UNDERSTANDING KING COUNTY'S MANUFACTURING SECTOR:

Preparing Our Workforce for Good Job Opportunities

OCTOBER 2012

Seattle Jobs Initiative

INTRODUCTION

Seattle Jobs Initiative seeks to better connect low-income individuals to living-wage jobs through education and training. Understanding important trends in the economy and labor market that may affect these individuals' opportunities for success is crucial to achieving this goal. Specifically, SJI has focused its efforts on identifying opportunities for low-income/low-skill residents to advance to living-wage jobs with additional education and training but not necessarily a four-year degree. SJI works to better understand the local labor market in order to identify these "middle-wage jobs" as defined in the March 2008 report, "**Skills Required: Preparing Puget Sound for Tomorrow's Middle-Wage Jobs**".[1]

The manufacturing industry within the Seattle area has been an important one for SJI and other workforce providers. SJI has trained individuals in welding and other manufacturing areas for the past 15 years as it has been an industry that traditionally provides individuals without a four-year college degree with ample opportunities to earn good wages with benefits and advancement. However, the industry is changing. Manufacturing jobs today are fewer than they were 20 years ago and require a much more highly-skilled workforce as the industry continues to make advances in technology in an effort to keep up with competition and increase its productivity gains. To help us and other workforce providers help individuals compete for a narrowing array of jobs, we wanted to take a fresh look at the local manufacturing trends and concerns going forward. Specifically, this research aims to address overall macro trends, workforce demographics, middle-wage job opportunities, supply and demand of workers, and industry certification practices within the local manufacturing sector.

1. 1. P. Sommers, M. Gardner, and J. Scarpa, Skills Required: Preparing Puget Sound for Tomorrow's Middle-Wage Jobs (Seattle Jobs Initiative, March 3, 2008) http://seattlejobsinitiative.com.s151400.gridserver.com/wp-content/uploads/SJIMWJReport07242008.pdf (August 2012).

MANUFACTURING SECTOR OVERVIEW

Industry Trends Over the Past Two Decades

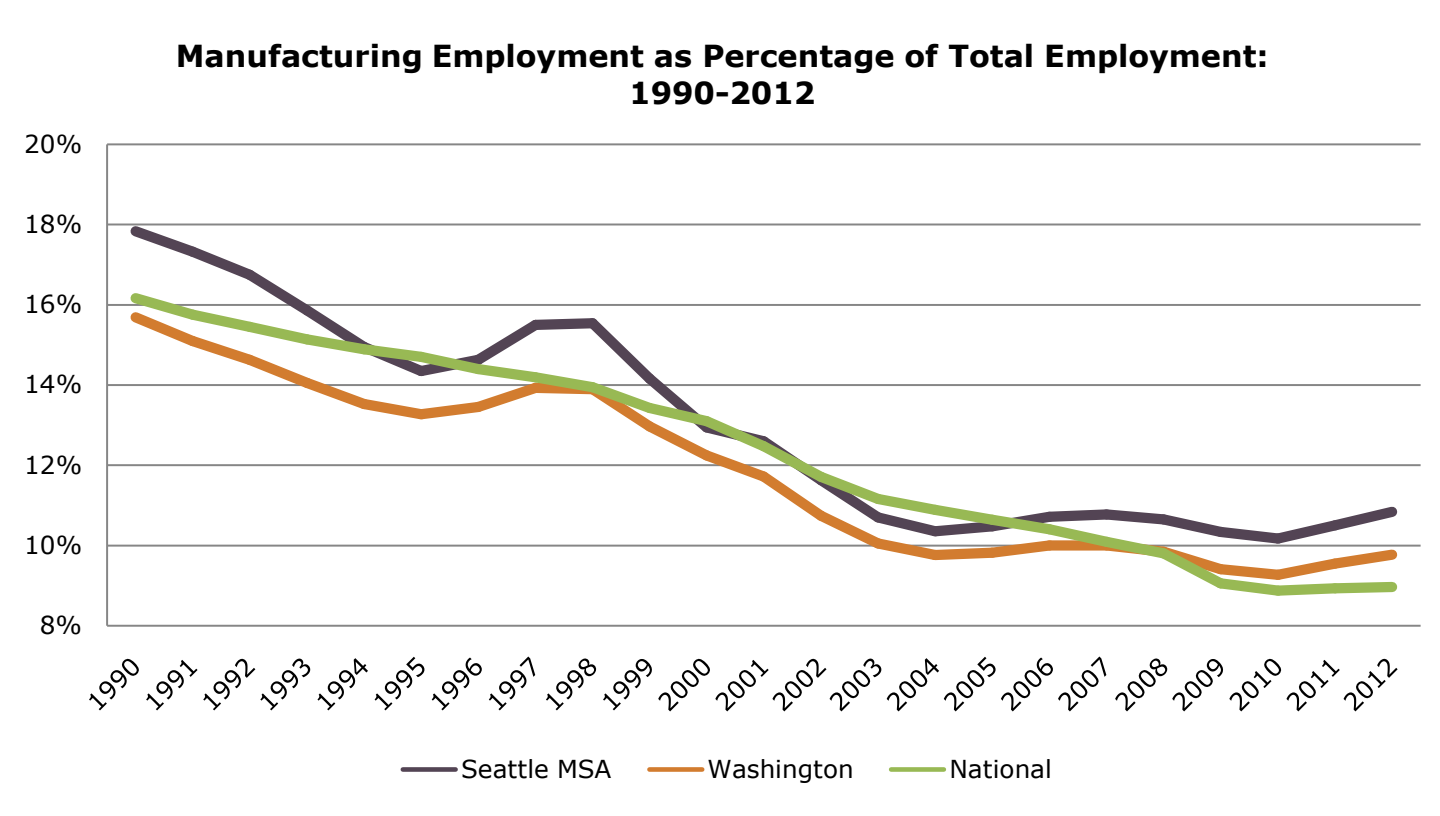
While the manufacturing industry in the United States has become a focal point for economic recovery as of late, over the past two decades, the sector has experienced a steady decline as many manufacturers have outsourced their operations to other countries to take advantage of the lower wage rates and lenient regulatory practices. **Chart 1** shows that over this period (1990 – 2012), manufacturing employment as a percentage of total employment in the U.S. has fallen from about 16% to about 9% (a 44% decline). Locally, Washington State and the Seattle metropolitan area have experienced similar declines in manufacturing employment over the same time period.

However, that trend is fading fast, largely due to a decline in overseas manufacturing resulting from several important factors. The narrowing wage gap in China and other popular manufacturing concentrations has made them less attractive as outsourcing destinations. Additionally, U.S. manufacturers have become very efficient in an effort to remain competitive in the global economy. The relatively weak U.S. dollar has made foreign direct investment on U.S. soil more attractive than in years past; thus, contributing to the resurgence.[2]

With the end of the Great Recession in 2009, the U.S. has experienced a boom in manufacturing with the Seattle area leading the charge. In the past year alone, Seattle-Tacoma-Bellevue was ranked second in the nation in manufacturing growth. Looking at **Chart 1**, the Seattle MSA has consistently been above the nation and Washington State in terms of the manufacturing sector's share of employment over the past two decades. Only in 1995 and 2003-2004 has it dipped below the national share. Washington State, on the other hand, has consistently remained below both the U.S. and Seattle MSA levels. It has only been since the end of the recession that the state's share of employment surpassed the nation's.

2. Rick Newman. "4 Lessons Learned from the U.S. Manufacturing Revival," April 19, 2012 <http://www.usnews.com/news/blogs/rick-newman/2012/04/19/4-lessons-from-the-us-manufacturing-revival> (July 2012).

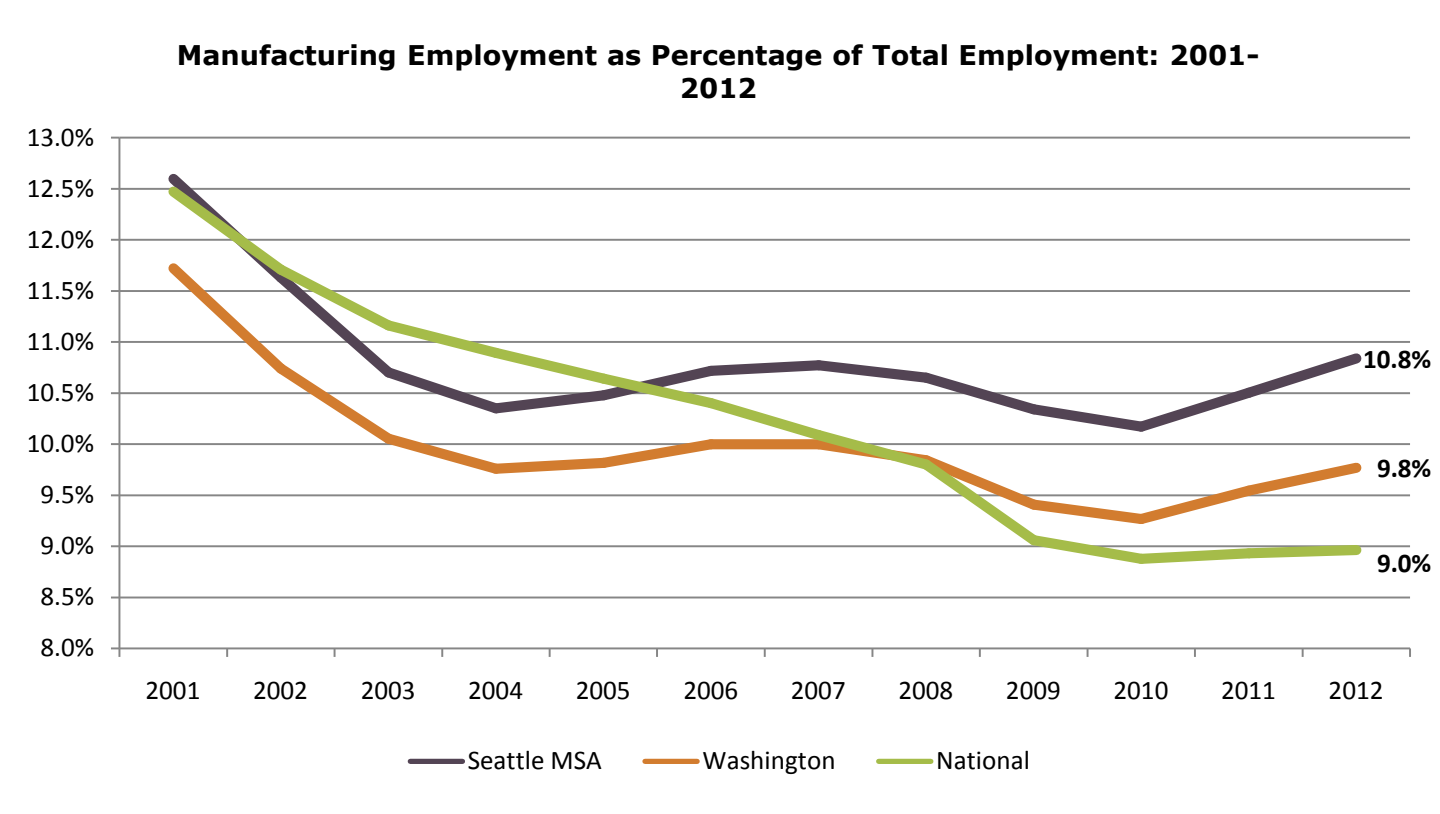
CHART 1



SOURCE: Bureau of Labor Statistics State and Area Estimates

Taking a closer look at the manufacturing sector locally and over a shorter time frame (2001 – 2012), we again see that the industry has decreased its share of total employment over the past decade. As illustrated in **Chart 2**, the Great Recession contributed to a steadily declining manufacturing share of total jobs within the Seattle MSA, Washington State as well as the US beginning in 2007 and reaching an all-time low in 2010. In 2001, the industry held 12.6%, 11.7%, and 12.5% of all jobs in these three geographies, respectively; by contrast, the industry currently holds only 10.8%, 9.8%, and 9% of all jobs in these geographies. Since 2010, the manufacturing share of total jobs in all three geographies has increased, albeit to different extents. The increase in manufacturing's share of employment in King County post-Recession has been somewhat lackluster when compared to the state and the Seattle MSA. The industry's pre-recession share of total employment in King County was fairly equivalent to its statewide share; however, the industry's share of employment in the state is increasing at a faster rate than its share in King County since the end of the Great Recession. This could possibly be due to the increasing share of employment by other industries over the past decade in King County, such as professional services and health care.

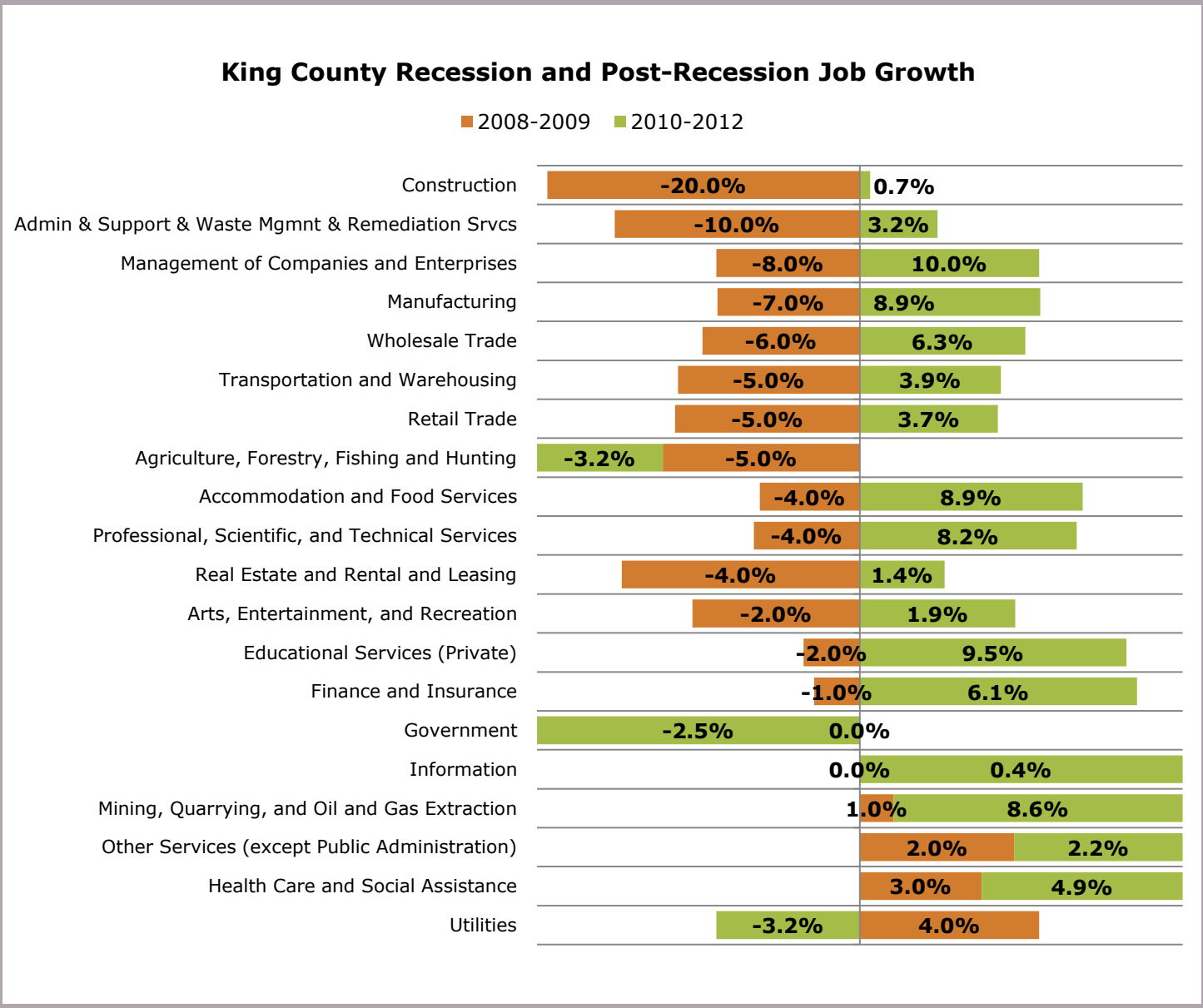
CHART 2



SOURCE: EMSI Complete Employment – 2012.2

Although the *share* of total jobs for the manufacturing industry of King County is declining, the manufacturing industry itself has actually increased its employment numbers since the end of the recession in 2009. As shown in **Chart 3**, King County manufacturing jobs have increased by 9,081 (8.9%) since 2010. This is opposed to an industry job loss of 7,982 (-7%) during the recession from 2008-2009. Overall, the industry ranks fourth in job growth post-recession behind Management of Companies and Enterprises, Educational Services, and Accommodation and Food Services. However, most of those industries did not experience the significant job loss that the manufacturing industry did during the recession. Of the top four industries in terms of job growth, only Management of Companies and Enterprises experienced a larger decline in job growth during the recession at -8%. All of the other top industries experienced a smaller decline in job growth during that time. This result is a clear indicator that the manufacturing resurgence is undeniably an anomaly to the economy.

