% more expensive	5.5% less expensive	14.0% less expensive

Source: Sources: Cost-of-living estimates derived from The Council for Community and Economic Research's "COST OF LIVING INDEX" by weighting index and average price values by metro's population in each state.

Affordability of housing are a significant barrier for building a strong manufacturing pipeline particularly for aerospace. Connecticut's average housing cost is about 21.2% higher than the US average. Interviewees noted that the lack of affordable housing is a critical issue that impedes talent attraction and overall business operations. That said, the **benchmark** state average of housing costs in states that are concentrated in shipbuilding and medical devices are even higher. In aerospace, however, the average across **benchmark** states for housing costs is nearly 7 percentage points lower than Connecticut.

> "There is an acute housing crisis in Connecticut, particularly in Fairfield County, where rents and housing costs [are] untouchable.
>
> Medical devices supplier

> "Challenges posed by high housing costs make certain areas impractical for business operations.
>
> Medical devices supplier

Connecticut lacks some amenities and up-to-date infrastructure putting the state at a disadvantage. A lack of amenities and last-mile transport for workers to corporate campuses place the state at a disadvantage to other states and other countries that have been able to develop new facilities with increased investment. For example, interviews with OEM revealed that corporate parks are not well supported by public transportation and for one location is only served by one bus line. A shortage of restaurants and services in the immediate vicinity of some CT corporate campuses means that workers are reluctant to relocate closer to the office.

Employment costs are relatively higher than benchmark states across all three industries. Average wages in ship building a more than a third higher in Connecticut than the benchmark states and nearly 23% more expensive in aerospace than the other states. The average Connecticut wage in medical devices is more than 6% more expensive than benchmark states.

Table 8. Employment costs in Connecticut compared with other US states

Average wages by sector in Connecticut compared with the benchmark state average

	Connecticut	Benchmark state average	Difference (CT-benchmark state average)
Aerospace	$129,326	$99,869	22.8% more expensive
Shipbuilding	$107,236	$70,116	34.6% more expensive
Medical devices	$84,045	$78,773	6.3% more expensive

Source: EY analysis of BLS Occupation Employment and Wage Statistics, 2023.

> “
>
> Connecticut] is in a really, really tough spot. It needs fun and affordable places to live to attract and retain talent.
>
> Medical devices supplier

> “
>
> How can we build a ‘factory town’ to develop the right mix of skills? To do so, requires addressing the shortage in affordable housing and cultivating the right mix of supplier businesses.
>
> Supplier to aerospace industries

> “
>
> We have no restaurants, no infrastructure, no bus line, no train line,... it’s not an attractive location right now for us. There could be a $150 million investment on this campus... and we look outside the building and there’s all broken down buildings, there’s nothing here.
>
> Connecticut OEM

> “
>
> There’s no last-mile transportation... [for] getting 50% of people to the site. there’s only one bus line [that] comes through the site.
>
> Connecticut OEM

Economic contributions of closing the supply chain gap

There are potential economic and employment benefits if Connecticut could narrow the supply chain gap with benchmark states. If Connecticut were to successfully implement strategies that increase the reliance on Connecticut companies for manufacturing inputs in aerospace, shipbuilding, and medical devices.

Based on the scenario that Connecticut OEMs would purchase inputs from suppliers at the same levels of the top 3-5 benchmark states, this section uses the IMPLAN (Economic Impact Analysis for Planning) model to estimate the additional economic activity including employment and income from expanded use of Connecticut's supply chain by Connecticut-based firms. The analysis that Connecticut could reach the average in-state reliance on inputs from the top 5 benchmark states. In the event of aerospace, which already ranked third for in-state purchases, we model the impacts using the top 3 benchmark states, excluding Connecticut.

