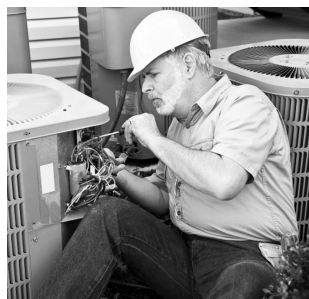# 2016 LABOR MARKET AND ECONOMIC REPORT

U.S. economy
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Employment Security Department
WASHINGTON STATE

Labor Market and Performance Analysis
May 2017

2016 Labor Market and Economic Report

Contents

Labor market fast facts

Fast facts 1. Labor force and unemployment, not seasonally adjusted
Washington state, annual data of selected years for the period from 1990 to September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics

Year	Labor force	Employed	Unemployed	Unemployment rate
1990	2,525,326	2,392,891	132,435	5.2%
1995	2,811,332	2,630,220	176,600	6.3%
2000	3,059,338	2,901,492	157,847	5.2%
2005	3,263,703	3,082,399	181,304	5.6%
2006	3,323,938	3,156,626	167,312	5.0%
2007	3,403,164	3,243,308	159,855	4.7%
2008	3,478,577	3,291,309	187,268	5.4%
2009	3,535,200	3,211,649	323,551	9.2%
2010	3,511,325	3,160,544	350,782	10.0%
2011	3,461,428	3,140,190	321,238	9.3%
2012	3,472,727	3,190,421	282,306	8.1%
2013	3,464,760	3,220,860	243,900	7.0%
2014	3,492,865	3,278,975	213,891	6.1%
2015	3,544,242	3,343,992	200,250	5.7%
2016 January through September*	3,626,486	3,418,750	207,736	5.7%

*2016 data is averaged for nine months.

Fast facts 2. Labor force and unemployment, not seasonally adjusted
Washington state metropolitan areas, January to September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics

Metropolitan area	Labor force	Employed	Unemployed	Unemployment rate
Washington state	**3,626,486**	**3,418,750**	**207,736**	**5.7%**
Bellingham	105,117	98,506	6,611	6.3%
Bremerton	117,670	110,754	6,916	5.9%
Kennewick-Pasco-Richland	134,650	125,345	9,305	6.9%
Longview-Kelso	45,413	42,001	3,412	7.5%
Mount Vernon-Anacortes	58,219	54,204	4,016	6.9%
Olympia	128,917	121,156	7,761	6.0%
Seattle-Bellevue-Everett MD*	1,614,390	1,541,335	73,055	4.5%
Spokane	255,847	238,600	17,248	6.7%
Tacoma MD* (Pierce)	403,590	377,677	25,914	6.4%
Wenatchee	64,941	60,777	4,164	6.4%
Yakima	125,400	115,262	10,138	8.1%

*Metropolitan Division

Fast facts 3. Projected industry average annual growth rates
Washington state, 2014 to 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics

NAICS	Industry sector	2015 Q2 to 2017 Q2	2014 to 2019	2019 to 2024
	Total nonfarm	**1.7%**	**1.8%**	**1.3%**
22, 48, 49	Transportation, warehousing and utilities	2.0%	2.0%	0.6%
23	Construction	2.2%	3.0%	0.6%
31-33	Manufacturing	-0.5%	0.0%	0.2%
42	Wholesale trade	2.4%	2.0%	1.0%
44-45	Retail trade	1.6%	1.9%	1.0%
51	Information	2.9%	2.5%	2.3%
52	Financial activities	0.7%	0.6%	0.3%
54-56	Professional and business services	3.1%	3.1%	2.5%
61-62	Education and health services	2.2%	2.1%	1.9%
71-72	Leisure and hospitality	2.0%	2.0%	1.6%
GOV	Government	1.2%	1.2%	0.9%

Fast facts 4. Wages and employment by industry
Washington state, 2015 annual averages (revised)
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

NAICS	Industry sector	Average number of firms	Total wages paid	Average employment	Average weekly wage
	Total	**214,868**	**$176,932,043,718**	**3,123,684**	**$1,089**
11	Agriculture, forestry, fishing and hunting	7,378	$2,912,083,324	102,547	$546
21	Mining	158	$157,774,702	2,340	$1,297
22	Utilities	228	$449,846,994	4,848	$1,784
23	Construction	22,978	$9,267,327,073	162,800	$1,095
31-33	Manufacturing	7,140	$21,241,882,432	287,595	$1,420
42	Wholesale trade	13,402	$9,441,681,407	130,189	$1,395
44-45	Retail trade	14,854	$13,391,193,398	349,640	$737
48-49	Transportation and warehousing	4,515	$4,935,057,749	90,812	$1,045
51	Information	3,304	$17,107,664,678	113,670	$2,894
52	Finance and insurance	5,660	$7,880,340,216	91,666	$1,653
53	Real estate, rental and leasing	6,600	$2,242,254,675	47,722	$904
54-55	Professional, scientific and technical services	22,807	$15,587,938,734	182,009	$1,647
55	Management of companies and enterprises	639	$4,542,854,344	41,890	$2,086
56	Admin. and support and waste mgmt. and remediation svcs.	11,391	$7,153,378,439	155,730	$883
61	Educational services	3,089	$1,489,853,759	39,796	$720
62	Healthcare and social assistance	54,024	$18,496,470,493	389,735	$913
71	Arts, entertainment and recreation	2,711	$1,452,356,990	47,604	$587
72	Accommodation and food services	13,877	$5,262,508,925	257,320	$393
81	Other services (except public administration)	17,986	$3,353,392,645	92,090	$700
GOV	Government	2,126	$30,566,182,741	533,684	$1,101

Executive summary

U.S. economy and labor market

The national economy marked its seventh year of expansion in 2016. The pace of economic growth during that time, however, has been historically weak, averaging just over 2.0 percent compared with roughly 4.0 percent in the years of expansion prior to 1990. Although considered modest when compared with previous recoveries and expansions, the level of growth has been sufficient to allow the unemployment rate to drop back to 5.0 percent in September 2016 and has sustained job growth in the labor market.

Total nonfarm employment in the United States reached 144.8 million in September 2016, up by 1.8 percent from September 2015. Private sector job growth was up 2.3 million, or 1.9 percent. Since September 2009, the largest percentage of jobs gained by major private industry sectors has been in professional and business services. The smallest percentage gain over this period occurred in the information sector. Public sector hiring has also improved in recent years, rising by 0.3 percent from September 2013 through September 2014, and by 0.5 and 0.8 percent over the same months in 2015 and 2016.

Washington's economy and labor market

Using state gross domestic product as the comparison measure, economic growth in Washington expanded by 2.9 percent in 2015, which outpaced the 2.6 percent growth achieved by the nation. From third quarter 2015 to third quarter 2016, personal income in the state increased 3.5 percent compared to 2.0 percent nationally, adjusted for inflation. Consistent with that, total nonfarm employment increased during the same period.

Seasonally adjusted total nonfarm employment increased by 3.3 percent from September 2015 to September 2016 with the addition of 104,400 jobs. The private sector accounted for the majority of the jobs added, with 87,500 added to private payrolls while government added 16,900 jobs. From September 2009 to September 2016, total nonfarm employment increased by 15.4 percent, with the largest percentage increase in employment occurring in the professional and business service industry sector. The state unemployment rate was 5.6 percent in September 2016 compared to the U.S. rate of 5.0 percent. Labor force growth in the state has averaged approximately 3.9 percent per year from September 2014 to September 2016, compared to the national average of 1.2 percent per year.

Seasonal, structural and cyclical industry employment

Industries in Washington that are most sensitive to seasonal forces include crop production, scenic and sightseeing transportation, and support activities for agriculture and forestry. Structural forces such as productivity improvement, policy changes and technological innovation have heavily influenced employment in ambulatory healthcare services, software publishing, and in food services and drinking places. Industries where the cyclical component accounts for the most change in employment include support activities for mining, scenic and sightseeing transportation, and crop production.

Unemployment

The seasonally adjusted unemployment rate in Washington began a dramatic rise in late 2008 and peaked in the first quarter of 2010 before falling to 5.6 percent in September 2016. The number of unemployment recipients was roughly 49,000 in September 2016, down from a peak of just over 300,000 in January 2010. The manufacturing and construction industries accounted for the greatest portion of workers who exhausted unemployment benefits from October 2015 through September 2016.

The Mass Layoff Statistics program was eliminated by the U.S. Bureau of Labor Statistics in 2013. Data beyond that point on dislocated workers, mass layoffs and plant closures are no longer available for publication.

Employment projections

Total nonfarm employment in Washington state is expected to grow at an average annual rate of 1.8 percent from 2014 to 2019. Total nonfarm industry employment is projected to reach about 3.36 million jobs by 2019 and about 3.59 million jobs by 2024. Computer and mathematical occupations, building and grounds cleaning and maintenance occupations and healthcare support occupations are projected to grow faster than other occupational groups from 2014 to 2024.

Income and wages

Recently released data show the median household income measured in 2015 dollars in Washington rose by 7.3 percent from 2011 to 2015, with most of the growth occurring in 2014 and 2015. From 2014 to 2015, the number of occupied jobs increased in all hourly wage ranges, with the exception of jobs paying less than $12 per hour. Job gains were greatest in occupations that paid between $12.00 and $17.99 per hour.

Chapter 1: U.S. economy and labor market

The national economy continued to expand following its recovery from the previous recession. The economic recovery that began in June 2009 reached its seventh year of expansion in 2016. The National Bureau of Economic Research is most typically credited for providing start and end dates to U.S. recessions. Their findings show the average length of an economic expansion in the post-World War II era has been about five.[1] Now over seven years old, the current expansion ranks as the fourth longest in the history of the U.S. economy.

By most measures, the economy and labor market have made great strides since the recession ended. The job market has rebounded. The U.S. Bureau of Labor Statistics (BLS) shows that 15 million nonfarm jobs have been added through September 2016, since the low point of employment in February 2010. The unemployment rate, at 5.0 percent in September 2016, has fallen to half of what it had been as a result of the recession. Yet concerns about the staying power of the labor market arise due to the incidence of historically weak economic growth. There has been a clear break from previous years with the pace of annual growth settling into a 2.0 percent range since the recession ended, compared with roughly 4.0 percent in the years of economic expansion prior to 1990.

The rate of growth can be expressed in terms of Gross Domestic Product (GDP), the measure of the output of goods and services in the economy over a period of time. Its rate of progress is shown in *Figure 1-1*.

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[1] National Bureau of Economic Research, Business Cycle Dating Committee.