CHART 3

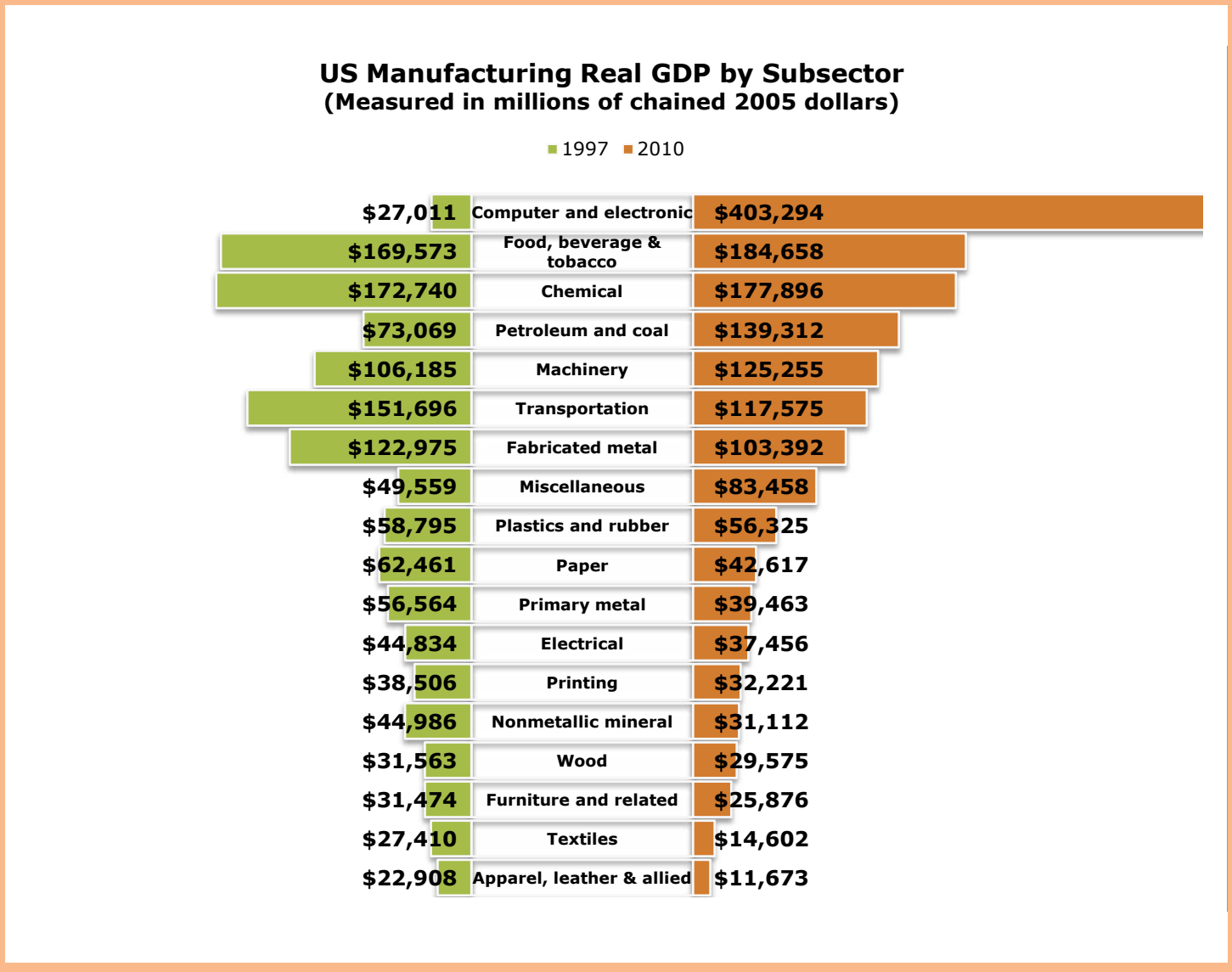


SOURCE: EMSI Complete Employment – 2012.3

Over the last decade or better, the amount of GDP (gross domestic product) produced by the nation's manufacturing industry has shifted in terms of subsector share of GDP. **Chart 4** shows the amount of real GDP per subsector with all years measured against 2005 dollars. The most notable shift in GDP in 1997 versus 2010 was in the Computer and Electronic Product subsector. In 1997, the subsector's GDP was 27,011 billion dollars. By 2010, that number has increased to an astronomical 403,294 billion dollars. As the nation has shifted to a services heavy economy, so has manufacturing. The need for computer and electronic products has certainly helped to boost the share of GDP within the subsector.

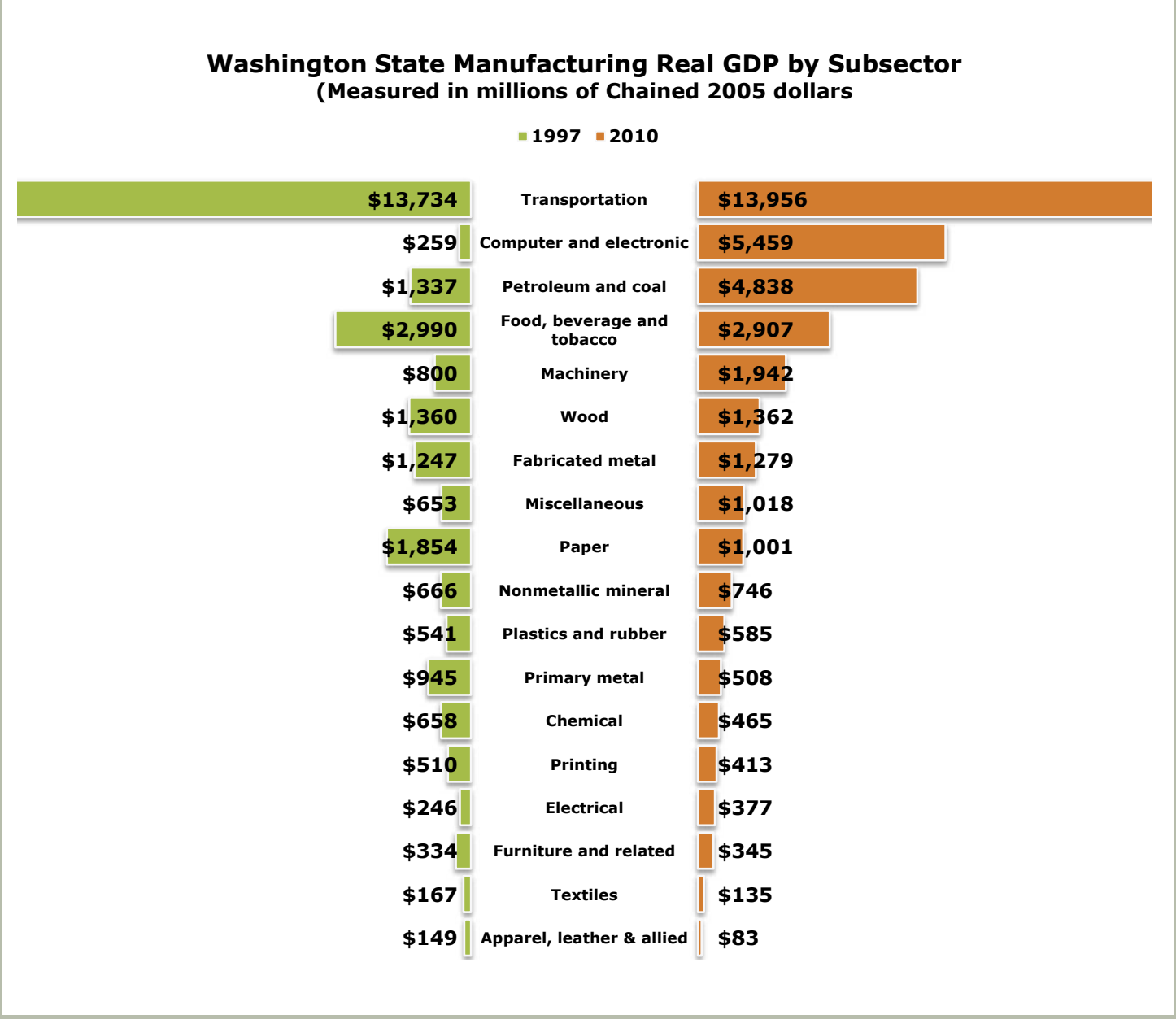
On a local level, Washington State has seen a similar increase in the Computer and Electronic Product Manufacturing subsector (See **Chart 5**). In 1997, its GDP was 259 million dollars compared to its 2010 level of 5,459 million dollars. Additionally, the Petroleum and Coal Products subsector has experienced a drastic change in GDP as well. Its share of GDP was 1,337 million dollars in 1997 and 4,838 million dollars in 2010. This statistic is likely due to the advances in technology that have occurred within the petroleum and coal industry that have allowed it to become more efficient in its production processes.

CHART 4



SOURCE: Bureau of Economic Analysis

CHART 5



SOURCE: Bureau of Economic Analysis

Looking Ahead: Industry Projections

Looking at the long- and short-term growth projections of all industries as shown in **Table 1**, the manufacturing industry is ranked dead last in terms of projected job growth over the long term nationally. Job growth projections are calculated as total growth over the long- and short-term rather than the CAGR (compound annual growth rate). Over the next five years, the industry is expected to decrease by -7.5% and -5.3% over the next five and ten-year periods, respectively. Compared to the national employment growth in manufacturing, however, King County is projected to significantly

outperform the national levels. The projections for the industry in King County are 0.8% and 10.9% growth over the next five and ten-year periods, respectively.

TABLE 1. Short- and Long-Term Employment Projections by Major Industry

Subsector	Percent Change 2012 - 2017		Percent Change 2012 - 2022	
	King	National	King	National
Administrative and Support and Waste Management and Remediation Services	18.1%	9.3%	36.6%	18.5%
Professional, Scientific, and Technical Services	14.9%	11.9%	28.2%	21.6%
Mining, Quarrying, and Oil and Gas Extraction	15.1%	16.2%	27.2%	27.9%
Information	13.7%	1.6%	23.6%	6.6%
Educational Services (Private)	12.0%	14.1%	21.3%	23.7%
Health Care and Social Assistance	11.8%	12.9%	20.3%	22.1%
Transportation and Warehousing	7.5%	5.2%	17.7%	10.4%
Finance and Insurance	9.2%	14.3%	17.5%	23.5%
Construction	5.8%	3.5%	16.7%	9.2%
Management of Companies and Enterprises	8.7%	6.7%	16.1%	11.3%
Real Estate and Rental and Leasing	9.1%	11.7%	14.8%	19.1%
Accommodation and Food Services	6.7%	6.2%	14.3%	11.2%
Wholesale Trade	5.1%	3.6%	14.3%	8.1%
Arts, Entertainment, and Recreation	9.2%	11.0%	13.7%	18.9%
Manufacturing	**0.8%**	**-7.5%**	**10.9%**	**-5.3%**
Utilities	7.9%	1.2%	9.8%	2.7%
Retail Trade	1.6%	1.7%	6.9%	4.4%
Government	3.0%	3.7%	6.6%	7.0%
Other Services (except Public Administration)	2.9%	7.8%	5.2%	13.6%
Agriculture, Forestry, Fishing and Hunting	-1.7%	-0.8%	-0.6%	-1.1%

SOURCE: EMSI Complete Employment - 2012.2

TABLE 2. Short- and Long-Term Employment Projections by Manufacturing Subsector

Subsector	King County	Percent Change 2012 - 2017		Percent Change 2012 - 2022	
	2012 Jobs	King	National	King	National
Total Manufacturing	**109,692**	**0.8%**	**-7.5%**	**10.9%**	**-5.3%**
Transportation Equipment Manufacturing	48,446	-0.7%	-9.0%	7.0%	-5.6%
Food Manufacturing	11,472	-0.3%	0.1%	2.9%	1.3%
Computer and Electronic Product Manufacturing	8,733	6.3%	-10.1%	25.6%	-9.1%
Miscellaneous Manufacturing	7,377	8.7%	3.1%	21.8%	9.6%
Fabricated Metal Product Manufacturing	6,277	11.3%	-6.5%	33.2%	-5.0%
Machinery Manufacturing	5,409	15.2%	-6.6%	41.5%	-3.7%
Printing and Related Support Activities	3,346	-24.8%	-10.2%	-31.1%	-10.9%
Nonmetallic Mineral Product Manufacturing	2,948	3.6%	-5.8%	7.6%	-2.1%
Plastics and Rubber Products Manufacturing	2,395	-8.8%	-10.5%	-1.3%	-9.7%
Beverage and Tobacco Product Manufacturing	2,248	6.9%	0.8%	18.5%	5.5%
Apparel Manufacturing	2,085	-13.3%	-27.5%	-15.6%	-23.2%
Furniture and Related Product Manufacturing	1,639	-12.3%	-11.5%	-1.3%	-6.0%
Chemical Manufacturing	1,421	0.5%	-3.4%	16.4%	-1.5%
Electrical Equipment, Appliance, and Component Manufacturing	1,405	12.9%	-10.7%	45.7%	-9.1%
Paper Manufacturing	1,292	-12.5%	-14.8%	-8.4%	-18.4%
Textile Product Mills	1,036	-22.2%	-19.9%	-24.9%	-21.1%
Primary Metal Manufacturing	955	5.4%	-11.3%	20.0%	-8.1%
Wood Product Manufacturing	902	-5.5%	-10.6%	10.6%	-6.6%
Leather and Allied Product Manufacturing	159	22.6%	-18.3%	51.6%	-13.2%
Petroleum and Coal Products Manufacturing	78	-28.2%	-5.5%	-41.0%	-7.8%
Textile Mills	69	24.6%	-40.5%	52.2%	-36.0%