From this analysis, the main metrics reported are the following:

- **Total economic output.** Economic output is the broadest measure of economic activity and includes State Gross Domestic Product (GDP) and intermediate input purchases from suppliers. For most industries, economic output is equivalent to total revenues (production value).
- **Value added (GDP).** Value added is a component of economic output and includes labor income, payments to capital and indirect taxes.
- **Labor income.** Labor income is a component of GDP and includes employee compensation (value of wages and benefits) and proprietor income.
- **Employment.** Employment reflects the total number of part- and full-time jobs (headcount) supported by the annual business operations.

Additionally, the impacts are reported at two levels:

- **Direct impacts** are the impacts of the initial activity (e.g., purchase of manufacturing inputs from suppliers).
- **Indirect impacts** are the impacts of additional rounds of supplier activity to the extent they occur in Connecticut. This would represent the activity of second-, third-, and lower-tier suppliers selling raw materials and other goods and services to Connecticut suppliers to OEMs
- **Induced impacts** are economic activity associated with increased spending by labor of the qualifying activity (e.g., workers at Connecticut suppliers) and employees of the supply chain (e.g., employees of suppliers to the research activity).

Table 9. Economic contributions due to increased purchases of manufacturing inputs from within Connecticut across aerospace, shipbuilding and medical devices

	Direct	Indirect	Induced	Total
Employment	368	223	269	**860**
Labor Income	$54.6	$25.9	$19.1	**$99.6**
Value Added (GDP)	$97.1	$40.4	$32.2	**$169.7**
Output	$190.4	$70.7	$50.5	**$311.6**

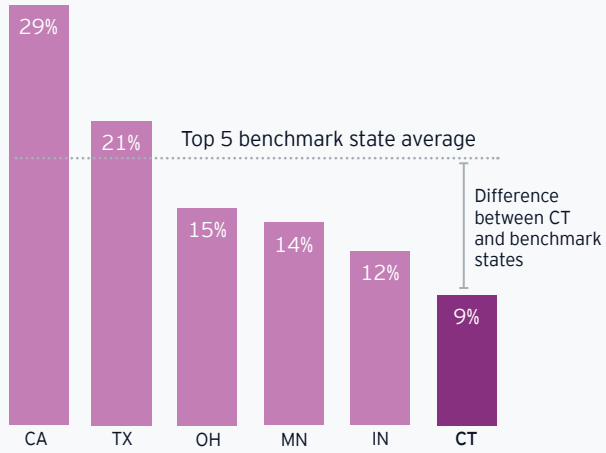
Note: Amounts in millions of dollars
Source: EY analysis and IMPLAN 2021

The analysis shows that if Connecticut increases in-state sourcing to match the share of in-state of the top three to five benchmark states in each sector, an estimated 814 additional direct manufacturing jobs would be supported. This would in turn generate $100.4 million in labor income, $160.6 million in GDP contributions, and $337.9 million in economic output in Connecticut. Direct jobs also support additional induced jobs due to employee spending. Induced jobs typically include jobs related to retail, healthcare, and social services (e.g., dependent care, community care facilities).

Additional industry-by-industry analysis below:

Medical Devices impacts. California, Texas, Ohio, Minnesota and Indiana are the top five benchmark states with the highest percentage of medical devices components being purchased from within state. Currently, Connecticut sources 9% of its medical device manufacturing demand from Connecticut companies, compared to 17.9% for the 5 benchmark states. If Connecticut's medical device reliance on in-state suppliers was similar to the top five benchmark states (California, Texas, Ohio, Minnesota and Indiana) and sourced 17.9% of it's in-state demand (compared to its current level of 9.0%), it would support an estimated additional 281 direct jobs. This in turn would support $29.0 million in direct annual labor income, $40.1 million in direct GDP contributions and $96.4 million in direct economic output within Connecticut. The additional direct manufacturing employees would also support 109 indirect and 160 induced jobs in Connecticut, with $51.2 million in labor income.