Figure 1-1. U.S. gross domestic product (chained 2009 dollars), quarterly percent change, seasonally adjusted annualized rate
United States, third quarter 2009 through third quarter 2016
Source: U.S. Bureau of Economic Analysis, Domestic Product and Income
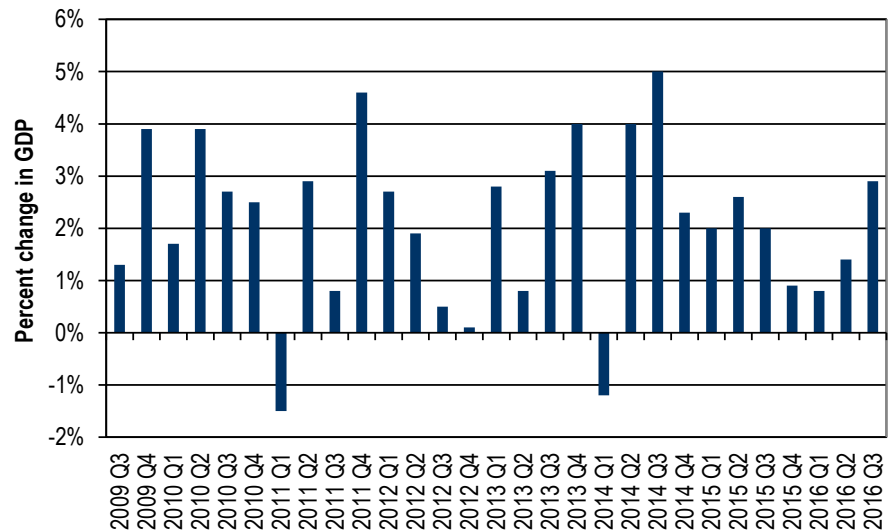
The U.S. economy has grown slowly on average since the recession ended in June 2009.

The rate of recovery during the expansion as depicted by the growth in GDP is tied to both cyclical and structural factors. That is to say, some of the cause for the downshift in long run GDP is likely to be due to the lingering effects of the recession and recently weakening global growth. The main structural element that has shifted is labor productivity. Labor productivity statistics, as calculated by BLS, is defined as output per hour worked. It follows naturally that productivity growth is the change in that ratio over time.[2] *Figure 1-2* shows how productivity has declined in the current economic cycle. Even with the 2016 third quarter rebound, productivity growth remains weak. Nonfarm output per hour is flat over the past year and is up only 0.5 percent on average since 2014.

[2] Shawn Sprague, "What can labor productivity tell us about the U.S. economy?" Beyond the Numbers: Productivity, vol. 3, no. 12 (U.S. Bureau of Labor Statistics, May 2014).

Figure 1-2. Nonfarm labor productivity, annual and quarterly percent change, seasonally adjusted annualized rate
United States, third quarter 2009 through third quarter 2016
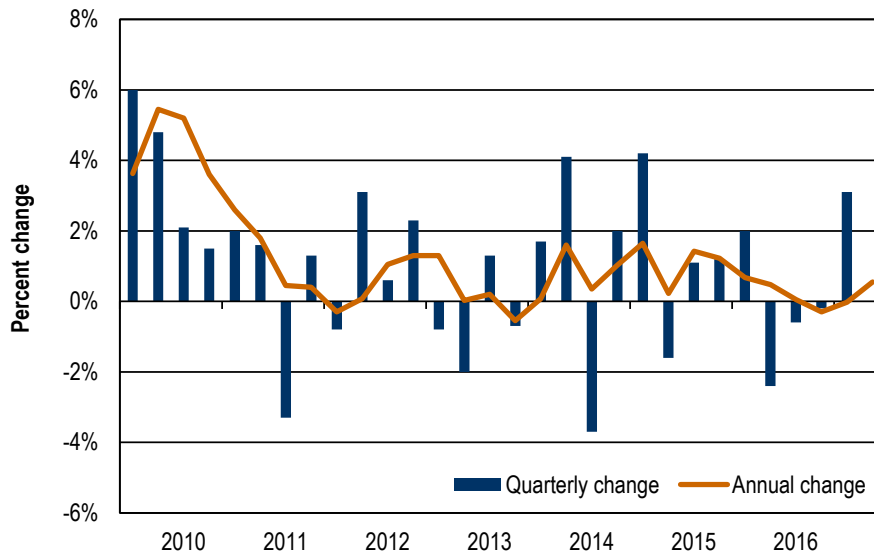Source: U.S. Bureau of Economic Analysis, Labor Productivity and Costs

Productivity has declined in the current economic cycle.

Productivity growth has gone through a number of different stages over the past 60 years or so, but has been particularly dismal throughout the current expansion. Over the past five years, it has averaged just 0.6 percent per year. Productivity growth enables an economy to produce increasingly more goods and services for the same amount of work, which leads to economic growth. Consequently, slower productivity growth tends to lead to slower economic growth, but can support employment growth since more workers are required to produce a given level of output.

Sluggish productivity growth has constrained wage increases for most of the expansion. As hiring has continued over the expansion, the degree of excess unemployment has diminished and has left employers with a smaller pool of workers from which to choose. This has allowed wages to gradually increase as the expansion has matured. *Figure 1-3* shows that the improvement in hourly earnings rates for all employees has occurred primarily over the last two years. In September 2016, average hourly earnings have risen 2.6 percent since September 2015.

Figure 1-3. Percent change in average hourly earnings, all private employers, seasonally adjusted annualized rate
United States, September 2009 through September 2016
Source: U.S. Bureau of Labor Statistics, Current Employment Statistics
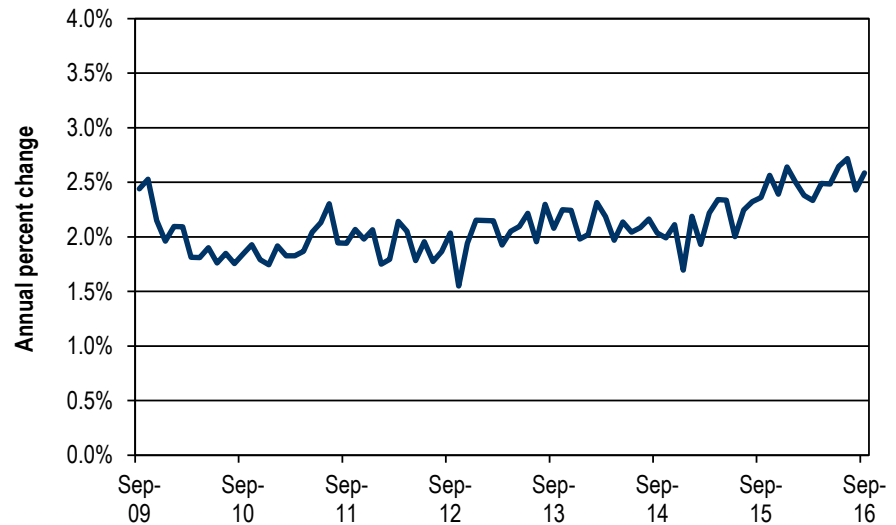
Wages have just recently begun to rise.

Recent Changes in GDP

Tracking quarterly changes in GDP over the past couple of years allows one to see how growth has been changing on a short run basis. It also shows how spending by economic sectors, namely domestic and foreign consumers, businesses and government contribute to economic growth (*Figure 1-4*). Beginning with fourth quarter 2015, real GDP moved into a period of below-trend growth. Real GDP rose by 0.9 percent in the fourth quarter of 2015 following a 2.0 percent rate in the third quarter. That marks the slowest pace of growth since the first quarter of 2014, which was hampered by harsh winter weather and port disruptions. Slower growth continued during the first half of 2016, with second quarter growth advancing at a 1.4 percent rate, a bit faster than the first quarter 0.8 percent rate. Third quarter growth rebounded to 2.9 percent, however, making it the fastest growing quarter in two years. Altogether, real GDP growth is up just 1.5 percent over the course of the year from third quarter 2015 through third quarter 2016.

Domestic consumption, or consumer spending, continues to drive real GDP growth. It has provided a positive contribution to quarterly economic growth over the last two years, whereas the other components of GDP (fixed investment, net exports, and government expenditures) have at times subtracted from growth. Since third

quarter 2014, no other component has made a larger quarterly contribution to headline GDP than has consumption expenditures. Weakness in business investment has persisted over the last four quarters, and has subtracted from economic growth over that time. Most of the weakness has been concentrated in equipment spending. Business inventories had subtracted from growth for five quarters before rebounding in third quarter 2016. The slower inventory growth had resulted in factories reducing production. Net exports have largely subtracted from economic growth due primarily to a weak global economy and a strong U.S. dollar. As some of the global weakness diminished in 2016, exports began making a subtle contribution to growth. A huge jump in soybean shipments to China helped the export contribution to GDP to jump in the last quarter. Government spending has mostly contributed to growth in recent quarters, although less spending by state and local governments in second quarter 2016 largely contributed to the negative result.

Figure 1-4. Contributions to percent change in real GDP, seasonally adjusted annualized rate
United States, third quarter 2014 through third quarter 2016
Source: U.S. Bureau of Economic Analysis, Domestic Product and Income

Contributions	2014 Q3	2014 Q4	2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	2016 Q2	2016 Q3
GDP percent change annual rate	5.0	2.3	2.0	2.6	2.0	0.9	0.8	1.4	2.9
Percentage contribution by factor									
Consumption expenditures	2.52	3.07	1.63	1.94	1.81	1.53	1.11	2.88	1.47
Fixed investment	1.16	0.22	0.61	0.70	0.92	-0.03	-0.15	-0.18	-0.09
Change in private inventories	0.32	0.23	1.01	-0.52	-0.57	-0.36	-0.41	-1.16	0.61
Net exports of goods and services	0.50	-1.14	-1.65	-0.08	-0.52	-0.45	0.01	0.18	0.83
Government expenditures	0.46	-0.07	0.45	0.57	0.34	0.18	0.28	-0.30	0.09

Consumer expenditures have contributed the most to economic growth

Consumer spending an important driver

Consumer spending makes up the greatest dollar-wise contribution to GDP, accounting for over two-thirds of total output value annually. It has been the main contributor to real GDP growth over the past four quarters. Solid income growth has fueled continued steady growth in real consumer spending, which has been running at a roughly 2.4 percent pace from September 2015 to September 2016 (*Figure 1-5*). Given the recent gains made in employment and wages, this sector should continue to support growth over the remainder of the year.

Real personal consumption began softly in 2016, declining 0.1 percent in January from the previous month. Spending picked up strongly during second quarter 2016, with real spending growth averaging

over 0.4 percent per month. Personal consumption expenditures in the third quarter failed to match the rate of growth it showed during the previous quarter. After declining by 0.2 percent in August, spending recovered somewhat in September, increasing by 0.3 percent during the month.

Monthly real disposable income has grown at a steadier pace in 2016 compared with monthly consumption. Income growth has been positive throughout the year. From September 2015 to September 2016, real disposable income is up 2.1 percent.