SOURCE: EMSI Complete Employment - 2012.2

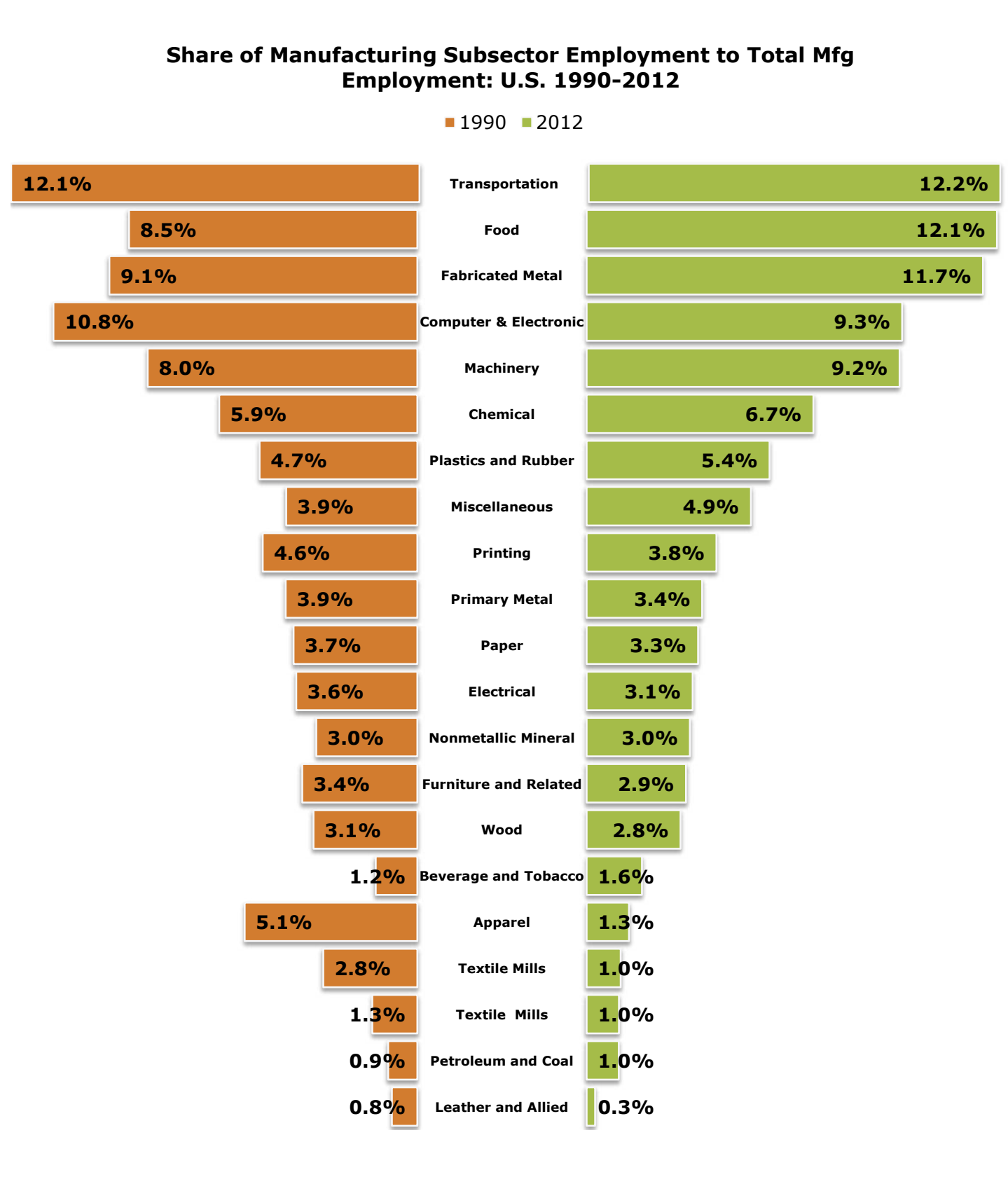
Leading the charge in manufacturing employment growth for King County are the Textile Mills and Leather and Allied Product Manufacturing subsectors at 52% in the long-term period from 2012-2022. Conversely, almost every manufacturing subsector will experience a negative percentage change in jobs over the ten-year span nationally. In the short-term, the Textile Mills and Leather and Allied Product Manufacturing employment growth projections lead the King County manufacturing industry with rates of 24.6% and 22.6%, respectively, and will continue to be a stable subsector in the long-term as well. The nation's growth in manufacturing will stagger over time, but the King County manufacturing industry will remain strong.

Manufacturing Trends: Output and Employment

In addition to identifying the amount of GDP produced by each subsector of manufacturing (**Table 2**), it is important to also identify the employment levels of these subsectors. **Chart 6** and **Chart 7** demonstrate the manufacturing subsectors' shares of employment relative to all manufacturing jobs for both the U.S. and King County. Overall, the U.S. is diverse in its concentration of manufacturing jobs. The highest share of employment is 12.2% in the Furniture and Related Product Manufacturing subsector as of 2012 in the U.S.

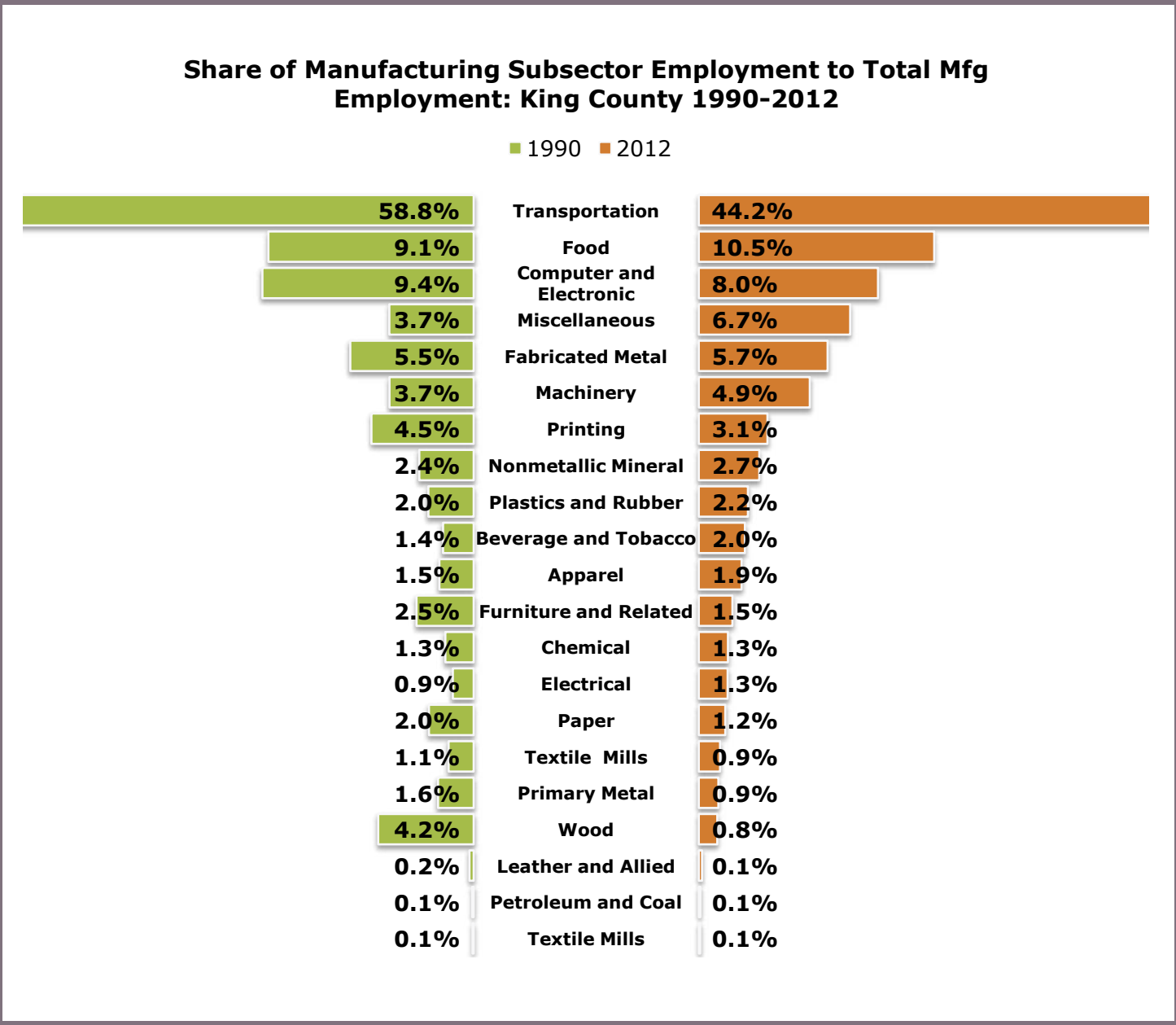
However, in King County the majority of the share of manufacturing jobs lies within the Transportation Equipment Manufacturing subsector, which holds 44.2% of jobs as of 2012. On a national level, the miscellaneous and computer and electronic product manufacturing subsectors have experienced the most significant increases in employment share, increasing by 3.5% and 2.6% respectively from 1990 – 2012. The biggest increase in employment share for King County manufacturing during this period has been in the Wood Product subsector, which increased by 3%. While the transportation equipment subsector has remained the largest shareholder of employment in King County, it has decreased its levels by nearly 15% since 1990. No subsector at the national level remotely approaches this level of decline. The Plastics and Rubber Products Manufacturing subsector has experienced the largest decline in its share of employment in the U.S. since 1990 with a decrease of 3.8%.

CHART 6



SOURCE: BLS – Current Employment Statistics

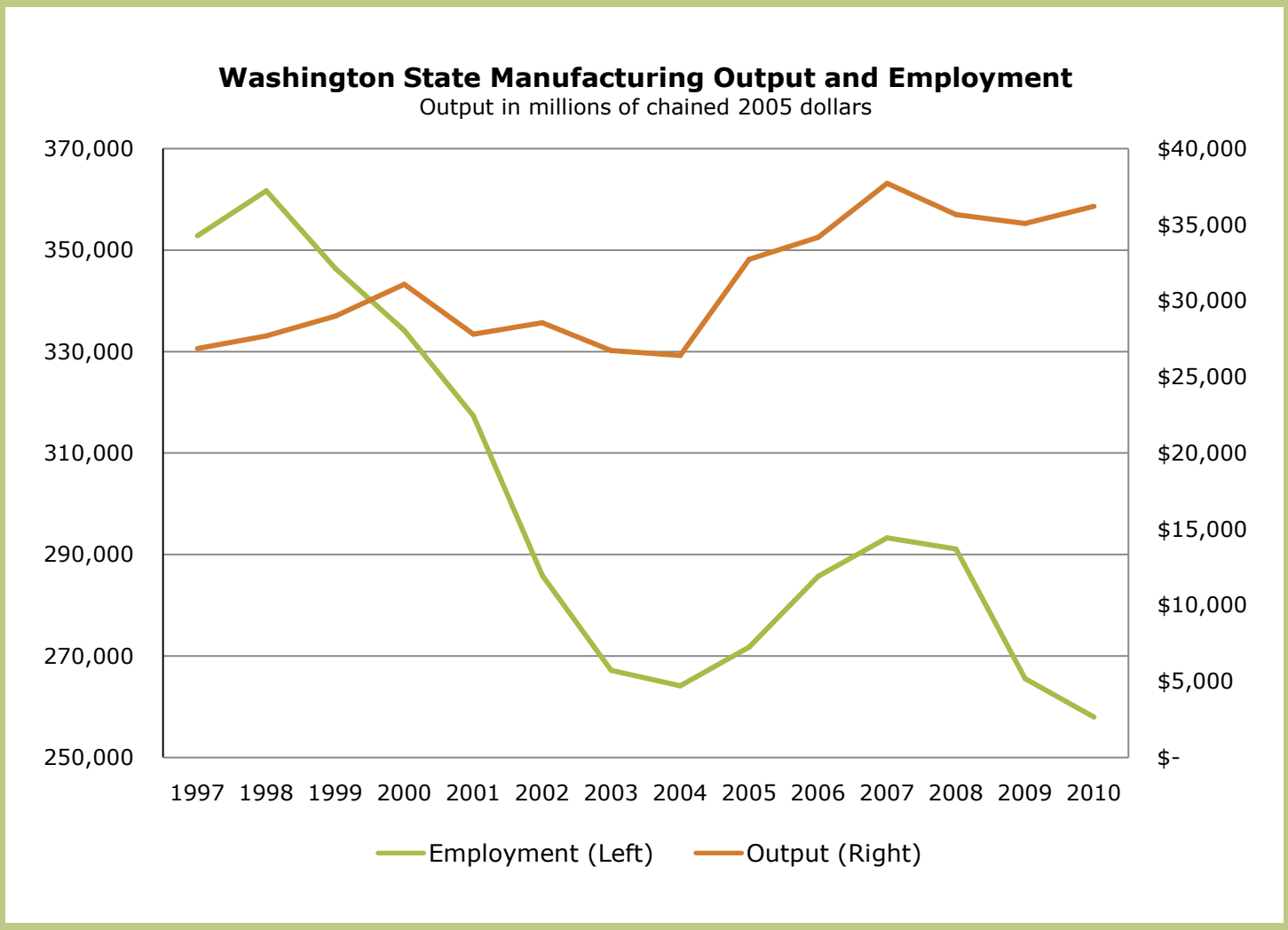
CHART 7



SOURCE: BLS – Current Employment Statistics

Through advances in technology from the period 1997-2010, the amount of output produced in the manufacturing industry in Washington State has shifted to rely more on capital and less on labor. A firm's output is dependent on any combination of labor and capital. The manufacturing industry has increased its output each decade, with the exception of a few subsectors. Employment levels have actually declined over the thirteen year span, which leads to the conclusion that advances in capital must be a major factor contributing to the higher output levels. From 1997 to 2000, employment levels were greater than the amount of output produced in Washington's manufacturing industry. Since that time, Washington's manufacturing output has risen steadily, increasing 17%, while employment declined 23% (see **Chart 8**). Both employment and output were on the rise before the Great Recession, but that gap has widened though 2010 as employment numbers have fallen significantly.