Figure 15. Percentage of medical devices industry purchases of manufacturing products sourced from in-state companies



Source: EY analysis and IMPLAN 2021

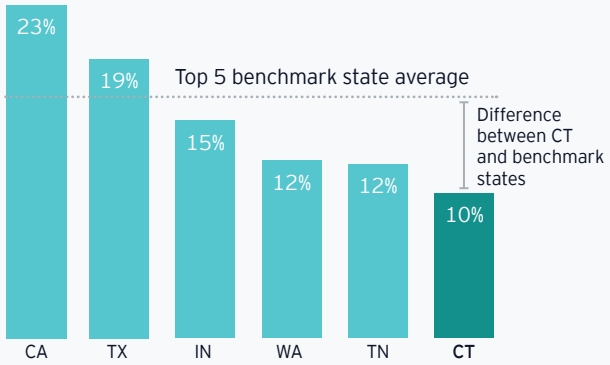
Table 10. Medical Devices: Economic contributions due to increased purchases of manufacturing inputs from within Connecticut

	Direct	Indirect	Induced	Total
Employment	281	109	160	**550**
Labor Income	$29.0	$10.9	$11.4	**$51.2**
Value Added (GDP)	$40.1	$17.4	$19.2	**$76.7**
Output	$96.4	$29.8	$30.1	**$156.3**

Note: Amounts in millions of dollars
Source: EY analysis and IMPLAN 2021

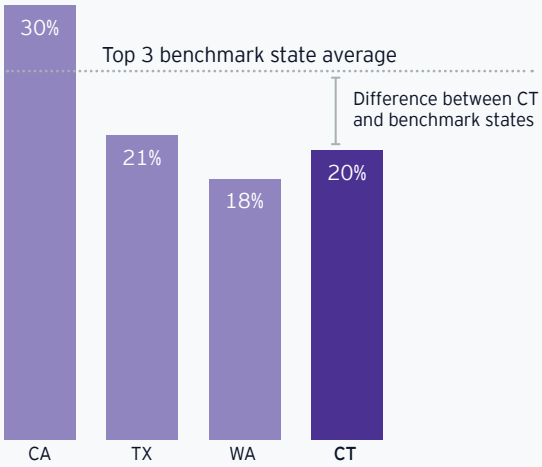
Shipbuilding impacts. California, Texas, Indiana, Washington and Tennessee are the top 5 states with the highest percentage of in-state demand. Connecticut sources 9.9% of it's shipbuilding demand with in-state suppliers, compared to the top 5 states which average 16.0%. If Connecticut's shipbuilding manufacturing profile was similar with the top 5 benchmark states (California, Texas, Indiana, Washington and Tennessee) and sourced 16.0% of it's in-state demand (compared to its current level of 9.9%), it would support an estimated additional 165 direct jobs. This in turn would support $16.8 million in direct annual labor income, $23.4 million in direct GDP contributions and $51.1 million in direct economic output within Connecticut. The additional direct manufacturing employees would also support 117 indirect and 89 induced jobs in Connecticut, with $34.2 million in labor income.

Figure 16. Percentage of shipbuilding industry purchases of manufacturing products sourced from in-state companies



Source: EY analysis and IMPLAN 2021

Figure 17. Percentage of aerospace industry purchases of manufacturing products sourced from in-state companies



Source: EY analysis and IMPLAN 2021

Table 11. Shipbuilding: Economic contributions due to increased purchases of manufacturing inputs from within Connecticut

	Direct	Indirect	Induced	Total
Employment	165	117	89	**372**
Labor Income	$16.8	$11.1	$6.3	**$34.2**
Value Added (GDP)	$23.4	$17.6	$10.7	**$51.7**
Output	$51.1	$29.9	$16.8	**$97.7**