Figure 1-5. Inflation-adjusted disposable income and personal consumption expenditures, seasonally adjusted annualized rate, year-over-year percent change
United States, September 2009 through September 2016
Source: U.S. Bureau of Economic Analysis , Personal Income and Outlays
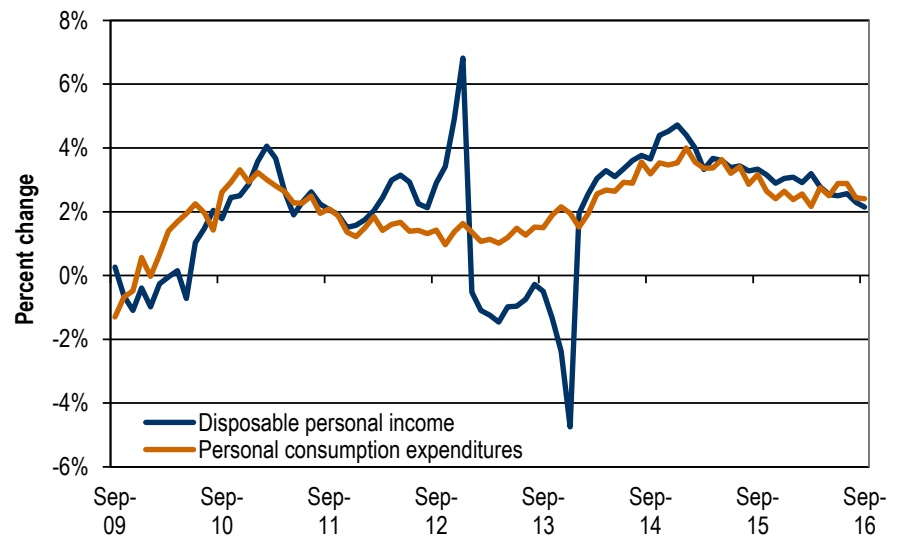
Growth in personal income has supported steady consumption activity.

Retail sales are a component of personal consumption expenditures. Retail sales are reported in nominal dollars, so sales value can be volatile since they are affected by price movements of items typically purchased. This includes gasoline price movements. Focusing on longer-term trends helps to navigate through some of this volatility. Sales grew by 2.8 percent over 2015 and are currently up 2.7 percent over the first nine months of 2016 on an annualized basis (*Figure 1-6*).

Monthly retail sales at the beginning of 2016 started weak. Sales declined in two of the three months in the first quarter. The data suggest that motor vehicle and parts dealer sales were the biggest reason for declining sales. Gasoline sales were mixed, pushing sales down in

February, but supporting sales in March when the price of petroleum and gasoline began to rise. The weak first quarter of retail sales supports the lower GDP growth rate registered in first quarter 2016.

Retail sales came roaring back in the second quarter starting with April. Sales surged 1.2 percent after a drop of 0.3 percent in March. Every component except for building material and garden equipment recorded a higher level of sales volume. Sales figures were modest but positive in May before surging again in June by 0.7 percent to close out the quarter.

Third quarter sales figures were more restrained. Although only one month, August, registered a small decline, July sales were only modestly higher. Sales recovered again in September, rising by 0.6 percent during the month. The third quarter figures indicate that consumers were still engaged in the economy, although not as much as during the second quarter. Nonetheless, consumer demand continues to act as the driver of the U.S. economy.

Figure 1-6. U.S. retail sales, month-over-month and year-over-year percent change
United States, January 2009 through September 2016
Source: U.S. Census Bureau, Monthly and Annual Retail Trade Report
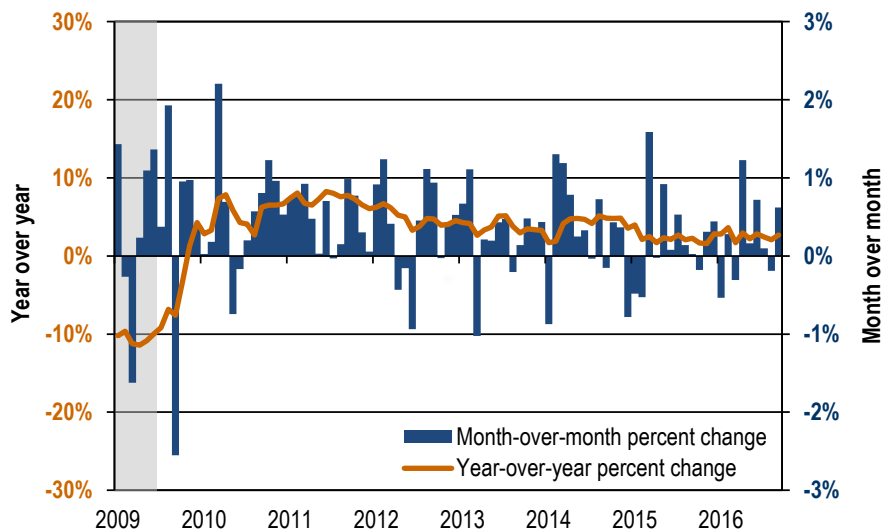
Shaded area is a U.S. recession period.

Increases in retail sales have been uneven but are still indicative of strong domestic consumption.

Federal Reserve on hold after rate hike last year

Near the end of 2015, it had been widely expected that the Federal Reserve Board (Fed) would move to raise short-term interest rates for the first time since the financial crisis (*Figure 1-7*). The announcement to do so came in December 2015. The decision signified a vote of confidence in the American economy and served as the beginning of the end for its economic stimulus program. Fed officials emphasized their intention to raise rates gradually, and only as economic growth progressed.

The Fed began the year in 2016 by acknowledging the improvement in labor market conditions and that the pace of economic growth looked promising.[3] The economy continued to progress toward the Federal Reserve's objective of maximum employment during the year, while inflation ran below the Fed's targeted level of 2.0 percent.

Slower economic growth during the first half of 2016 prompted the Fed to delay raising rates a second time. An encouraging outlook on second half growth now increases the odds of the Fed initiating the next rate hike in December 2016.[4]

Figure 1-7. Selected interest rates
United States, January 2001 through September 2016
Source: Federal Reserve Board
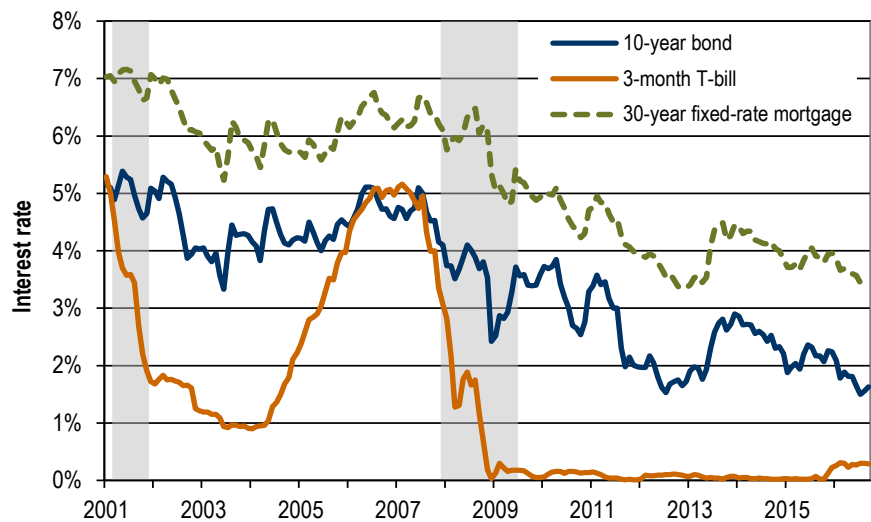
Shaded areas are U.S. recession periods.

Federal Reserve Board policy measures in response to the last recession have sustained low interest rates.

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[3] "Monetary Policy Report," Board of Governors of the Federal Reserve System, March 16, 2016, https://www.federalreserve.gov/newsevents/press/monetary/20160316a.htm.

[4] Stanley Fischer, Vice Chairman, Federal Reserve Board, "The U.S. Economy and Monetary Policy," Speech presented at the 31st Annual Group of Thirty International Banking Seminar, Washington D.C., October 9, 2016.

Business fixed investment and global economic considerations

Business fixed investment entails spending by businesses on structures, equipment and software. This type of investment is expressed as "fixed" to distinguish it from investment in inventories. Spending on equipment, which is a component of nonresidential investment, constitutes the largest dollar outlay for businesses.

Equipment spending has settled into a slower pace of growth and has been most responsible for the weak investment spending of late. The willingness by businesses to invest in response to lower interest rates has changed. Factors including the continued moderate pace of growth along with disappointing energy, global growth and dollar impacts, have lowered the incentive for firms to finance new capital investment.

The advent of fracking technology in oil and gas exploration and production had increased investment in equipment. This encompassed items such as orders for steel pipes used for drilling; railcars used to haul fracking materials, sand and oil; and heavy industrial equipment used to prepare and operate drilling sites. Increased domestic production levels, coupled with a global economic slowdown, led to a plunge in oil prices (*Figure 1-8*).

The ensuing oil glut sent prices tumbling down from over $100 per barrel in August 2014 to $30 in January 2016. Prices appear to be rebounding somewhat, but equipment spending related to energy development fell off considerably over the first half of the year.

Figure 1-8. West Texas intermediate crude oil prices, dollars per barrel
United States, August 2014 through September 2016
Source: U.S. Energy Information Administration

Oil prices look to be stabilizing after declining significantly the last two years.

Slower global economic growth, led by China, has contributed to a weaker U.S. export position and consequently weaker economic growth. Chinese economic growth averaged roughly 10 percent per year between 2000 and 2011. Growth in China has slowed in 2016 to 6.7 percent.[5] Economic deceleration has been occurring across the developing world over the past few years.[6] As developing countries' growth prospects diminished, these economies have generally not been able to attract enough capital inflows to finance their trade accounts. Consequently, their exchange rates have come under downward pressure and depreciated relative to other countries. The plunge in oil prices has also weakened the Canadian and Mexican economies. The impact of these scenarios has been to raise the value of the dollar relative to other currencies, which makes it even more difficult for U.S. exporters to compete overseas (*Figure 1-9*).

Figure 1-9. Trade weighted dollar index, January 1997 = 100, not seasonally adjusted
United States, September 2009 through September 2016
Source: Board of Governors of the Federal Reserve System
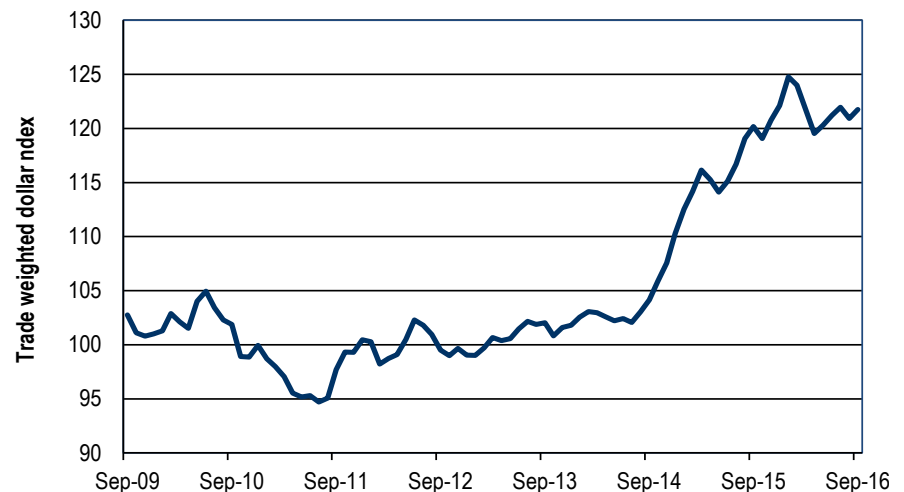
The U.S. dollar has appreciated considerably since the middle of 2014 in comparison to foreign currency value.