CHART 8

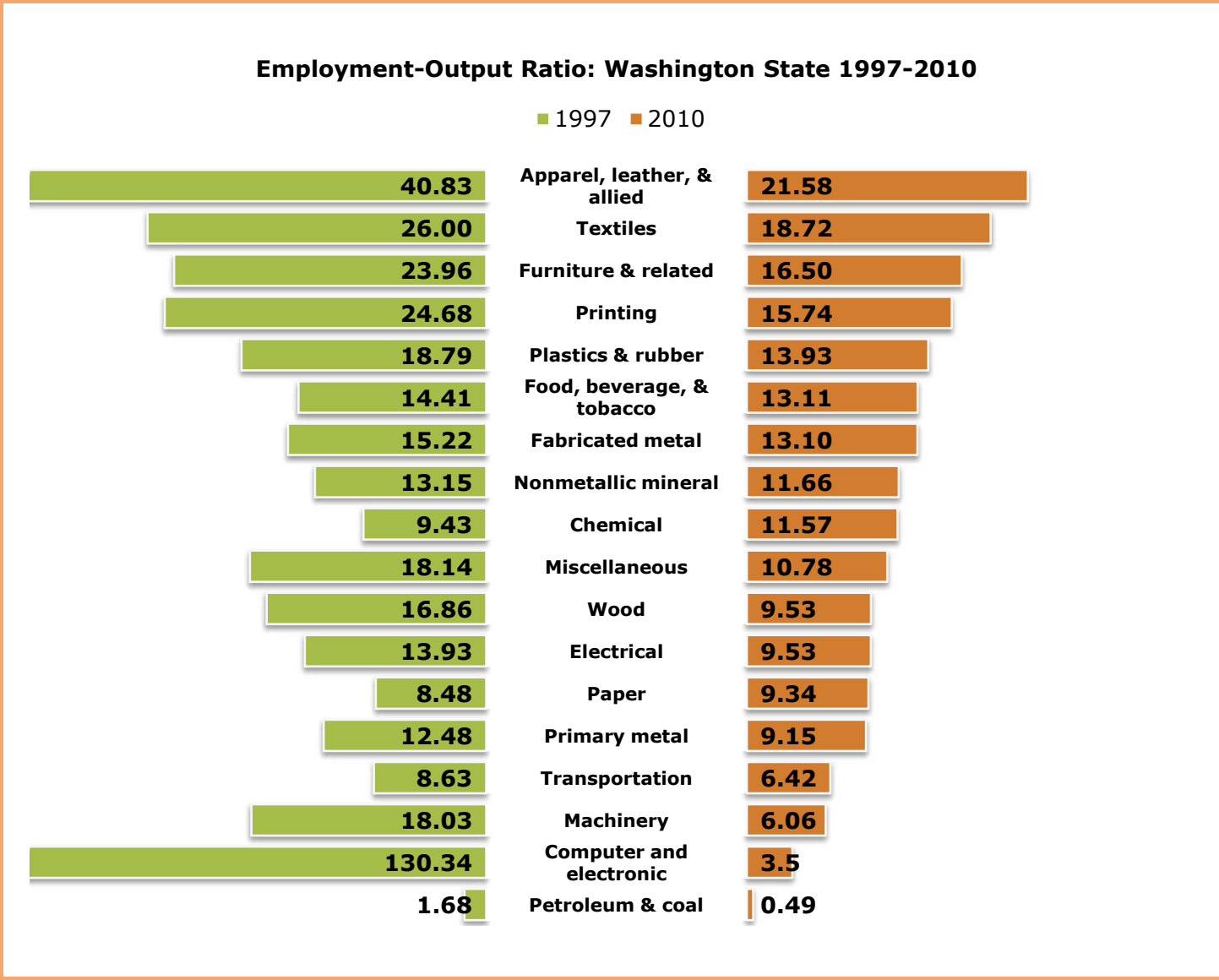


SOURCE: Bureau of Economic Analysis – GDP by State

Chart 9 shows the employment-output ratios of the manufacturing subsectors in 1997 and 2010 for the state of Washington. The majority of subsectors experienced an overall decline in their employment-output ratios.[3] A higher ratio illustrates that more labor is needed to produce some level of output. For example, an employment-output ratio of 9/5 in 1997 indicates that 9 workers are needed to produce 5 units of output. As fewer workers are needed to produce a higher level of output, the employment-output ratio shrinks. In 2010, that same subsector's ratio is now 5/7, which is an overall decrease of 60% from 1997-2010. This result shows that, over time, fewer workers are needed to produce higher levels of output. Thus, the subsector has become more efficient in its labor productivity processes. The most significant decline in employment-output ratio occurred within the Computer and Electronic Product Manufacturing subsector. In 1997, its ratio was 130.34 and has decreased substantially to a mere 3.5 as of 2010. This means that in 1997, the subsector needed 33,757 workers to produce $259 million worth of output compared to only 19,093 workers needed to produce $5,459 million of output in 2010.

3. Output data is not available for subsectors at the state level. GDP was used as a proxy for output instead.

CHART 9



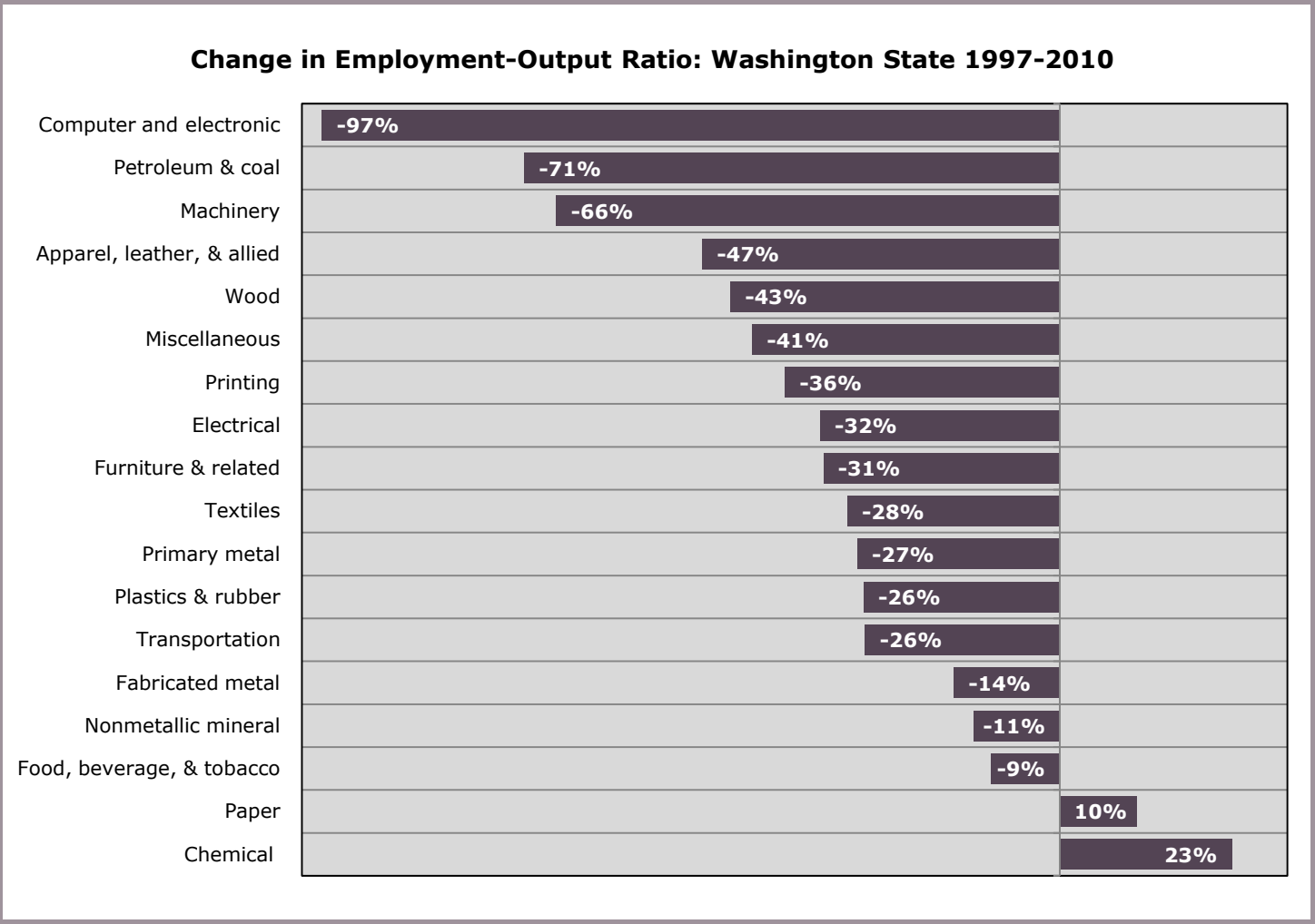
SOURCE: Bureau of Economic Analysis: GDP by State and Employment

Chart 10 shows the change in employment-output ratios of the manufacturing subsectors from 1997-2010 for the state of Washington. Computer and Electronic Product, Petroleum and Coal, and Machinery Manufacturing have experienced the largest decline in their employment-to-output ratios at -97%, -71%, and -66%, respectively. The high levels of output for these subsectors do not necessarily correlate to high levels of employment. In fact, the Petroleum and Coal Product subsector has become so efficient in its production processes that only a small, highly skilled workforce is needed to produce high levels of output. As of 2012, it only accounts for 0.1% of the manufacturing industry's share of employment in King County. On the flip side, the Computer and Electronic Product Manufacturing subsector is an efficient source for both employment and output, accounting for over 8% of manufacturing employment in King County and 15% of the manufacturing output in Washington State.

While the majority of Washington's manufacturing subsectors have shrunk their employment-output ratios, Paper and Chemical Manufacturing have actually increased their ratios by 10% and 23% respectively. These subsectors have effectively become less productive over the thirteen-year period. These subsectors do not hold a substantial share of employment (**Chart 7**) either. They are shrinking subsectors in terms of monetary value and employment opportunities. Low employment levels and a shrinking output will lead to lower-paying jobs and thus training efforts should be focused on subsectors that are growing in terms of both output and employment.

In determining which manufacturing subsectors are growing, it is important to look not only at employment levels, but at labor productivity as well. Identifying which subsectors are growing in terms of employment represents the concentration of jobs within the local economy. Also identifying which subsectors have increased their labor productivity most significantly will help determine longevity and advancement in manufacturing technology. Those subsectors which have consistent employment combined with increases in labor productivity should be the focal point of training and certification programs.

CHART 10

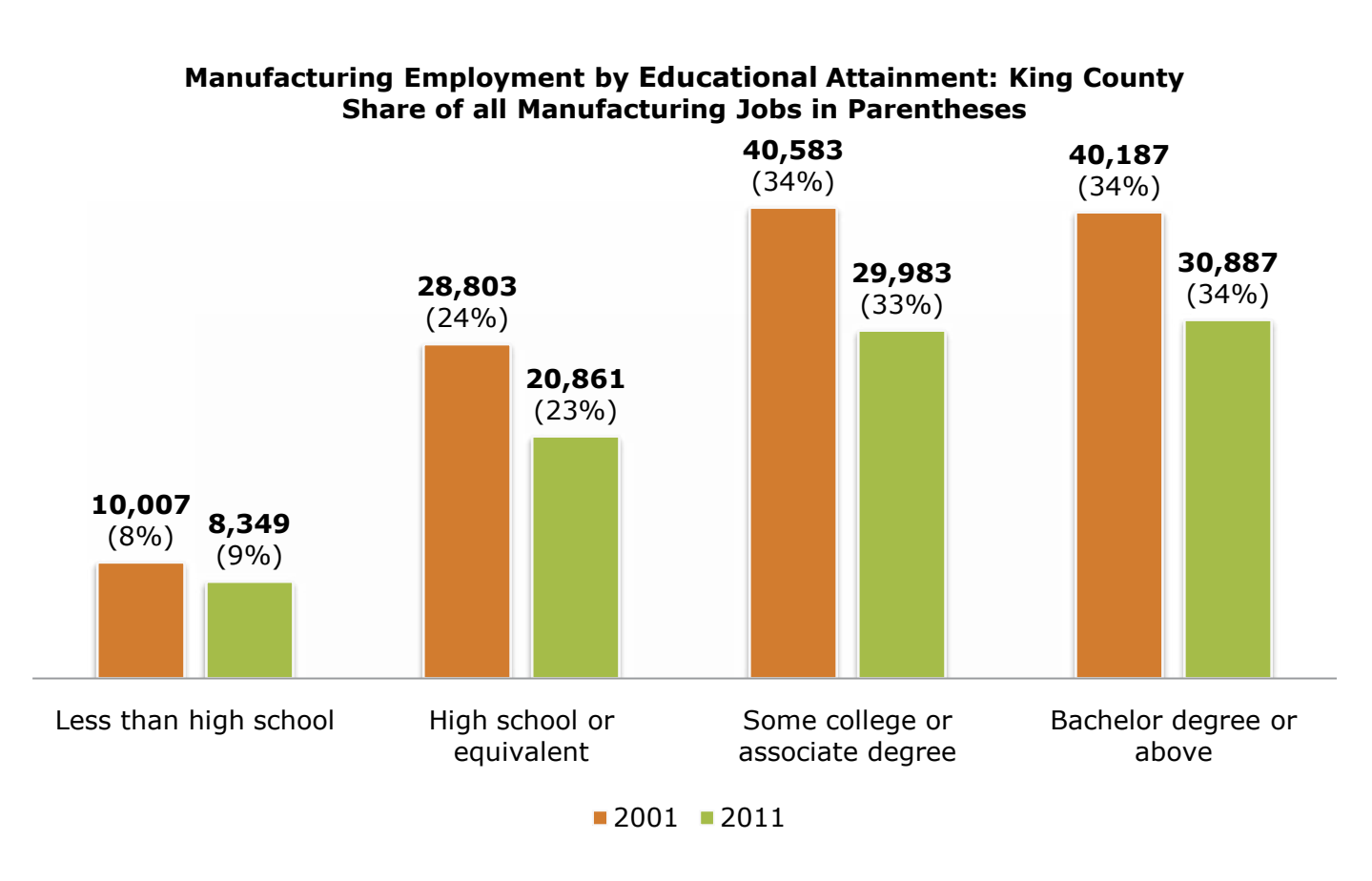


SOURCE: Bureau of Economic Analysis: GDP by State and Employment

THE LOCAL MANUFACTURING SECTOR WORKFORCE

When discussing which subsectors are growing in terms of employment and monetary value within King County's manufacturing industry, it is also important to identify the workforce demographics comprised within the industry. Looking at the educational attainment, race, and age demographics of the King County manufacturing industry workforce will help employers and workers identify barriers to entry as well as opportunities for success.