Note: Amounts in millions of dollars
Source: EY analysis and IMPLAN 2021

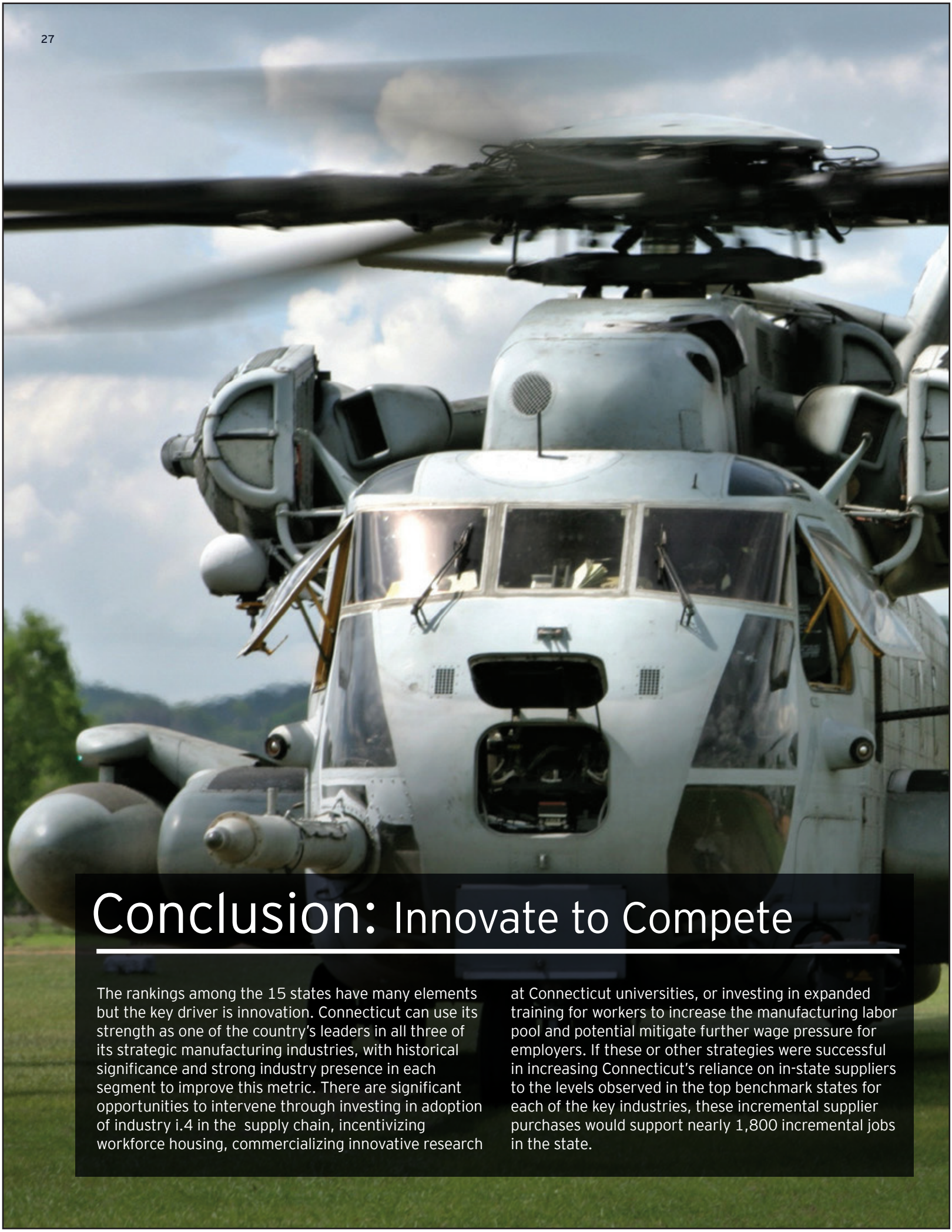
Table 12. Aerospace: Economic contributions due to increased purchases of manufacturing inputs from within Connecticut

	Direct	Indirect	Induced	Total
Employment	368	223	269	**860**
Labor Income	$54.6	$25.9	$19.1	**$99.6**
Value Added (GDP)	$97.1	$40.4	$32.2	**$169.7**
Output	$190.4	$70.7	$50.5	**$311.6**

Note: Amounts in millions of dollars
Source: EY analysis and IMPLAN 2021

Aerospace impacts. California, Texas and Washington are the top 3 states with the highest percentage of in-state supplier spending. Currently, Connecticut sources 20.1% of its aerospace demand with in-state suppliers, compared to the top 3 states which average 23.1%. If Connecticut's aerospace manufacturing profile was in-line with the top 3 benchmark states (California, Washington, and Texas) and sourced 23.1% of its supplier demand from within the state (compared to its current level of 20.1%), it would support an estimated additional 368 direct jobs. This in turn would support $54.6 million in direct annual labor income, $97.1 million in direct GDP contributions and $190.4 million in direct economic output within Connecticut.