Slower global growth and over-supplied markets have not only impacted the energy sector but have also affected the mining industry. China is the world's largest consumer of metals, and its demand for natural resources has subsided in conjunction with its slowing economy. Prices for commodities such as aluminum, copper and gold have tumbled primarily since 2014 and are just recently staging a modest recovery (*Figure 1-10*). This development has resulted in less business investment needed for equipment used for metal mining, depressing overall business investment further.

[5] National Bureau of Statistics of China.

[6] International Monetary Fund, World Economic Outlook, "Too Slow for Too Long," April 2016.

The continued pace of moderate economic growth along with the disappointing energy, global growth and dollar impacts, have lowered the incentive for firms to finance new capital investment despite continued low interest rates. The recent stabilization of energy and commodity prices however, should benefit investment in equipment and nonresidential construction for the remainder of the year.

Figure 1-10. Commodity Research Bureau Commodities Index, 1967 =100, not seasonally adjusted
United States, September 2009 through September 2016
Source: Thomson Reuters Corporation

Prices of leading commodities retreated to a six-year low in late 2015.

Construction activity slows but keeps improving

An important category of private fixed investment is the construction of new residential and nonresidential structures. Construction spending momentum continues to build (*Figure 1-11*). Total private construction spending has been positive over the first nine months of 2016, but given the overall weak business investment environment, it has been growing at a slower rate. Through the first nine months of 2016, private construction spending is up 6.7 percent from the same period in 2015. Over the first nine months of 2015, private construction spending increased by 12.4 percent from the same period in 2014. Total dollar investment in private residential investment continues to outpace investment in private nonresidential investment, although the gap has closed in recent months.

Total private construction softened over August and September 2016, falling below the level of spending occurring in July 2016. Despite the recent weakness, moderate construction spending is likely to continue in the quarters ahead due to expectations for economic growth and low interest rates in general.

Figure 1-11. Value of private construction, millions of dollars, seasonally adjusted annualized rate
United States, September 2009 through September 2016
Source: U.S. Census Bureau, Construction Spending
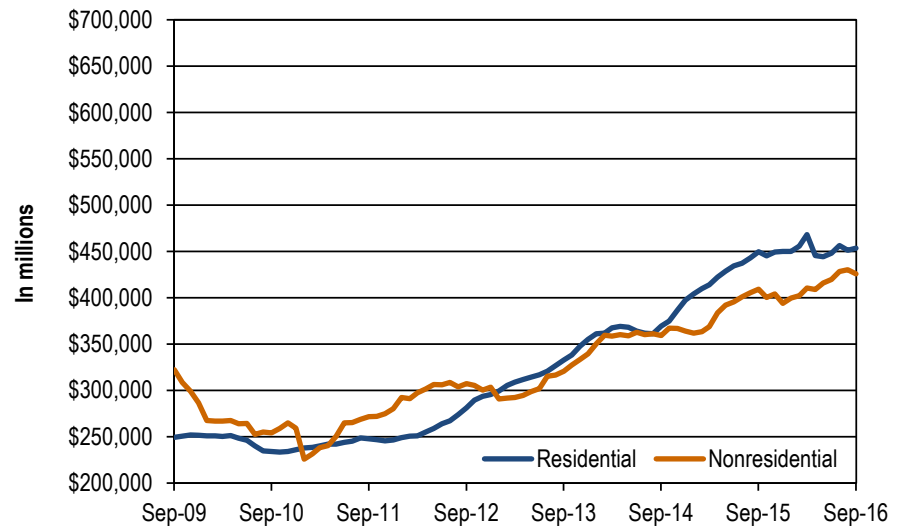
Construction activity has been slowly rebounding since the recession ended.

Housing remains a bright spot for the economy

The housing market ended 2015 on a fairly solid note, supported by the improving trend for new home sales. Monthly data can be volatile, but the 14.2 percent gain in new homes sold in 2015 clearly points to improvement over that time (*Figure 1-12*). The forward momentum failed to carry over to the start of 2016. Monthly new home sales fell below the December 2015 total of 538,000 during first quarter 2016. Sales bounced back in April to a seasonally adjusted annual rate of 570,000, rising by 6.1 percent during the month.

The level of sales recorded in April established a post-recession high at the time. The higher level of sales activity was helped by two other factors. The winter of 2016 was one of the mildest on record and allowed there to be more home construction activity during the winter months. Easter also came early in 2016. Falling on the last weekend in March, it was the earliest Easter since 2008. This meant that April had one extra weekend with which to offer available homes for sale than in most other years.

The April data seemed illusory when sales volume declined in May and June. New home sales, however, took off again in July, rising by 12.7 percent during the month and establishing a new post-recession high at 629,000. The up-and-down volatility continued in August with new home sales falling by 8.6 percent. The sharpest declines were seen in the southern United States due to flooding in Louisiana and surrounding areas due to heavy rains. The weakness proved to be transitory as new home sales rose by 3.1 percent in September to a 593,000 unit annual pace.

Thus far, in 2016 the upward trend in new home sales remains intact. Total sales over the first nine months of 2016 have increased by 12.8 percent over the sales volume recorded during the same period in 2015.

Figure 1-12. Conventional 30-year mortgage rates and new home sales, seasonally adjusted annualized rate
United States, January 2005 through September 2016
Source: Federal Housing Finance Agency; U.S. Bureau of Economic Analysis, New Residential Sales
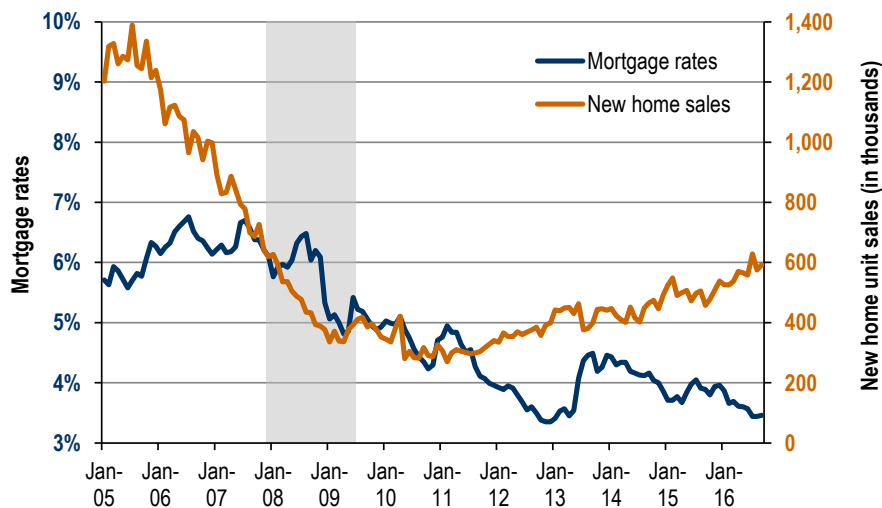
Shaded area is a U.S. recession period.

Sales of new homes improve into 2016.

The demand for homes continues to be fueled by strong job growth and low mortgage rates. Still, the degree of improvement in housing remains on the subtle side, with sales occurring at a level below that of what had previously been thought to be the norm. Taking that into consideration, and given the sensitivity of the housing market with respect to mortgage interest rate movements, the Fed is likely to remain judicious in its decisions to raise rates in 2017. This should allow home buying to continue gathering momentum.

Government (public sector) spending levels off

Government spending activity for fiscal year 2016, which ran from October 1, 2015 to September 30, 2016, has concluded. A steady stream of government outlay in terms of real expenditures, roughly characterizes fiscal year 2016. The improving near-term fiscal situation of the past several years had given policymakers some flexibility to bump up federal consumption and investment. The Bipartisan Budget Act of 2015 put this into effect, but the boost has shown itself to be on the modest end. Total real outlays were $2.9 trillion in fiscal year 2016, only 1.3 percent more than in fiscal year 2015. Most of the increase in spending came from state and local governments, reflecting rising tax receipts and easing budget pressures in most states. Federal outlays in 2016 were little changed.

As such, government spending has provided only a modest contribution to real GDP growth during 2016. An improving economic climate has the capacity to boost federal revenue growth in fiscal year 2017. However, the continuing aging of the population, rising medical costs and higher interest rates will commit government to allocate more funds toward mandatory spending triggered by these drivers. This offset will likely limit government's ability to directly contribute to economic growth through discretionary spending in the near future.

Figure 1-13. Government purchases and gross investment, trillions of dollars adjusted for inflation, seasonally adjusted annualized rate
United States, third quarter 2009 through third quarter 2016
Source: U.S. Bureau of Economic Analysis, Government Current Receipts and Expenditures
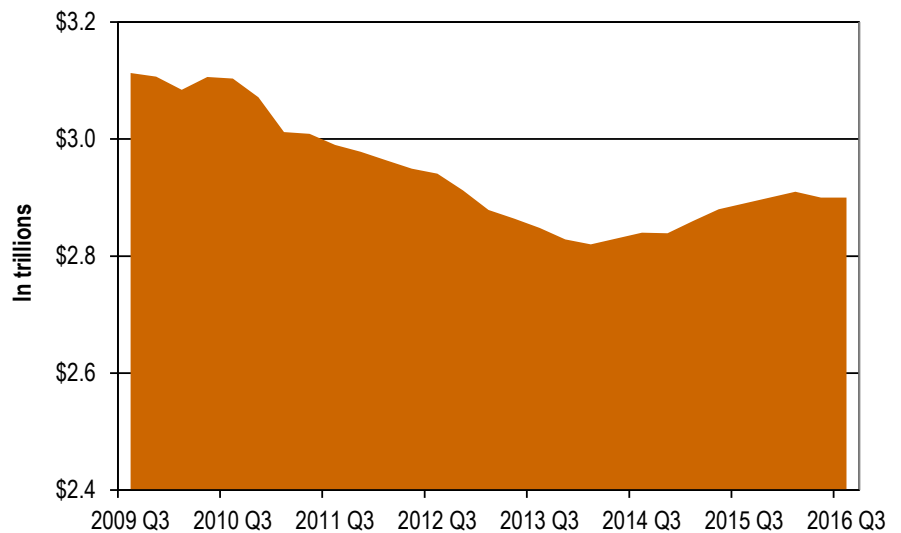
Government spending has increased at a slower pace off of its recent high point.

Public and private sector employment growth

Public sector employment shows better growth while private sector employment grows more slowly.

Two surveys are used by the U.S. Bureau of Labor Statistics (BLS) to measure national labor market trends. The establishment survey provides an estimate of the number of occupied jobs in the private and public sectors (federal, state and local government). The survey of households, which numbers roughly 60,000 households out of about 125 million households in the country, is an estimate of the number of people either employed or unemployed but searching for a job.[7]

According to the establishment survey, total nonfarm employment reached 144.8 million in September 2016, seasonally adjusted, which is up by 1.8 percent from September 2015. Employment using this survey approach uses payroll information provided by employers, and is usually referred to as payroll employment.