CHART 11



SOURCE: U.S. Census Bureau – Quarterly Workforce Indicators

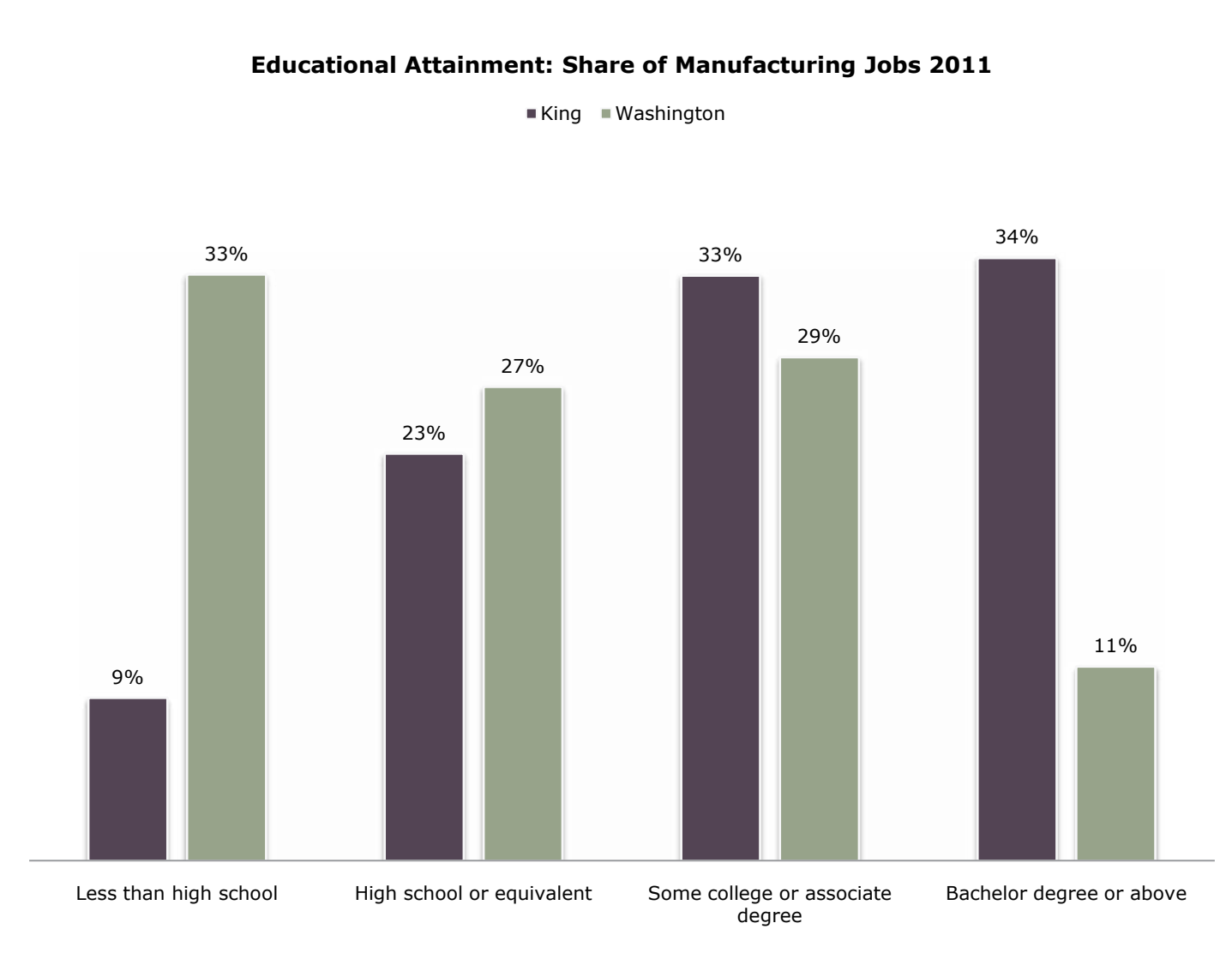
Educational Attainment of Workers

Chart 11 shows the educational attainment of the manufacturing workforce in King County over the period 2001-2011. Over the last decade, a shift in educational attainment has occurred. In 2001, the largest share of the employed held an associate's degree or some postsecondary education (34% of manufacturing workers). However, in 2011, the largest share of the employed held a bachelor's degree or higher (34% of manufacturing workers). Conversely, those workers with a high school diploma or less have consistently held less than 10% of all manufacturing jobs over the last decade. Additionally, workers with a high school diploma or equivalent and those with some college or associate's degree have experienced a 1% decline in their share of all manufacturing jobs from 2001 to 2011 (23% and 33% respectively). It is evident that the King County manufacturing workforce has shrunk over the ten-year period; however, the educational attainment levels have experienced little to no movement during that time.

While the manufacturing workforce in King County is primarily comprised of workers with some

college/associate degrees or bachelor degrees, that is not the case for Washington State. As illustrated by Chart 12, 33% of the Washington State workforce has a high school diploma or equivalent. This is compared to only 9% in King County. It is also worth noting that only 11% of the state's manufacturing workforce has some college or an associate's degree. That is in contrast to 34% in King County. The stark differences in educational attainment between Washington and King County workers is likely a consequence of the larger concentration of manufacturing occupations with high skill requirements in King County. Tables 3 and 4 illustrate this by portraying the educational requirements of the top employed manufacturing occupations for both King County and Washington State. Of the top 20 manufacturing occupations for King County, 30% of occupations require some education beyond high school compared to 20% of the top 20 Washington State occupations. On the other hand, those occupations requiring less than a high school diploma employ double

CHART 12



SOURCE: Source: U.S. Census Bureau – Quarterly Workforce Indicators

(20%) the number of workers in Washington State as they do in King County's (10%). The stark difference in educational attainment is indeed due to the high skill requirements of the top employed manufacturing occupations in King County compared to Washington State.

TABLE 3. King County Education Requirements for Top 20 Manufacturing Occupations, Ranked by Employment

Occupation	Jobs	Education Required
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	3166	High school diploma or equivalent
First-Line Supervisors/Managers of Production and Operating Workers	2690	Postsecondary non-degree award
Inspectors, Testers, Sorters, Samplers, and Weighers	2216	High school diploma or equivalent
Team Assemblers	2138	High school diploma or equivalent
Aerospace Engineers	2043	Bachelor's degree
Shipping, Receiving, and Traffic Clerks	1920	High school diploma or equivalent
Information Security Analysts, Web Developers, and Computer Network Architects	1915	Bachelor's degree
Industrial Engineers	1901	Bachelor's degree
Logisticians	1688	Bachelor's degree
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	1559	High school diploma or equivalent
Purchasing Agents, Except Wholesale, Retail, and Farm Products	1522	High school diploma or equivalent
Assemblers and Fabricators, All Other	1509	High school diploma or equivalent
Laborers and Freight, Stock, and Material Movers, Hand	1498	Less than high school
Meat, Poultry, and Fish Cutters and Trimmers	1491	Less than high school
Software Developers, Applications	1447	Bachelor's degree
Machinists	1436	High school diploma or equivalent
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	1230	High school diploma or equivalent
Welders, Cutters, Solderers, and Brazers	1174	High school diploma or equivalent
Bookkeeping, Accounting, and Auditing Clerks	1155	High school diploma or equivalent
Electrical and Electronic Equipment Assemblers	1146	High school diploma or equivalent

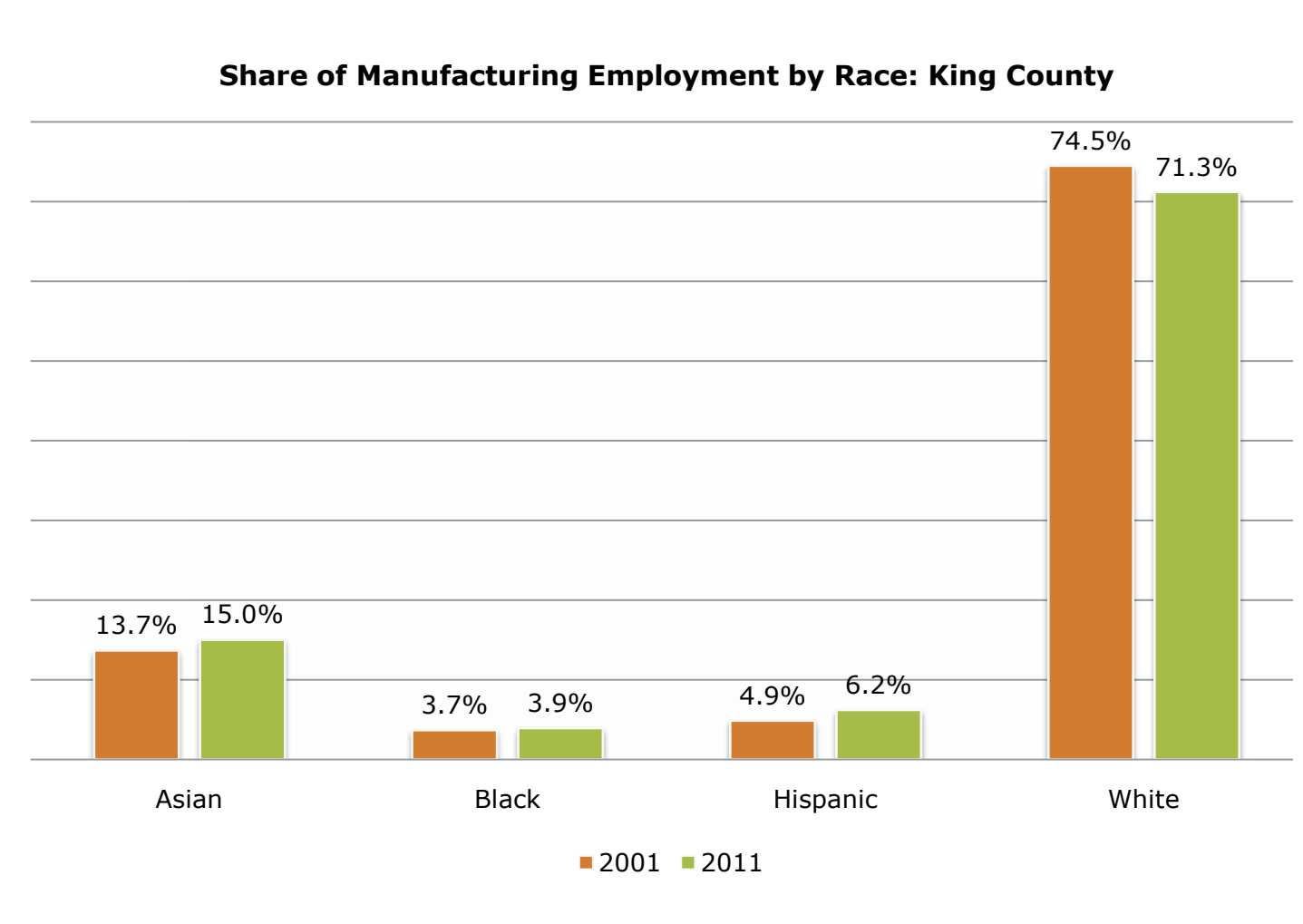
SOURCE: Washington Employment Security Department, BLS

TABLE 4. Washington Education Requirements for Top 20 Manufacturing Occupations, Ranked by Employment

Occupation	Jobs	Education Required
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	12070	High school diploma or equivalent
First-Line Supervisors/Managers of Production and Operating Workers	8046	Postsecondary non-degree award
Inspectors, Testers, Sorters, Samplers, and Weighers	7258	High school diploma or equivalent
Laborers and Freight, Stock, and Material Movers, Hand	6608	Less than high school
Aerospace Engineers	6286	Bachelor's degree
Team Assemblers	4713	High school diploma or equivalent
Industrial Engineers	4512	Bachelor's degree
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	4167	High school diploma or equivalent
Assemblers and Fabricators, All Other	4161	High school diploma or equivalent
Machinists	4024	High school diploma or equivalent
Logisticians	3952	Bachelor's degree
Welders, Cutters, Solderers, and Brazers	3907	High school diploma or equivalent
Shipping, Receiving, and Traffic Clerks	3886	High school diploma or equivalent
Purchasing Agents, Except Wholesale, Retail, and Farm Products	3815	High school diploma or equivalent
Electrical and Electronic Equipment Assemblers	3716	High school diploma or equivalent
Packaging and Filling Machine Operators and Tenders	3660	High school diploma or equivalent
Industrial Machinery Mechanics	3657	High school diploma or equivalent
Meat, Poultry, and Fish Cutters and Trimmers	3618	Less than high school
Helpers--Production Workers	3507	Less than high school
Industrial Truck and Tractor Operators	3083	Less than high school

SOURCE: Washington Employment Security Department, BLS

CHART 13



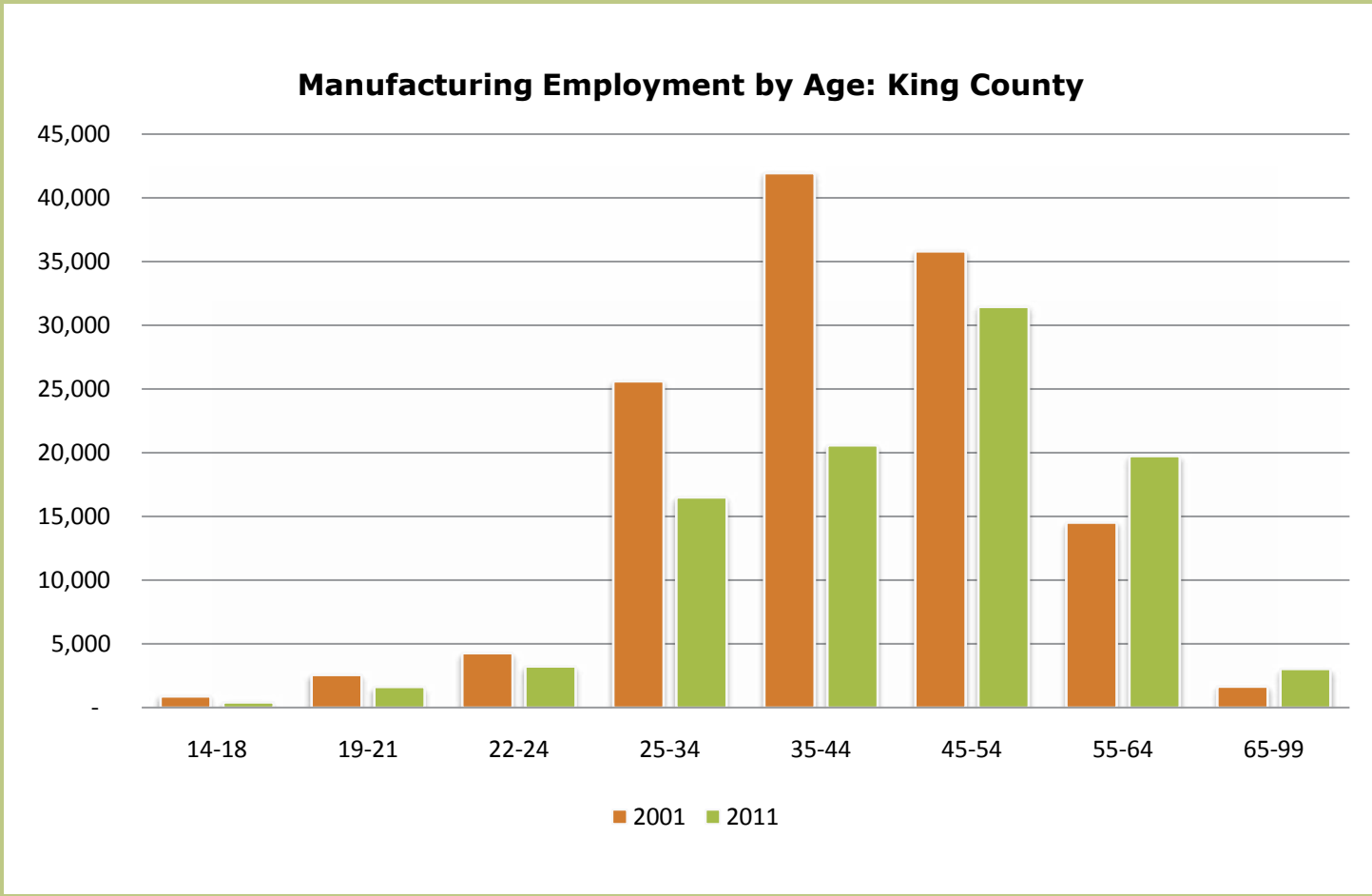
SOURCE: Quarterly Workforce Indicators

Demographic Characteristics of Workers

The manufacturing industry of King County is comprised primarily of white workers. As shown in **Chart 13**, nearly three-fourths of all manufacturing jobs are held by white workers. In 2011, the share of white employment actually decreased by 3.2% from its 2001 level while the share of Asian, black, and Hispanic employment all increased. The composition of the entire King County workforce does not differ much from its manufacturing workforce. As of 2011, 13% of the total workforce was made up of Asian workers, 5.4% were black, 6.9% were Hispanic, and 77.1% were white.[4]

4. QWI Washington County Pivot Reports, "King - Quarterly Workforce Indicators," < http://lehd.did.census.gov/led/datatools/ qwiapp.html> (August 2012).