The additional direct manufacturing employees would also support induced jobs through employee spending on goods such as wholesale and retailers, and services such as health and social services.



Conclusion: Innovate to Compete

The rankings among the 15 states have many elements but the key driver is innovation. Connecticut can use its strength as one of the country's leaders in all three of its strategic manufacturing industries, with historical significance and strong industry presence in each segment to improve this metric. There are significant opportunities to intervene through investing in adoption of industry i.4 in the supply chain, incentivizing workforce housing, commercializing innovative research at Connecticut universities, or investing in expanded training for workers to increase the manufacturing labor pool and potential mitigate further wage pressure for employers. If these or other strategies were successful in increasing Connecticut's reliance on in-state suppliers to the levels observed in the top benchmark states for each of the key industries, these incremental supplier purchases would support nearly 1,800 incremental jobs in the state.

Endnotes

Executive summary

1 EY analysis of Bureau of Economic Analysis and IMPLAN data.

2 The three sectors have a location quotient of 3.5, which is the ratio of the share of employment across the three industries in Connecticut with the US national industry employment share in these sectors.

3 State of Connecticut, "Connecticut Defense Manufacturing Community Consortium," https://portal.ct.gov/DECD/Content/Business-Development/04_Business_Expertise/CDMCC

Employment Growth and Industry Concentration

4 The three sectors have a location quotient of 3.5, which is the ratio of the share of employment across the three industries in Connecticut with the US national industry employment share in these sectors.

5 "Growth stories: how businesses are making it in Connecticut," CBIA, 2019 August 20. https://www.cbia.com/news/economy/making-it-in-connecticut/

6 Interview with aerospace supplier, September 2023.

7 For example, see "Sikorsky drops challenge after losing Army helicopter contract; CT's congressional delegation wants more answers," Hartford Courant, 20 April 2023, https://www.courant.com/2023/04/20/sikorsky-drops-challenge-after-losing-army-helicopter-contract-cts-congressional-delegation-wants-more-answers/

8 "2023 Innovator: Murphy leads Electric Boat's 'once-in-a- generation' hiring spree," Hartford Business Journal, 27 November 2023. https://www.hartfordbusiness.com/article/2023-innovator-murphy-leads-electric-boats-once-in-a-generation-hiring-spree

9 For example, see "Medtronic cuts suppliers and manufacturing sites, CEO says in supply chain and operations update," Medical Design and Outsourcing, 8 January 2024. https://www.medicaldesignandoutsourcing.com/medtronic-cuts-suppliers-manufacturing-sites-operations-efficiency-supply-chain/

Innovation

10 EY "Strengths, Weaknesses, Opportunities, and Threats: Aerospace and Marine Shipbuilding in Connecticut's Advanced Manufacturing Communities Prepared for the Connecticut Department of Economic and Community Development", April 11, 2014

11 Calculated the average ranking across 2017-2019 and 2018-2020 surveys as the pre-pandemic baseline. US Census Annual Business Survey (ABS), which measures product innovation as "the introduction to the market of new or improved products (goods or services) that differed significantly from the business's previous products."

Supply Chain In-State Sourcing

12 Federal Register, "Cybersecurity Maturity Model Certification (CMMC) Program", https://www.federalregister.gov/documents/2023/12/26/2023-27280/cybersecurity-maturity-model-certification-cmmc-program, 26 December 2023

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13 CNBC, "How we chose America's Top States for Business in 2023," https://www.cnbc.com/2023/06/15/how-we-are-choosing-americas-top-states-for-business-in-2023.html

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