Figure 1-14 shows how employment has been trending in both the private and public sectors since September 2009. Private sector employment growth had mostly outpaced growth in the public sector initially as total government spending tightened and state and local government budgets struggled with low revenue growth. Public sector hiring improved in recent years, rising by 0.3 percent from September 2013 through September 2014, and by 0.5 and 0.8 percent over the same months in 2015 and 2016. State and local government employment makes up 87 percent of total government employment, so fiscal conditions in the states will guide much of the hiring in the public sector.

Private sector employment has continued to increase. Job gains have been remarkably steady, averaging just over 2 percent on a year-ago basis. Employment growth in the private sector was just off that pace in 2016, rising 1.9 percent from September 2015 to September 2016.

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[7] The estimate of the number of households in the United States comes from the quarterly Homeownership and Vacancy report published by the U.S. Census Bureau.

Figure 1-14. Total private and public nonfarm employment, in thousands, seasonally adjusted
United States, September 2009 through September 2016
Source: U.S. Bureau of Labor Statistics, Current Employment Statistics
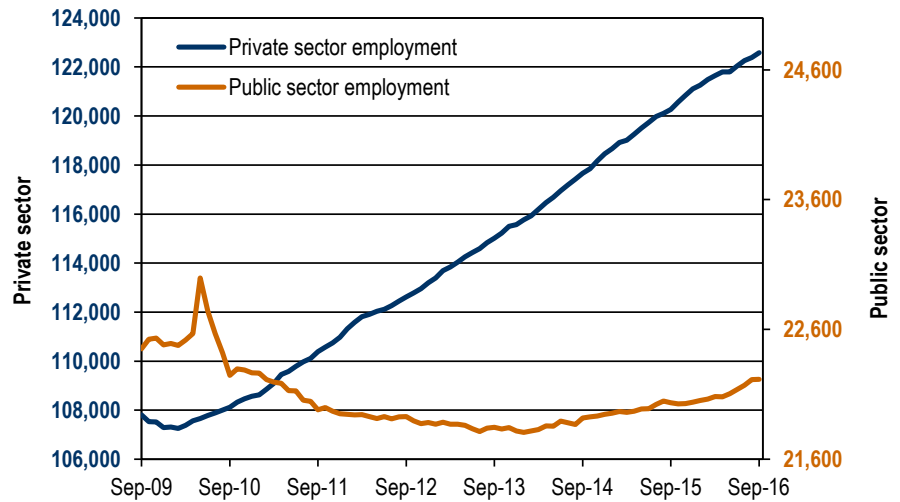
Private sector employment has been steadily expanding and public sector employment has turned upward.

Job growth has been most prevalent in professional and business services, leisure and hospitality, education and health services, transportation, warehousing and utilities, and construction (*Figure 1-15*), all of which grew more than average with respect to total private nonfarm employment growth. The top two industries that added the most jobs over the seven-year period were professional and business services, with 3,400,000 jobs added, and education and health services, which added more than 3,000,000 jobs.

In contrast, employment growth has been weakest in manufacturing, mining and logging and in information. The below-average growth occurring in manufacturing and mining and logging is consistent with the moderation in the global economy and the strength of the dollar, and serves as a sign of the divide between the services and goods-related sectors.

Figure 1-15. Percent change in private sector employment by industry
United States, September 2009 through September 2016
Source: U.S. Bureau of Labor Statistics, Current Employment Statistics
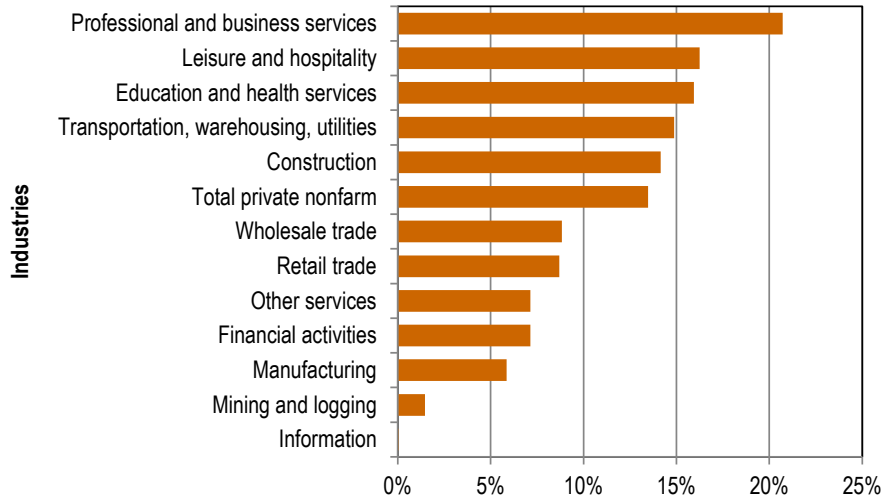
Private sector employment has expanded in all major industries during the current economic expansion.

Downward trend for unemployment rate

The unemployment rate is based on the national household survey and is perhaps the most widely used measure of the labor market. As of September 2016, the unemployment rate was 5.0 percent, down only slightly from 5.1 percent in September 2015, but half of what it was from the recession peak of 10.0 percent in October 2009 (*Figure 1-16*). This drop in the unemployment rate has corresponded with an impressive monthly string of job gains. The last time there was a reported loss of jobs from one month to the next occurred during September 2010.

So far in 2016, payrolls are reported to have grown at a slightly lower pace compared with the monthly jobs gained during 2015. Still, this has been sufficient enough to provide jobs for new entrants into the labor force. Despite the job growth, the unemployment rate, at 5.0 percent in September 2016, has stayed roughly constant during the year as individuals have come back into the labor market in response to better employment opportunities and higher wages.

Figure 1-16. Monthly unemployment rate, seasonally adjusted
United States, September 2002 through September 2016
Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics
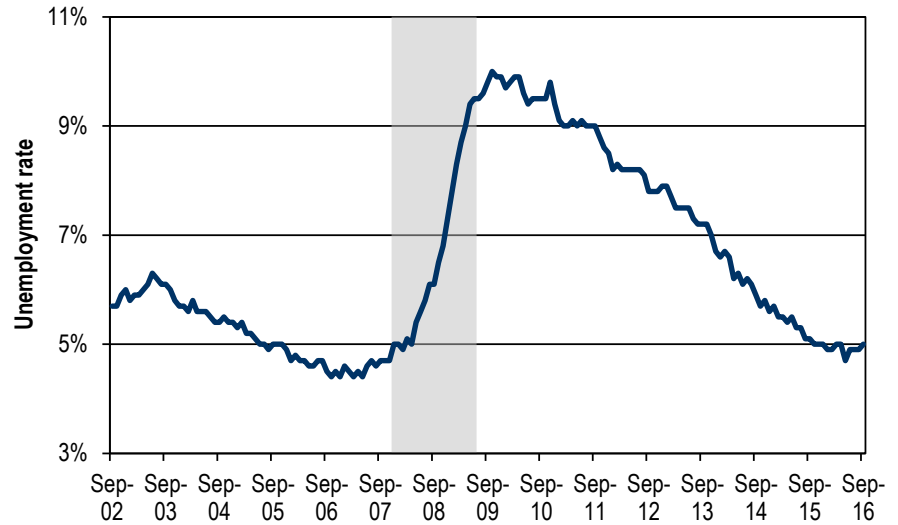
Shaded area is a U.S. recession period.

The unemployment rate decline has stalled most recently.

This development has contributed to a rebound in the labor force participation rate over the past year (*Figure 1-17*). This has occurred amidst a backdrop of a declining longer-run trend owing to the aging of the population and other related factors. The increase suggests that the level of cyclical unemployment continues to diminish.

Despite labor force participation remaining near multi-decade lows, the employment situation facing workers has improved. The employment-to-population ratio, which is a measure of the number of people employed relative to the total number of working age people in the population, has risen to new cycle highs. Given the limited prospects for a rise in the participation rate based on demographic factors, full employment for the economy might not be far away despite the low levels of workforce engagement.

Figure 1-17. Labor force participation rate and employment-to-population ratio, seasonally adjusted annualized rate
United States, January 2002 through September 2016
Source: U.S. Bureau of Labor Statistics, Current Population Survey
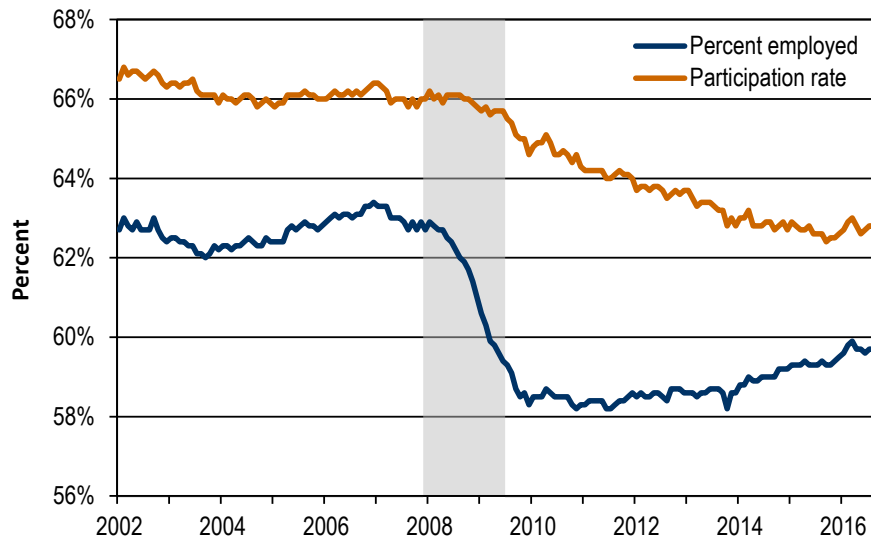
Shaded area is a U.S. recession period.

Improving job prospects have boosted employment and labor force participation.

Chapter 2: Washington's economy and labor market

Economic events and policies that affect and shape the national economy have very similar effects on state economies. States are connected economically through the free flow of commerce across state lines and through the mobility of labor. Consequently, national recessions and expansions are typically experienced by all states, though the degree to which they are felt might differ between states.

Washington's level of economic activity can be measured by the value of the goods and services it produces at some point in time. This measure of the economic output of the state, formerly known as gross state product and now known as state gross domestic product (GDP), is the sum of all value added by industries within the state. It is the counterpart to the nation's GDP.

The U.S. Bureau of Economic Analysis computes state GDP annually. Changes in state GDP can be used as a measure of state economic growth, much as changes in national GDP are used to measure national economic growth.

Washington state's economy, in terms of GDP, ranked 14th among all U.S. states and territories in 2015. Its GDP expanded by 2.9 percent in 2015 (*Figure 2-1*), which outpaced the 2.6 percent growth achieved by the nation.

The pattern of economic growth for Washington follows the pattern of growth for the nation since the last recession. Like that of the nation, the pace of economic growth has been moderate for the state. Washington's GDP has grown an average of 2.1 percent per year from 2010 through 2015, while growth at the national level has averaged 2.2 percent over the same period. Washington's economy, however, has been gaining momentum and has grown faster than the U.S. in three of the last four years.