CHART 14

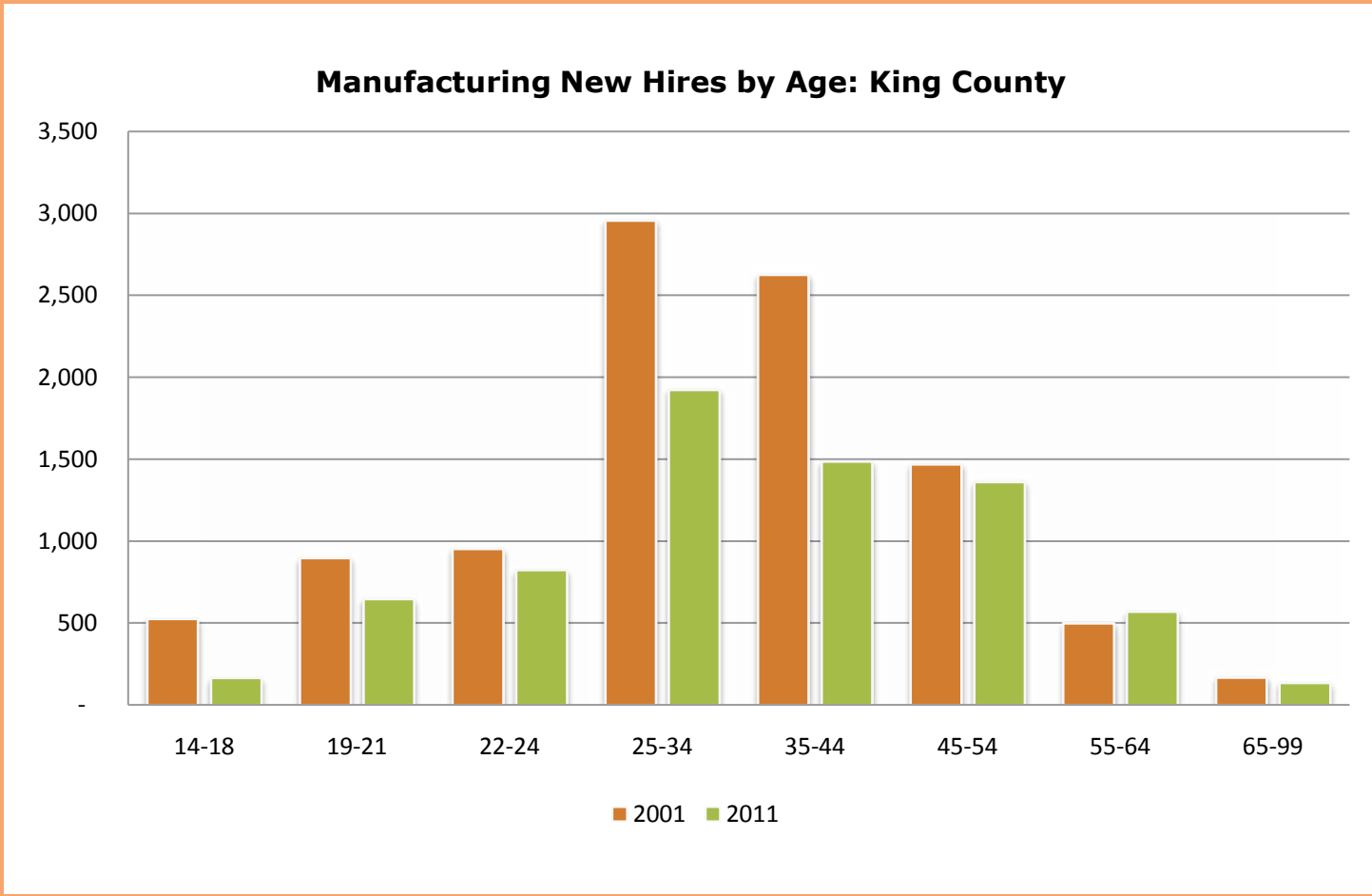


SOURCE: Quarterly Workforce Indicators

The age demographics of the manufacturing industry in King County provide an important observation for the future of the workforce. Every year since 2001 has seen a shift in the age ranges of the employed. **Chart 14** shows that workers in the industry are getting older and younger workers are not replenishing the gaps created by this movement. Workers aged 55 and up have seen an increase in employment over the past decade, while the other age ranges have experienced a decline. Most alarming is the decline in the 35-44 age group. It has declined by nearly half its 2001 employment levels.

Chart 15 supports the aging workforce dilemma within the current manufacturing climate of King County by showing the number of new hires employed by age group. In the younger age groups, specifically 25-34, the number of new hires has drastically declined over the last ten years. These are also the same age groups that have declined in total employment as well over the same period as shown in Chart 14. Conversely, the same trend in the aging demographics is not evident for

CHART 15

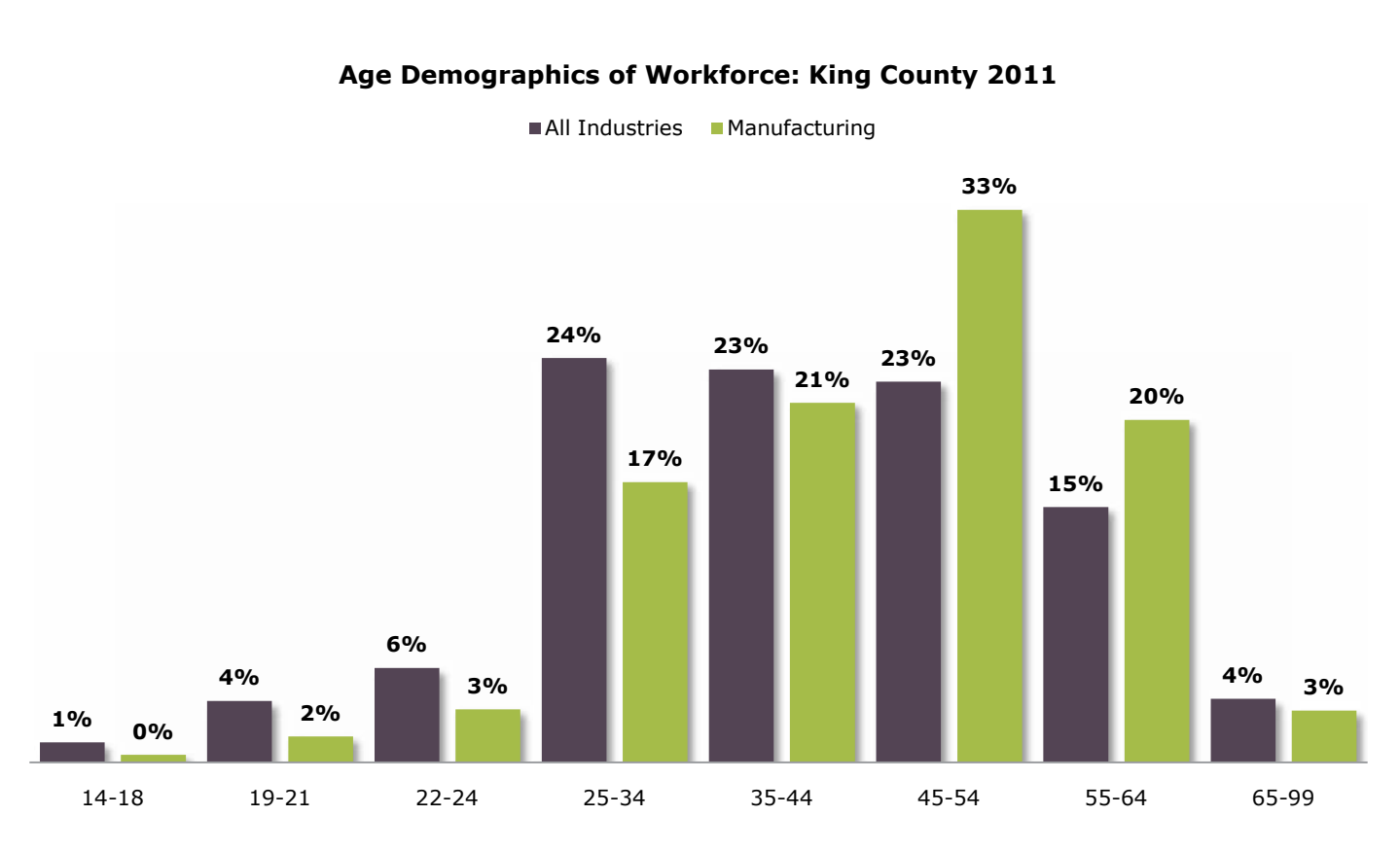


SOURCE: Quarterly Workforce Indicators

the King County workforce as a whole. It appears that the aging workforce dilemma is a prevalent problem facing the future of the King County manufacturing industry.

As illustrated by **Chart 16**, King County holds a larger percentage of its workforce in the 25-44 age ranges when compared to its manufacturing workforce alone. The manufacturing workforce of King County has the largest share of its workforce in the 45-54 age range (33%), while the entire county's workforce is primarily concentrated in the younger demographics of 25-34 (24%). With the resurgence of the manufacturing industry specifically, training new and younger workers will be crucial to keeping up with the booming growth of the industry in the foreseeable future.

CHART 16



SOURCE: Quarterly Workforce Indicators

MIDDLE-WAGE JOBS IN THE LOCAL MANUFACTURING SECTOR

The manufacturing industry's recent surge in the Seattle/King County area has not only led to more jobs, but also higher-paying jobs for its workforce. **Table 5** depicts the median hourly wages on a local and national level, ranked by the 20 manufacturing occupations with the highest levels of employment in King County as of the second quarter of 2011. Overall, the median wages of the combined manufacturing occupations within King County, at $20.95, are more than $2 higher than the national median wage for these occupations. And of the top 20 manufacturing occupations in King County, only three have median hourly wages that are lower than the median for the corresponding occupations nationally. Those occupations are aerospace engineers, logisticians, and electrical and electronic equipment assemblers. The median hourly wage of all occupations in King County is $23.87. This is almost three dollars more than the median hourly wage for all manufacturing occupations. The gap between manufacturing occupations and all occupations in King County is expected given the area's high concentration of well-paying jobs.

TABLE 5. Median Hourly Wage for Manufacturing Occupations with Highest Employment

Occupation	2011 Jobs	King	National
Total Manufacturing Occupations	85641	$20.95	$18.30
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	3166	$24.94	$22.22
First-Line Supervisors/Managers of Production and Operating Workers	2690	$29.13	$25.80
Inspectors, Testers, Sorters, Samplers, and Weighers	2216	$23.74	$16.36
Team Assemblers	2138	$14.93	$13.22
Aerospace Engineers	2043	$41.37	$49.24
Shipping, Receiving, and Traffic Clerks	1920	$16.61	$13.84
Industrial Engineers	1901	$37.59	$37.13
Logisticians	1688	$32.42	$34.57
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	1559	$25.77	$25.74
Purchasing Agents, Except Wholesale, Retail, and Farm Products	1522	$30.03	$27.68
Assemblers and Fabricators, All Other	1509	$14.42	$12.56
Laborers and Freight, Stock, and Material Movers, Hand	1498	$12.84	$11.42
Meat, Poultry, and Fish Cutters and Trimmers	1491	$11.10	$10.92
Machinists	1436	$21.28	$18.86
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	1230	$16.75	$14.29
Welders, Cutters, Solderers, and Brazers	1174	$20.61	$17.27
Bookkeeping, Accounting, and Auditing Clerks	1155	$19.18	$16.70
Electrical and Electronic Equipment Assemblers	1146	$13.80	$13.96
Mechanical Engineers	1116	$38.81	$38.09
Packers and Packagers, Hand	1116	$10.93	$9.55

SOURCE: Washington State Employment Security Department, EMSI, Bureau of Labor Statistics

TABLE 6. King County Manufacturing Middle-Wage Jobs Occupations (as of 2nd Quarter 2011)

Occupation	Jobs	Median Hourly Wage	Education Attainment	Education Required	OTJ Training
First-Line Supervisors/Managers of Production and Operating Workers	2690	$29.13	Work experience in a related occupation	Postsecondary non-degree award	None
General and Operations Managers	969	$60.53	Bachelor's or higher degree, plus work experience	Associate's degree	None
Aircraft Mechanics and Service Technicians	803	$26.54	Postsecondary vocational award	Postsecondary non-degree award	None
Industrial Engineering Technicians	734	$29.45	Associate's degree	Associate's degree	None
Mechanical Drafters	674	$30.48	Postsecondary vocational award	Associate's degree	None
Semiconductor Processors	503	$18.69	Postsecondary vocational award	Associate's degree	Moderate
Electrical and Electronic Engineering Technicians	386	$26.67	Associate's degree	Associate's degree	None
Avionics Technicians	360	$20.37	Postsecondary vocational award	Postsecondary non-degree award	None
Mechanical Engineering Technicians	335	$27.18	Associate's degree	Associate's degree	None
Aerospace Engineering and Operations Technicians	310	$27.23	Associate's degree	Associate's degree	None
Engineering Technicians, Except Drafters, All Other	273	$31.57	Associate's degree	Associate's degree	None
Electrical and Electronics Repairers, Commercial and Industrial Equipment	261	$32.60	Postsecondary vocational award	Postsecondary non-degree award	Long
Electrical and Electronics Drafters	188	$31.48	Postsecondary vocational award	Associate's degree	None
Electrical and Electronics Installers and Repairers, Transportation Equipment	109	$21.88	Postsecondary vocational award	Postsecondary non-degree award	Long
Electro-Mechanical Technicians	102	$28.24	Associate's degree	Associate's degree	None
Drafters, All Other	96	$27.62	Postsecondary vocational award	Associate's degree	None
Commercial Pilots	86	$27.46	Postsecondary vocational award	Postsecondary non-degree award	None
Medical Equipment Repairers	64	$25.35	Associate's degree	Associate's degree	Moderate
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	63	$26.94	Postsecondary vocational award	Postsecondary non-degree award	Long

SOURCE: EMSI, Bureau of Labor Statistics

TABLE 6. King County Manufacturing Middle-Wage Jobs Occupations (as of 2nd Quarter 2011), *cont'd*

Occupation	Jobs	Median Hourly Wage	Education Attainment	Education Required	OTJ Training
Private Detectives and Investigators	62	$24.33	Work experience in a related occupation	Some college, no degree	Moderate
Fire Fighters	54	$35.24	Long-term on-the-job training	Postsecondary non-degree award	Long
Environmental Engineering Technicians	39	$27.97	Associate's degree	Associate's degree	None
Paralegals and Legal Assistants	28	$25.62	Associate's degree	Associate's degree	None
Registered Nurses	26	$37.63	Associate's degree	Associate's degree	None
Desktop Publishers	23	$22.54	Postsecondary vocational award	Associate's degree	Short
Agricultural and Food Science Technicians	22	$21.71	Associate's degree	Associate's degree	None
Electric Motor, Power Tool, and Related Repairers	20	$20.46	Postsecondary vocational award	Postsecondary non-degree award	Long
Precision Instrument and Equipment Repairers, All Other	16	$27.29	Moderate-term on-the-job training	Associate's degree	Long
First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	13	$46.23	Work experience in a related occupation	Postsecondary non-degree award	None
Radio Mechanics	10	$20.13	Postsecondary vocational award	Associate's degree	Moderate
Architectural and Civil Drafters	8	$20.96	Postsecondary vocational award	Associate's degree	None
Civil Engineering Technicians	7	$26.88	Associate's degree	Associate's degree	None
Library Technicians	6	$19.61	Postsecondary vocational award	Postsecondary non-degree award	None
Computer, Automated Teller, and Office Machine Repairers	6	$18.83	Postsecondary vocational award	Postsecondary non-degree award	None
Telecommunications Equipment Installers and Repairers, Except Line Installers	6	$28.29	Postsecondary vocational award	Postsecondary non-degree award	Moderate
Environmental Science and Protection Technicians, Including Health	3	$22.31	Associate's degree	Associate's degree	Moderate
Sound Engineering Technicians	3	$26.31	Postsecondary vocational award	Postsecondary non-degree award	Short
Audio and Video Equipment Technicians	2	$19.89	Postsecondary vocational award	Postsecondary non-degree award	Short

SOURCE: EMSI, Bureau of Labor Statistics

Table 6 depicts the middle-wage jobs within the manufacturing industry of King County, ranked by employment as of the second quarter of 2011. Seattle Jobs Initiative defines middle-wage jobs as those that require some training beyond high school, but less than a bachelor's degree, and that pay at least $17 per hour. First-line supervisors/managers of production and operating workers is the most saturated middle-wage manufacturing occupation at 2,690 jobs and a median hourly wage of $29.13. The majority of incumbent workers within this occupation have achieved their skill set through work experience in a related field along with a postsecondary non-degree award. In fact, of the 38 middle-wage occupations in the local manufacturing industry, 15 require a postsecondary award and 22 require an associate's degree. Only one middle-wage occupation, private detectives and investigators, requires some college and no degree. While most of the sector's middle-wage occupations require a degree or postsecondary award of some kind, there are several where the actual educational attainment of incumbent workers is less than the requirements. This could indicate that in some instances, employers prefer work experience over education when hiring employees. Mechanical drafters, semiconductor processors, electrical and electronics drafters, and desktop publishers are a few examples of occupations requiring an associate's degree while the actual average educational attainment of incumbent workers is only a postsecondary vocational award.

TABLE 7. Manufacturing Share of Middle-Wage Jobs in King County by Subsector (as of 2nd Quarter 2011)

Subsector	Middle-Wage Jobs	% Middle-Wage Jobs
Transportation Equipment Manufacturing	4900	52.4%
Computer and Electronic Product Manufacturing	1389	14.8%
Food Manufacturing	518	5.5%
Fabricated Metal Product Manufacturing	474	5.1%
Machinery Manufacturing	472	5.0%
Miscellaneous Manufacturing	357	3.8%
Printing and Related Support Activities	203	2.2%
Nonmetallic Mineral Product Manufacturing	188	2.0%
Plastics and Rubber Products Manufacturing	143	1.5%
Electrical Equipment, Appliance, and Component Manufacturing	127	1.4%
Furniture and Related Product Manufacturing	109	1.2%
Beverage and Tobacco Product Manufacturing	88	0.9%
Textile Product Mills	85	0.9%
Chemical Manufacturing	78	0.8%
Apparel Manufacturing	73	0.8%
Paper Manufacturing	62	0.7%
Wood Product Manufacturing	42	0.4%
Primary Metal Manufacturing	36	0.4%
Leather and Allied Product Manufacturing	12	0.1%
Petroleum and Coal Products Manufacturing	4	0.0%
Textile Mills	0	0.0%

SOURCE: EMSI, Washington State Employment Security Department, BLS

In conjunction with the middle-wage jobs occupations established by Table 6, **Table 7** shows the share of middle-wage jobs within the 21 manufacturing subsectors. Over half (52.4%) of the sector's middle-wage jobs in King County are located in the Transportation and Equipment Manufacturing subsector. Computer and Electronic Product Manufacturing ranks second with a 14.8% share of the sector's middle-wage jobs in King County. Given that these two subsectors comprise over 67% of King County's middle-wage manufacturing jobs, efforts should be made within the workforce community to train potential workers in these occupations.

It is not only important to identify the top employed middle-wage job occupations, but also the most productive. This methodology, described earlier, provides a more accurate outlook of which occupations are growing in terms of employment and advancements in capital production. Sectors with high levels of employment and declining levels of output may cut wages to compensate for production losses. Likewise, sectors with high levels of output and low levels of employment are becoming so technologically advanced in their production processes that jobs will be harder to obtain. The Computer and Electronic Product Manufacturing subsector ranks first in productivity advances with a 97% decrease in its employment-output ratio from 1997-2010. Even though the subsector has decreased its employment by 43% (14,664 jobs) in Washington State over that time, it remains one of the most prominent areas for middle-wage jobs in King County. This result indicates a healthy opportunity for jobseekers and workers to pursue. Transportation Equipment Manufacturing has experienced a modest increase in productivity gains with a 26% decrease in its employment-output ratio. It continues to be the leader in the state's manufacturing employment while increasing its productivity gains. While the transportation subsector has experienced an increase in productivity due to advances in technology, there are still many occupations that are labor intensive and therefore require higher employment levels than other subsectors.

OPPORTUNITIES FOR TRAINING: SUPPLY AND DEMAND

It is evident that over the last 20 years or better that Washington State's manufacturing industry employment has declined while its output has increased. In light of this phenomenon, a skills gap has emerged between available jobs and qualified workers. The industry's surge of higher productivity levels has led to a more highly-skilled and educated manufacturing workforce, sharply reducing the need for the so-called "blue-collar" workers that were so prevalent in years past. Technological advances have nearly eliminated the need for labor intensive jobs to exist in the modern manufacturing world. To enter the manufacturing workforce of today, training beyond high school is necessary to be competitive. However, developing a highly-skilled and highly-trained workforce in manufacturing has proven to be challenging and has contributed to the growing skills gap facing King County manufacturers.[5]

In trying to capture the skills gap outlook for the manufacturing industry of King County, this research uses EMSI (Economic Modeling Specialists Inc.) to measure the shortage or surplus of manufacturing workers within the region. Demand is calculated as the projected job openings over the next five-year period. Supply is calculated as the number of students that complete specific instructional programs in King County consistent with the SJI definition of middle-wage jobs as described previously. The data for regional completions is gathered from the IPEDS (Integrated Postsecondary Education Data System) by EMSI and it only includes education/training from King County colleges, technical institutes, and vocational schools. It does not include any information on students who complete any union-affiliated apprenticeship programs within the county.

When looking at the following tables, it is important to keep in mind that a fraction of the supply pool will come from apprenticeship programs, but it is not quantified in the data analysis. It is also worth noting that there are currently 7,000 unemployed workers in King County and there are certainly a fraction of those that will re-enter the manufacturing workforce; however, it is difficult to quantify that fraction. Another caveat to calculating supply is the assumption that all completers of a program in a given area will work in that same area. This, of course, is not always the case and there is no real way to account for this movement of labor. While there may very well be an overall shortage of workers even when including the unemployed and union apprenticeship completers, the supply numbers displayed in Table 8 are lower than the actual supply of workers due to the exclusion of those variables.

Table 8 displays the results of the above-mentioned skills gap analysis for the top 20 (in terms of employment) manufacturing occupations of King County. Over the next five-year period, the combined occupations are facing a shortage of 1,972 workers. Of the top 20 manufacturing occupations in King County, laborers and freight, stock, and material movers have the lowest supply

5. Emily Stover DeRocco. "Executive Brief: Producing a High-Performance Manufacturing Workforce," The Manufacturing Institute (August 2012).

of workers relative to demand, with a shortage of 759 jobs. However, the skill requirements for this occupation are less than a high school diploma and the supply is not actually zero given that most new hires will be coming from the unemployment pool. Specifically analyzing the manufacturing occupations requiring some education or training beyond high school, first-line supervisors/managers of production and operating workers and logisticians have the lowest supply of workers relative to demand, with a shortage of 78 and 75 jobs, respectively. Conversely, mechanical engineers hold the

TABLE 8. Annual Salary and Demand for Top 20 Manufacturing Occupations, Ranked by Employment, King County

Occupation	Demand	Supply	Shortage or Surplus	Education Requirements
Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	144	0	-144	High school diploma or equivalent
First-Line Supervisors/Managers of Production and Operating Workers	85	7	-78	Postsecondary non-degree award
Inspectors, Testers, Sorters, Samplers, and Weighers	113	0	-113	High school diploma or equivalent
Team Assemblers	255	0	-255	High school diploma or equivalent
Aerospace Engineers	97	92	-5	Bachelor's degree
Shipping, Receiving, and Traffic Clerks	209	241	32	High school diploma or equivalent
Industrial Engineers	141	101	-40	Bachelor's degree
Logisticians	94	19	-75	Bachelor's degree
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	765	470	-295	High school diploma or equivalent
Purchasing Agents, Except Wholesale, Retail, and Farm Products	188	0	-188	High school diploma or equivalent
Assemblers and Fabricators, All Other	106	0	-106	High school diploma or equivalent
Laborers and Freight, Stock, and Material Movers, Hand	759	0	-759	Less than high school
Meat, Poultry, and Fish Cutters and Trimmers	74	0	-74	Less than high school
Machinists	78	52	-26	High school diploma or equivalent
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	33	52	19	High school diploma or equivalent
Welders, Cutters, Solderers, and Brazers	96	234	138	High school diploma or equivalent
Bookkeeping, Accounting, and Auditing Clerks	506	634	128	High school diploma or equivalent
Electrical and Electronic Equipment Assemblers	53	2	-51	High school diploma or equivalent
Mechanical Engineers	118	203	85	Bachelor's degree
Packers and Packagers, Hand	165	0	-165	Less than high school
Total	**4,079**	**2,107**	**-1,972**	

SOURCE: EMSI, Washington State Employment Security Department, BLS

highest supply of workers relative to demand, with a surplus of 85 workers. These jobs are likely to be more competitive given that the supply of talent is plentiful for employers from which to choose.

Table 9 depicts the annual supply and demand for the top 15 manufacturing middle-wage jobs in King County, ranked by employment. Most of these occupations are not straying too far from equilibrium; however, there are a few significant spikes in the supply of workers. Notably, the demand for general and operations managers is projected to be 464 jobs over the next five-year period while the supply is 2,966 workers as of 2010, leading to an overall surplus of 2,502 jobs. The surplus of these workers is likely to cause fierce competition for jobs and high unemployment within this occupation over the next five-year period. Electrical and electronics installers and repairers (transportation equipment) occupations are also producing a large supply of workers compared to a very small projected demand over the next five-year period. Community colleges, technical institutes, and other workforce providers should consider steering students away from training for occupations toward training for occupations in need of a talented supply pool.

TABLE 9. Annual Supply and Demand for Top 15 Middle-Wage Manufacturing Occupations Ranked by 2011 Q2 Employment, King County

Occupation	Demand (Avg. Annual Openings, 2013-2018)	Supply (Regional Completions, 2010)	Shortage or Surplus
First-Line Supervisors/Managers of Production and Operating Workers	85	7	-78
General and Operations Managers	464	2966	2502
Aircraft Mechanics and Service Technicians	64	0	-64
Industrial Engineering Technicians	32	45	13
Mechanical Drafters	32	9	-23
Semiconductor Processors	6	2	-4
Electrical and Electronic Engineering Technicians	37	69	32
Avionics Technicians	10	0	-10
Mechanical Engineering Technicians	16	2	-14
Aerospace Engineering and Operations Technicians	7	1	-6
Engineering Technicians, Except Drafters, All Other	31	5	-26
Electrical and Electronics Repairers, Commercial and Industrial Equipment	16	17	1
Electrical and Electronics Drafters	17	0	-17
Electrical and Electronics Installers and Repairers, Transportation Equipment	4	523	519
Electro-Mechanical Technicians	5	1	-4

SOURCE: EMSI, Washington State Employment Security Department, BLS

In the manufacturing sector, training efforts should be focused on jobs like mechanical drafters, aircraft mechanics and service technicians, engineering technicians, and electrical and electronics drafters – middle-wage jobs which have a projected demand that will exceed the supply of workers over the next five-year period. The majority of the jobs for these occupations are located within the Transportation Equipment Manufacturing subsector of the King County manufacturing industry. Fortunately, this is the top-employed subsector and is projected to increase its jobs by 7% over the next 10-year period as depicted previously in Table 2. The Transportation Equipment Manufacturing subsector is also efficient in terms of increases in production effectiveness as previously illustrated by Chart 9 with an employment-output ratio decrease of 32% from 1997-2010.