Figure 2-1. U.S. and Washington state gross domestic product, (chained 2009 dollars), annual percent change, seasonally adjusted annualized rate
United States and Washington state, 2009 through 2015
Source: U.S. Bureau of Economic Analysis, Domestic Product and Income
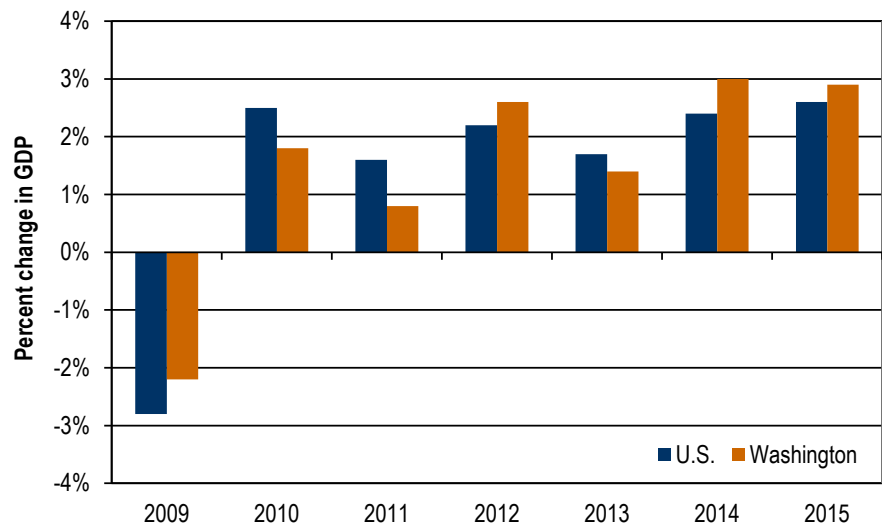
Washington's economy has grown faster than the national economy the past two years.

Personal income gains supported with wage growth

Washington's GDP has expanded going into its seventh year in 2016. The higher levels of economic activity have contributed to increased wages, a component of personal income earned by the state's residents. *Figure 2-2* shows how personal income growth in Washington has taken place during the seven years of the current economic expansion in comparison with the U.S. As the expansion has matured, income growth has stabilized. Income growth for the nation has averaged 2.5 percent per quarter from the third quarter of 2015 through the third quarter of 2016, adjusted for inflation. Income growth in Washington has largely been greater than the U.S. rate of gain since the first quarter of 2012. The only exception occurred during the fourth quarter of 2015, when the 3.0 percent rate of gain fell below the national rate of 3.3 percent. From third quarter 2015 through third quarter 2016, the level of personal income in Washington has grown an average of 3.6 percent per quarter on an annualized basis.

Figure 2-2. Personal income, adjusted for inflation, percent change year ago quarter
United States and Washington state, third quarter 2009 through third quarter 2016
Source: U.S. Bureau of Economic Analysis , Personal Income and Outlays
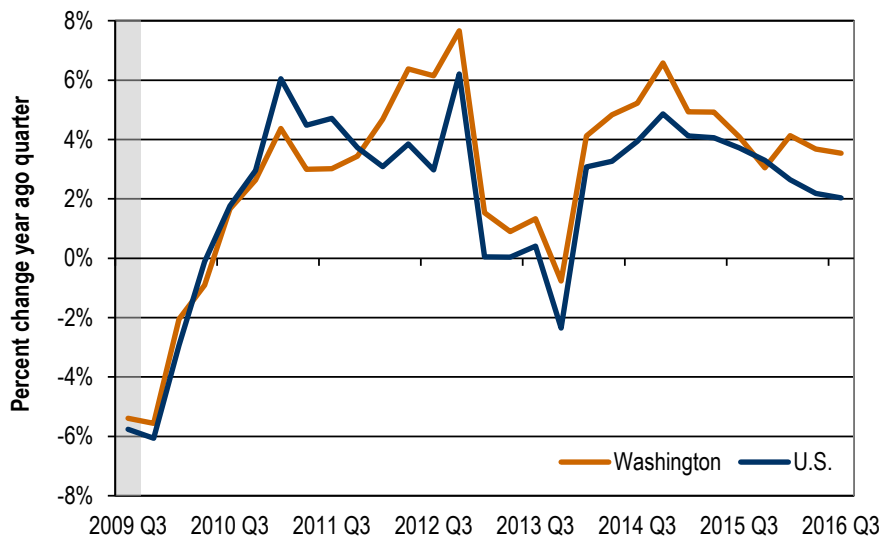
Shaded area is a U.S. recession.

Washington's income growth has largely surpassed the nation since first quarter 2012.

The annual growth in wages for Washington state is shown in *Figure 2-3*. The wages are expressed in nominal terms, unadjusted for inflation. The figure also shows the disparity in wages owing to King County, where Seattle is located, and the rest of the state. King County is the most populated county in the state and has the highest county levels of business representation and employment. During the period from 2009 through 2015, the average annual wage in King County has grown by 3.4 percent per year on average, while average annual wages throughout the rest of the state have grown by 2.4 percent on average. In a sign that wage growth is finally starting to spread throughout the state, the average annual wage for the state net of King County grew by 3.2 percent in 2015, while the King County average wage grew by 2.4 percent, marking the first time this has happened in the current expansion.

Figure 2-3. Average annual wage
King County and balance of Washington state, 2009 through 2015
Source: Employment Security Department/LMPA, U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages
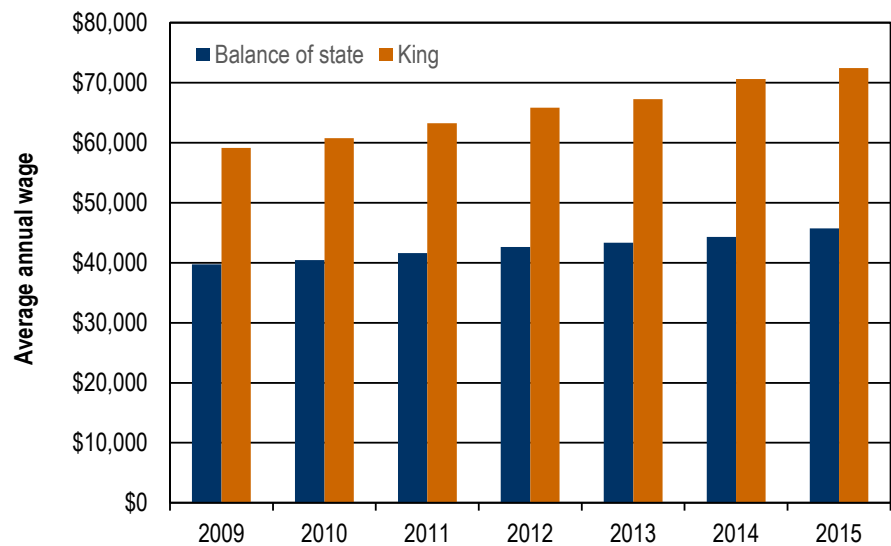
Wage growth has been most prominent in King County and is gradually progressing across the remainder of the state.

Figure 2-4 shows on a percentage basis, the manner in which nominal wages have grown by industry sector from 2009 through 2015. Average wages in five of the state's 13 major industrial sectors grew faster than the state average wage, which grew by 9.3 percent. These included professional and business services, other services, financial activities, information and retail trade. Average wages in seven of the remaining eight industry sectors grew slower than the state's average wage, with wages in the mining and logging industry growing at about the state average, and leisure and hospitality not very far off the state average.

The industry that paid the highest average rate in 2015, at $150,500, was the information sector. During the economic expansion, wages in this sector have grown by 42.4 percent. During the same time, wages within the industry with the lowest average wage in 2015 at $22,000, leisure and hospitality, grew by 19 percent.

Figure 2-4. Percent change in average annual wage
Washington state, 2009 through 2015
Source: Employment Security Department/LMPA, U.S. Bureau of Labor Statistics,
Quarterly Census of Employment and Wages
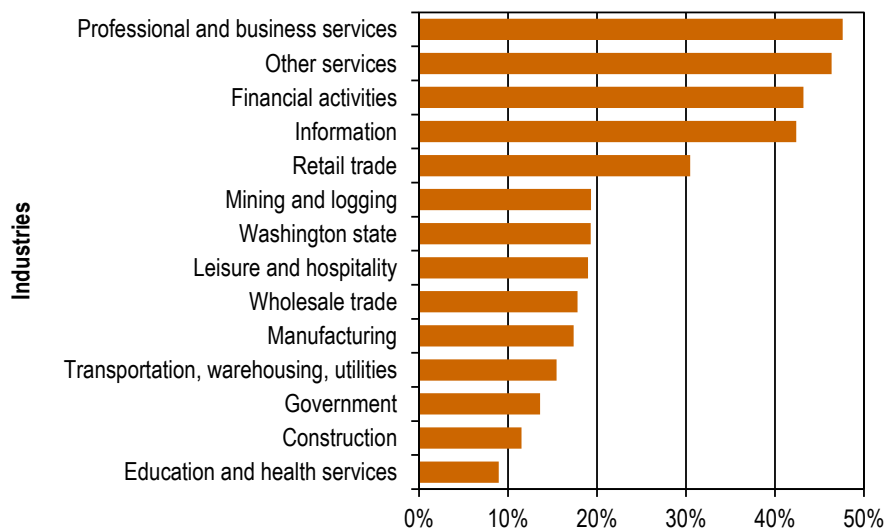
On a percentage basis, wages have grown the most in professional and business services and the least in education and health services.

Income and wage growth supports greater spending

Local consumer spending patterns are reflected in taxable retail sales. *Figure 2-5* shows how taxable sales have risen annually during the current economic expansion from 2009 through 2015. Spending by Washington consumers has been gaining momentum as the expansion has continued. Since 2011, sales revenues have increased an average of nearly 7.0 percent per year. In 2015, taxable retail sales increased by 8.4 percent from 2014, a current cycle high.

Figure 2-5. Annual taxable retail sales, millions of dollars
Washington state, 2009 through 2015
Source: Washington State Department of Revenue
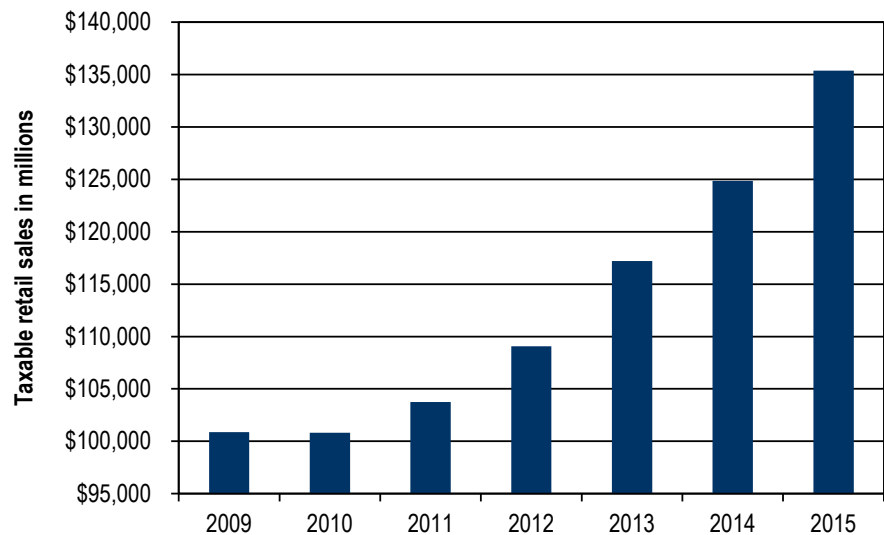
Retail sales have grown steadily since 2011, but have shown the most growth in 2015.