While there are caveats to the supply and demand analysis, the overall projected shortage of qualified workers is on par with the perception of local employers. In a 2011 job sector survey conducted by the Seattle Metropolitan Chamber of Commerce, many employers in Seattle and around the Puget Sound Region were asked to give their perception of the economic conditions and challenges facing their companies. Of the manufacturing employers surveyed, 70% value vocational training and higher education equally as much for their employees. All other sectors surveyed valued higher education more than vocational training for their employees. In addition, 1 in 4 employers said they had to recruit outside of the county in an effort to find qualified workers[6].

Current education and training programs offered for middle-wage jobs in the manufacturing sector in King County are shown in **Table 10**. There are several community colleges and technical institutes offering a wide range of awards for students to pursue careers in middle-wage occupations in King County. Most notably, automotive, business, and electrical technology programs are offered in at least five community and technical colleges within King County.

6. Alison Peters, "Job Sector Survey: Puget Sound Business Barometer, 2011," The Seattle Metropolitan Chamber of Commerce (January 2012): 13 http://www.seattlechamber.com/Libraries/Reports_PDF/JSSReport2011.sflb.ashx (September 2012).

TABLE 10. Middle-Wage Job Program Offerings by Institution, King County

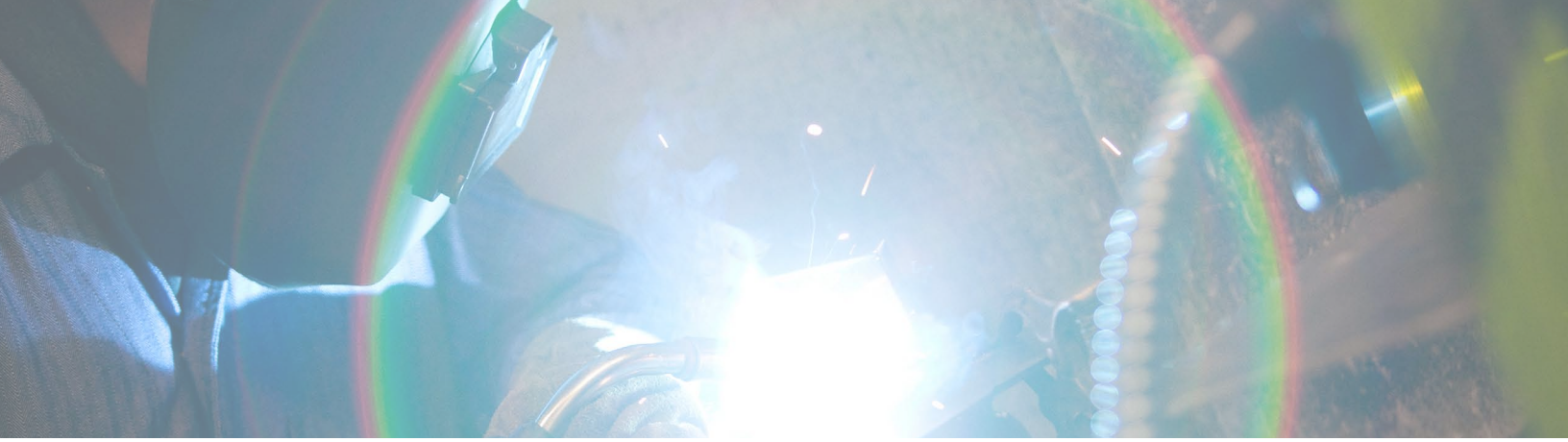
Program	Institution	Award Level
Automobile/Automotive Mechanics Technology/ Technician	Shoreline Community College	Associate's degree
		Award of at least 1 but less than 2 academic years
		Award of less than 1 academic year
	Green River Community College	Associate's degree
		Award of less than 1 academic year
	Lake Washington Technical College	Associate's degree
		Award of at least 1 but less than 2 academic years
	Seattle Community College-South Campus	Associate's degree
		Award of less than 1 academic year
		Award of at least 2 but less than 4 academic years
	Renton Technical College	Award of at least 2 but less than 4 academic years
		Associate's degree
Business Administration and Management, General	Seattle Community College-North & South Campus	Associate's degree
	Highline Community College	
	Bellevue College	Associate's degree
		Award of less than 1 academic year
	Shoreline Community College	Associate's degree
		Award of less than 1 academic year
Business/Commerce, General	Bellevue College	Associate's degree
	Seattle Community College-South Campus	
	Highline Community College	
	Shoreline Community College	
	Cascadia Community College	
	Green River Community College	
	Seattle Community College-North Campus	
Computer Installation and Repair Technology/Technician	Seattle Vocational Institute	Award of at least 1 but less than 2 academic years
Electrical/Electronic/ Communications Engr Technology/Technician	Lake Washington Technical College	Associate's degree
	Renton Technical College	
	ITT Technical Institute-Seattle	
	DeVry University-Washington	
	Seattle Community College-North Campus	Associate's degree
		Award of at least 1 but less than 2 academic years
		Award of less than 1 academic year

SOURCE: EMSI, National Center for Education Statistics

TABLE 10. Middle-Wage Job Program Offerings by Institution, King County, *cont'd*

Program	Institution	Award Level
Entrepreneurship/ Entrepreneurial Studies	Bellevue College	Award of less than 1 academic year
	Lake Washington Technical College	Award of less than 1 academic year
Industrial Electronics Technology/Technician	Seattle Community College-North Campus	Associate's degree
		Award of at least 1 but less than 2 academic years
Industrial Production Technologies/ Technicians, Other	Seattle Community College-North Campus	Associate's degree
International Business/Trade/ Commerce	Seattle Community College-North Campus	Associate's degree
	Highline Community College	Associate's degree
		Award of at least 1 but less than 2 academic years
	Shoreline Community College	Award of less than 1 academic year
Manufacturing Technology/ Technician	Renton Technical College	Associate's degree
	Shoreline Community College	Award of less than 1 academic year
Mechanical Drafting and Mechanical Drafting CAD/CADD	Seattle Community College-North & South Campus	Associate's degree
	Green River Community College	Award of at least 1 but less than 2 academic years
	Lake Washington Technical College	Award of at least 1 but less than 2 academic years
Mechanical Engineering/ Mechanical Technology/ Technician	Green River Community College	Associate's degree
Operations Management and Supervision	Seattle Community College-South Campus	Associate's degree
		Award of at least 2 but less than 4 academic years
		Award of less than 1 academic year
	Seattle Community College-North Campus	Award of less than 1 academic year

SOURCE: EMSI, National Center for Education Statistics



INDUSTRY CERTIFICATION TO MEET INCREASING SKILLS DEMANDS

The effect of the above-mentioned skills gap on the supply and demand of jobs within the manufacturing industry of King County has been challenging to reduce. Even with an unemployment rate as high as 10% in 2012, King County manufacturers are having difficulty filling jobs with qualified workers.[7] In the aftermath of the Great Recession, workers of all types (old, young, mid-career, ESL, high school drop outs, etc.) seek to find a job that allows them to be self-sufficient. If workers attain that goal through efforts made by the local community to produce a higher-skilled workforce, it will only make the economy stronger. Once workers are trained and employed in the workforce, they can contribute a return on investment to the local economy as high as $10.45 per dollar spent on training.[8] King County has made significant strides in bridging this skills gap in manufacturing through more efficient, industry-specific certification processes. The Center for Advanced Manufacturing Puget Sound (CAMPS) is a resource center devoted to bringing together manufacturers, supply chain partners, pre-qualified business development specialists, and strategic partners in the Puget Sound region. CAMPS defines advanced manufacturing as:

"…The integration of technology based systems and processes in the production of products (fit, form, and function) to the highest level of quality and in compliance with industry specific certification standards. Products and processes are often innovative, made from advanced materials and components, and produced on technology driven equipment and processes. Paramount to Advanced Manufacturing is a highly skilled workforce operating in lean and continuous improvement cultures. The goal of Advanced Manufacturing companies is to continue to strive to be the "best in class", focused on high performance, with constant awareness of customer expectations."[9]

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7. Economic Modeling Specialists, Inc., King County: Unemployment by Industry, https://west.economicmodeling.com/analyst/ ?session_tab=702c9a5886ef5d94f4c45eb423ead355#module=economy&section=my_economy (September 2012).
8. Marlena Sessions, "Closing the skills gap requires a push from business leaders," Puget Sound Business Journal (March 2012): 28. http://www.nationalskillscoalition.org/press-room/in-my-opinion/2012-articles/psbusinessjournal_2012-03-02.pdf
9. Center for Advanced Manufacturing Puget Sound, Advanced Manufacturing, http://www.camps-us.com/about-camps/advanced-manufacturing/ (August 2012).

Two of the most important characteristics of advanced manufacturing are technological innovation and a highly-skilled workforce. The introduction of CNC programming (computer numerical control) has revolutionized the automation processes present in many manufacturing subsectors today. Other innovations like robotics, lasers, and plasmas have also contributed to the movement away from labor intensive manufacturing processes to more advanced and efficient ones. The ability of the manufacturing industry to continuously improve its production processes through technological innovation has inadvertently led to an increasing demand for a highly-skilled workforce.[10] And the demand for workers has outpaced supply. This skills gap has been a growing concern for manufacturers everywhere. To compensate for the shortage of skilled workers, manufacturers are paying overtime to current employees, subcontracting work out, hiring temporary employees, and in some instances even turning away business.[11]

In Washington, efforts have been made to help bridge this gap by implementing the NAM-Endorsed Certification System. In 2009, the Manufacturing Institute, an affiliate of the National Association of Manufacturers (NAM), began an initiative to implement the NAM-Endorsed Certification System in Shoreline Community College. The main focus of this certification system is to allow the individual to work and learn through short-term training options that are linked to certifications, continually improve skills, and construct skill sets that lead to promotion and wage increases.[12]

The NAM-Endorsed Certification System is comprised of five industry-based certifications. They are: the National Career Readiness Certificate (NCRC), Manufacturing Skills Standards Council (MSSC) Production Technician Certification, National Institute of Metalworking Skills (NIMS), American Welding Society (AWS), and Society of Manufacturing Engineers (SME).[13] The Shoreline program specifically focuses on the NIMS machining certification. NIMS includes specialties in CAM, CNC programming, and rapid prototyping. Shoreline is the first college in Washington to earn the NIMS accreditation and the results have been promising. Since the onset of its NIMS accreditation, Shoreline has had 52 students complete the CNC Machinist program. All of those students took the assessment and achieved certification at the basic level. Of those who have graduated from the program, 100% are employed. The results of the NIMS certification program at Shoreline have shed light on some positive externalities of the program. Most notably, the program was able to provide students with good paying jobs, work closely with manufacturers as partners, and also create new curriculum to meet industry needs. Though the program was widely successful, there were some challenges that arose as well – most notably, the cost for updated equipment and working with the manufacturing industry to promote the value of certifications. While the program is desirable, interest in the program is negatively impacted by its cost.[14]

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10. Ibid.
11. Center for Advanced Manufacturing Puget Sound, Workforce Development Tool Box, http://www.camps-us.com/manufacturers-tools/workforce-development-programs/ (August 2012).
12. Workforce Training and Education Coordinating Board, "Status of Manufacturing Skills Certification in Washington," Report prepared for National Association of Manufacturers/The Manufacturers Institute, December 2011. p. 5.
13. Ibid., p. 10.
14. Op. cit., Workforce Training and Education Coordinating Board, pp. 20-21.

In addition to the NIMS certification offered by Shoreline, Lake Washington Institute of Technology and Green River Community College both offer the MSSC Production Technician Certification. As of yet, neither of these colleges has reported that students who completed the training program have taken the assessment to obtain certification. There is ample interest in this certification, however, and it is expected to grow over the next year.[15]

The American Welding Society (AWS) certification is currently offered by many colleges around the state. However, the WABO (Washington Association of Building Officials) is a carbon copy of the AWS certification and is specific to Washington State. This has become problematic because most colleges offer the AWS certification, but the WABO certification is needed for welders who plan to stay in state. The only true difference between the two certifications is that WABO only certifies steel while AWS certifies stainless, aluminum, and mild steel welding. There is a need from Washington's strong aerospace industry and other advanced technology industries for certified welders in aluminum and stainless steel in addition to steel (WABO) certifications. Colleges around the state are considering setting up advanced welding programs, e.g,. Everett Community College, to help meet this need.[16]

As well as the NAM-Endorsed Certification System implemented by the Manufacturing Institute, efforts have been made by the Manufacturing Industrial Council (MIC), Impact Washington, and the abovementioned CAMPS to promote a more highly-skilled, highly-trained manufacturing workforce within King County. Through education partnerships with local and state educators (Seattle Public Schools, Puget Sound Skills Center, and Real Green), the MIC has developed programs to develop a motivated and qualified manufacturing workforce.[17] The MIC has also developed job training programs, SODO Inc. and Green Light, in an effort to assist the adult and youth populations that have barriers to succeeding in traditional education settings.[18] Impact Washington is a non-profit organization that focuses on strengthening Washington manufacturers to make them more globally competitive. The workforce development component of the organization specifically focuses on a training program called Training within Industry (TWI). TWI provides the essential skills needed by supervisors and team leaders to make a real difference in productivity and profitability.[19] Efforts made by all of these organizations will certainly help to bridge the gap between the workforce supply and industry demand that exists in the current labor market climate.

15. Op. cit., Workforce Training and Education Coordinating Board, p. 19.
16. Op. cit., Workforce Training and Education Coordinating Board, pp. 21-22.
17. Manufacturing Industrial Council, Education Partnerships, http://www.micouncil.org/education.php (September 2012).
18. Manufacturing Industrial Council, Job Training Programs, http://www.micouncil.org/jobtraining.php (September 2012).
19. Impact Washington, Workforce Development, http://impactwashington.org/develop-your-people/workforce-development (October 2012).

CONCLUSION

Ultimately, the manufacturing industry of King County is one of the strongest in the nation and will continue to perform well in the long-term. There has been significant job growth since the end of the recession and that trend will continue over the next 10-year period. The state has experienced increasing levels of output in most of the manufacturing subsectors over time due to the advances made in manufacturing technology production processes. In terms of education, the King County manufacturing workforce is well-educated in comparison to the rest of the state. Because of the many occupations offered within the transportation subsector of manufacturing, King County has many middle-wage job occupations to offer its workforce. Attaining those occupations can help to bring individuals out of poverty through living-wage careers, which is also indisputably better for the local economy in the long-term.

Though there are many positive signs for the manufacturing industry moving forward, there are pressing issues that need to be addressed to ensure that the manufacturing surge of late is not simply a bubble waiting to burst. Employing efforts to train young, skilled workers are necessary to combat the current aging manufacturing workforce of King County. Additionally, training and certification programs like the NAM-Endorsed Certification System will help to bridge the gap between the demand and supply of workers over the long-term. Addressing these issues head on will surely help to maintain the strong manufacturing presence here in King County, Washington.