Washington housing market improves with economy

Low interest rates, population growth and improving employment conditions continue to bolster the demand for housing throughout the state. This has pushed house prices in the state to new levels surpassing their pre-recession peak, and prompted builders to respond by building more homes (*Figure 2-6*). Based on the Washington House Price Index provided by the Federal Home Loan Mortgage Corporation (or Freddie Mac), the Washington state home price index surpassed its pre-recession peak in March 2016. Since then, the index has risen by 7.4 percent into and through September 2016. Over the course of the year, the state's home price index in September 2016 is 11.8 percent higher than it was in September 2015.

Much of the increase in local home prices has been taking place in Seattle, where home prices have risen by 11 percent from September 2015 through September 2016, according to the monthly Case-Shiller home price index, another measure used to track home prices. The increase ranked as the largest among the 20 major metro areas covered by the index. It also marks the first time in nine years that Seattle has led the country in home price growth.

Housing starts have been moving to keep pace with the rise in home prices. After a strong 2015 when housing starts rose by 20 percent over 2014, total starts in 2016 through September are occurring at about the same pace compared with 2015. February 2015 was an unusually strong month for homebuilding activity, as housing starts totaled more than 4,000 for the first time since 2007. Housing starts in 2016 have yet to break 4,000 in any month through September, but the outlook remains favorable that sales in the final quarter will put 2016 over the top for the year.

Figure 2-6. Housing price index and single-family housing starts, seasonally adjusted, December 2000 = 100
Washington state, January 2006 through September 2016
Source: Federal Home Loan Mortgage Corporation
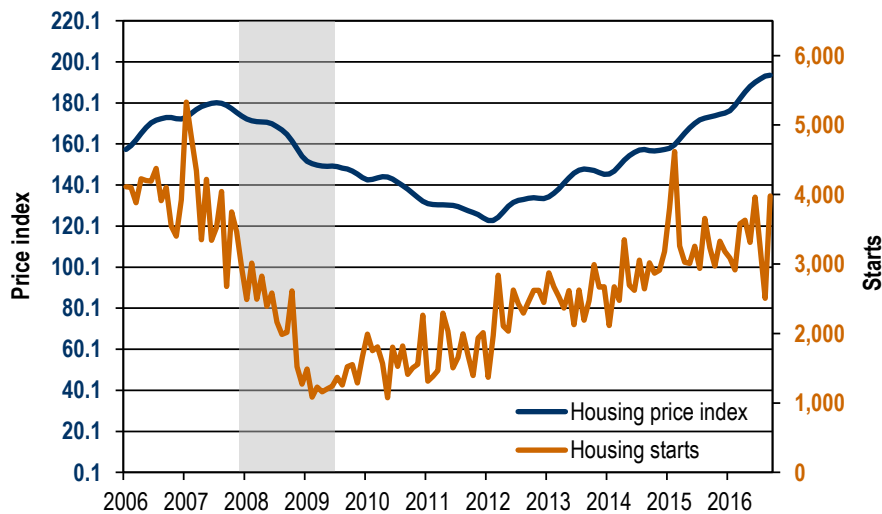
Shaded area is a U.S. recession.

Rising house prices are helping to boost housing starts.

Residential building permits are the precursor to the start of housing projects, so it is no surprise to see the level of permits rising in tandem with housing starts. Most residential activity has traditionally been aimed at construction of single-family units compared with multi-family residences (*Figure 2-7*). However, there has been a rebound in multi-family unit construction, including apartments and condominiums. The number of multi-family permits began to overtake the number of permits being issued for single-family residences in the second half of 2013, and has accounted for about 50 percent of the total permits issued to developers through third quarter 2015. Builders began turning more attention to the development of single-family residences during the last quarter of 2015. From that time through third quarter 2016, the number of permits issued for single-family structures has outnumbered permits issued for multi-family residences.

Figure 2-7. Residential building permits by type of unit, unadjusted rate
Washington state, first quarter 2001 through third quarter 2016
Source: U.S. Census Bureau, Building Permits Survey
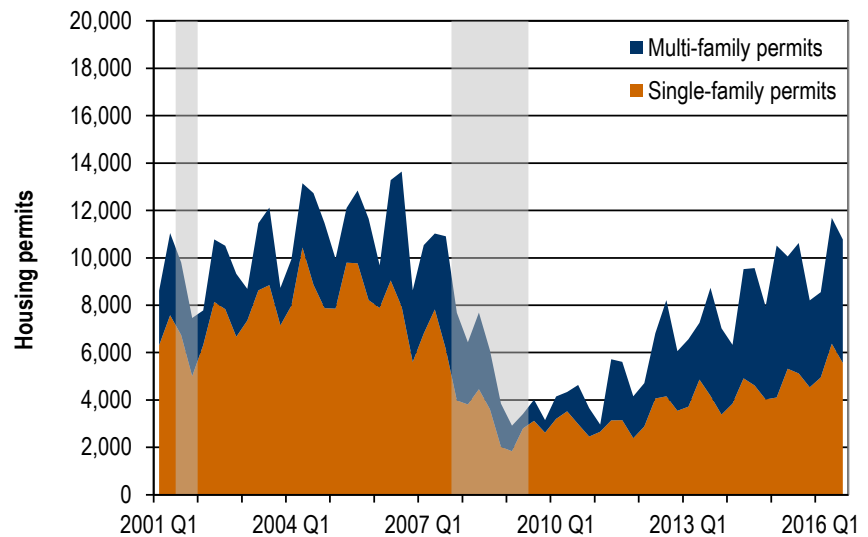
Shaded areas (bars) are U.S. recessions.

Permits issued for multi-family units had drawn even with those issued for single-family units, but have now fallen behind in 2016.

International trade, an important part of the state economy

Washington was the third-largest exporting state in the country in 2015 based on total export value, having moved up from fourth in 2013. The state has maintained a positive trade balance, with the value of exports exceeding imports.[8] Transportation equipment, particularly commercial aircraft, made up the dominant share of the state's exports in terms of value, and accounted for nearly three times the combined total value of the next four top export commodities. The total value of Washington state exports had risen each year since 2010, but declined in 2015. A weaker global economy coupled with a rise in the value of the dollar versus foreign currencies helped reduce the value of Washington's exports to 86.4 billion dollars in 2015 from 90.6 billion dollars in 2014. Washington's share of the total U.S. value, at 5.7 percent, remained largely unaffected.

China largest destination for Washington state exports

Washington's geographic orientation toward the Asian Pacific Rim, along with its coastal ports, provides a strong basis for international trade with that region. Washington also shares a border with Canada and engages in a significant amount of trade with its northern neighbor. China continues to be Washington's largest export destination, despite the total value of exports to China declining from 2014 through 2015 (*Figure 2-8*).

Figure 2-8. Top 10 destination countries for Washington state exports, millions of dollars, based on 2015 ranking
Washington state, 2012 through 2015
Source: U.S. Census Bureau, State Trade Data

Country	2012	2013	2014	2015	Percent share 2015	Percent change 2014 to 2015
China	$14,157	$16,711	$20,690	$19,486	22.6%	-5.8%
Canada	$8,381	$8,993	$9,291	$8,019	9.3%	-13.8%
Japan	$9,026	$7,037	$7,362	$5,998	6.9%	-18.5%
South Korea	$3,384	$2,712	$2,753	$4,287	5.0%	55.8%
United Arab Emirates	$5,059	$3,870	$3,272	$3,211	3.7%	-1.9%
Chile	$1,000	$1,386	$1,102	$3,003	3.5%	172.4%
Taiwan	$1,515	$1,443	$2,474	$2,758	3.2%	11.5%
United Kingdom	$1,610	$2,702	$2,951	$2,541	2.9%	-13.9%
Singapore	$910	$1,253	$1,714	$2,519	2.9%	47.0%
Turkey	$856	$548	$1,340	$1,922	2.2%	43.4%

China has consistently been the top trade destination for Washington exports.

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[8] United States Census Bureau, State Trade Data.

Labor market conditions continue to improve

Figure 2-9 shows how nonfarm employment in the state has changed in both the private and public sectors over the past seven years. Both sectors continued to add jobs over the course of the year from September 2015 through September 2016. Total nonfarm employment increased by 3.3 percent during that time as employers throughout the state added 104,400 jobs. The private sector accounted for the majority of the jobs added, with 87,500 added to private payrolls while government added 16,900 jobs.

State and local government employment made up over 87 percent of total government employment in September 2015. State and local governments also accounted for nearly all of the total government jobs added from September 2015 to September 2016, contributing 16,700 out of the 16,900 jobs added. As state economic conditions have improved and private sector employment has continued to rise, state tax revenues have increased and have enabled state and local governments to increase hiring. From September 2015 to September 2016, employment by state and local governments has increased by 3.4 percent compared with 1.9 percent in the year prior.

Figure 2-9. Total private and public sector nonfarm employment, seasonally adjusted Washington state, September 2009 through September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Current Employment Statistics
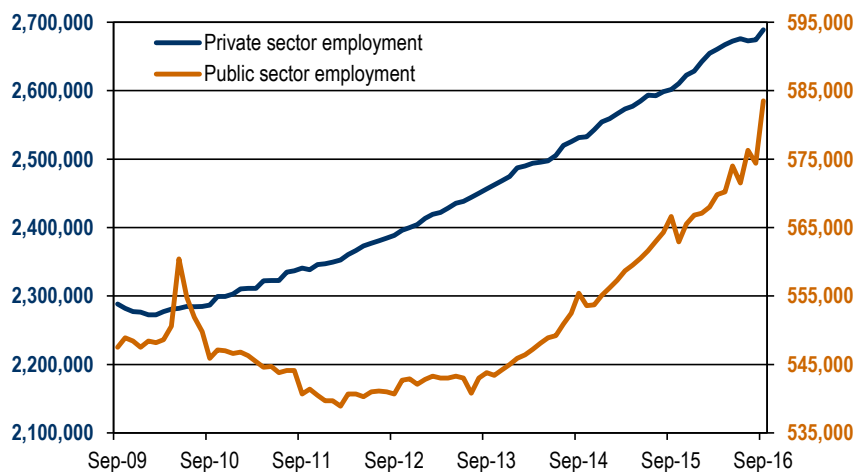
The employment recovery is now being felt in both the private and public sectors.

Figure 2-10 shows how the percentage gain in total nonfarm employment over the last seven years, from September 2009 through September 2016, has been distributed among the major industrial groups making up the state economy. During that time, Washington employment increased by 15.4 percent, or 436,700 jobs.

Employment has increased in all of the major industrial groups with the exception of mining and logging, which has been trimming jobs most recently due to low commodity prices. Six of the remaining private industry sectors had employment gains above the state average. Professional and business services employment expanded by the largest margin, 27.3 percent. Four private sector industries had employment gains below the state average. One of which, manufacturing, started strong at the beginning when it was bolstered by aerospace jobs. Some of those jobs have been lost, most of which occurred within the past year, as employers in this group restructured work crews and assignments. Manufacturers have also been under duress due to more challenging global conditions recently. One more private industry sector, other services, which include repair, maintenance and laundry services, increased employment at about the same rate as the state total. All private industry groups that added to employment during this period did so at a rate faster than the government sector.

Figure 2-10. Percent change in employment by industry
Washington state, September 2009 through September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Current Employment Statistics
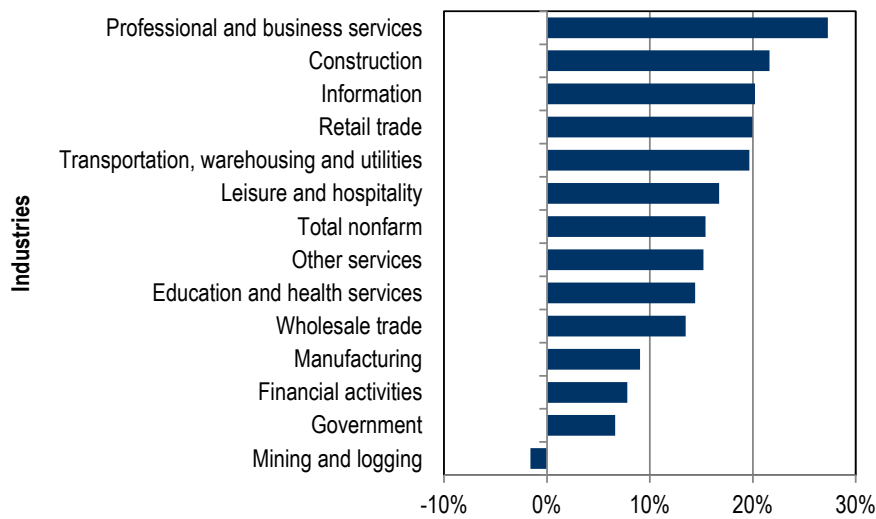
Employment has increased in all but one of the major industries during the current economic expansion.

Seattle area creating the most jobs in the state

Figures 2-11 and *2-12* illustrate the extent to which the Seattle-Bellevue-Everett (Seattle) Metropolitan Division (King and Snohomish counties) has served as a major center for job creation during the seven-year economic expansion. This Metropolitan Division (MD) had lost a greater number of jobs during the recession than the rest of the state as a whole. Since September 2009, however, nonfarm employment in the Seattle MD grew by 266,400 through September 2016, or by 19 percent. By contrast, the rest of the state has added 170,000 jobs and has increased employment by 11.9 percent during the same period.

Total employment in the Seattle MD has been larger than that within the balance of the state since September 2012. The difference in total nonfarm employment between the two areas has widened in 2016.

Figure 2-11. Total nonfarm employment change, seasonally adjusted
Washington state, Seattle-Bellevue-Everett Metropolitan Division and balance of state, September 2009 through September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Current Employment Statistics

Area	Total employment change September 2009 through September 2016	Percent employment change September 2009 through September 2016
Seattle-Bellevue-Everett Metropolitan Division	266,400	19.0%
Balance of state	170,300	11.9%
Total for state	**436,700**	**15.4%**

The Seattle-Bellevue-Everett Metropolitan Division continues to lead in job creation.

Figure 2-12. Monthly total nonfarm employment, in thousands, seasonally adjusted
Seattle-Bellevue-Everett Metropolitan Division and balance of state, September 2009 through September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Current Employment Statistics
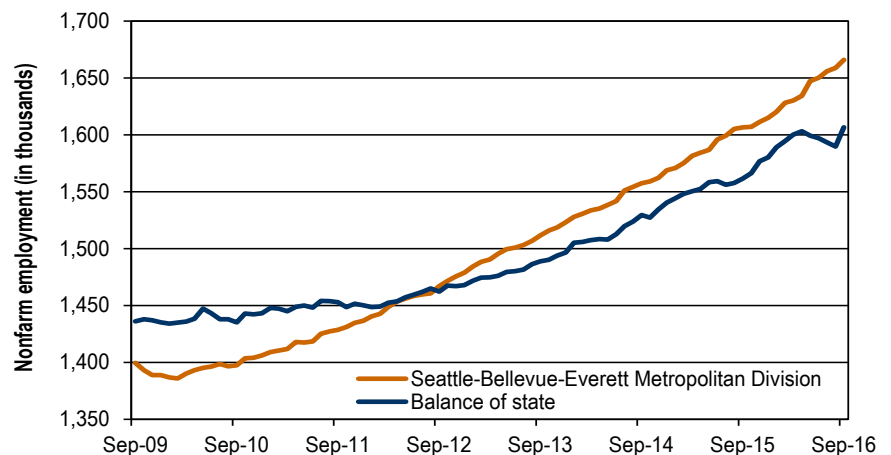
Employment is growing, with the Seattle-Bellevue-Everett Metropolitan Division area continuing to lead the way.

Washington state and U.S. unemployment rates start to diverge

Washington state's unemployment rate had tracked more closely with the national unemployment rate during and after the recent recession (*Figure 2-13*). From September 2009 to June 2015, the average difference between the two rates was less than one-tenth of one percentage point. Some separation between the rates began occurring thereafter to where the unemployment rate for Washington was 5.6 percent and 5.0 percent for the U.S.in September 2016. Both the state and national unemployment rates began declining more gradually into 2015 and 2016. The sustained pace of job growth has been attracting more participants into the labor force to compete for the number of available jobs. This tended to add to the ranks of those counted as unemployed, and has begun to limit the downward progress made in the unemployment rate.

Figure 2-13. Monthly seasonally adjusted annualized unemployment rates
United States and Washington state, September 2002 through September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics,
Local Area Unemployment Statistics
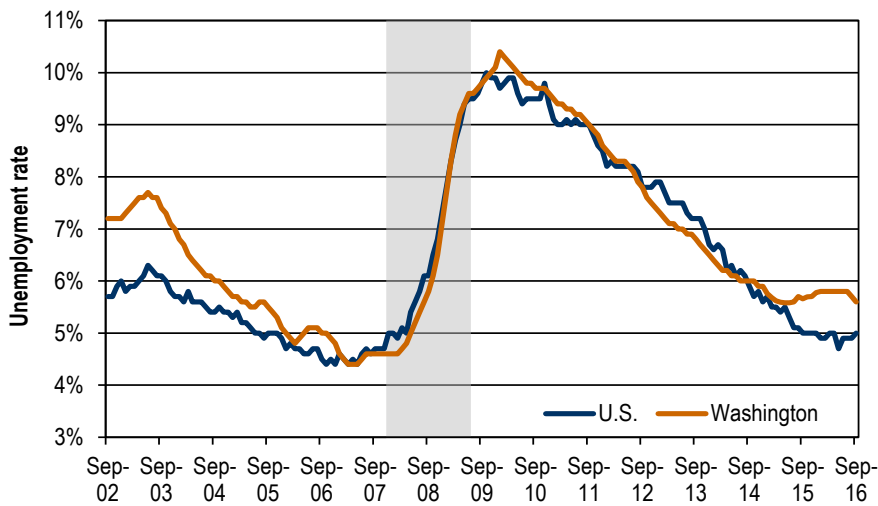
Shaded area is a U.S. recession.

The Washington state unemployment rate has tracked closely with the national rate since the recession began, although some separation began occurring in 2015.

Washington's rate of labor force participation has been strong enough to temporarily reverse the downward long-term trend in the unemployment rate (*Figure 2-14*). The increase in the size of the state's labor force over the last couple of years also helps to explain the deviation of its unemployment rate from the national rate. Over the past two years, from September 2014 through September 2016, the state's labor force growth has averaged roughly 3.9 percent per year. The nation as a whole, however, has averaged only 1.2 percent labor force growth per year over the same period.

With the labor force being more stable from a national standpoint, the movement of the national unemployment rate toward its current position, coupled with renewed wage growth, indicates that excess unemployment has been reduced and the labor market appears to be very close to a full employment level. With solid job creation continuing to occur, the Federal Reserve Board (Fed) becomes more likely to start raising interest rates to choke off the looming specter of inflation. This could have the effect of slightly elevating unemployment rates should it occur, and it might appear that a bottom for the state and national unemployment rates has been or will very soon be reached.

Figure 2-14. Labor force participation rate and employment-to-population ratio, seasonally adjusted annual rate
Washington state, January 2002 through September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics
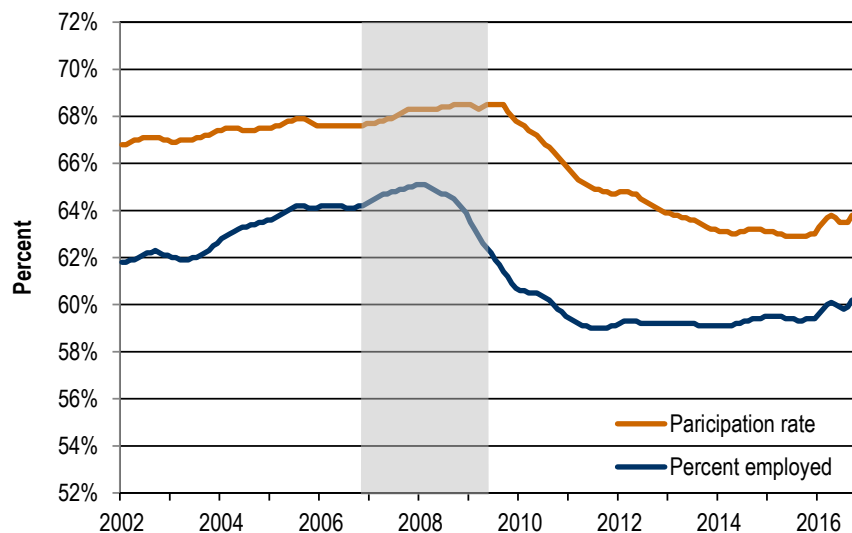
Shaded area is a U.S. recession.

The labor force participation rate and the percent of the population employed have increased slightly going into 2016.

Chapter 3: Seasonal, structural and cyclical industry employment

The purpose of this chapter is to identify the most influential factors in employment trends for different industries in Washington state. The results are important for both a better understanding of current employment trends and for practical applications such as job placement, unemployment insurance and training programs. Annually, for instance, industries with high levels of seasonality experience significant variation in monthly employment. With this monthly variation, short-term high job demand follows upon employment declines. For industries with high cyclical variation, periods of booming employment can be followed by periods of decline. Training programs should be developed in anticipation of such variation.

We have also analyzed the relationships between industry and total state employment (see *Appendix 2*). The results of this analysis can help in creating a better understanding of the key components of state employment trends.

Our analysis is based on historical employment data from January 1990 to December 2015.[9] The analysis splits industry employment trends among the following four components:

1. **Seasonal**: regular predictable employment changes that recur each calendar year, caused by seasonal factors, which can include natural factors (changes in weather), administrative measures (starting and ending of the school year) and social, cultural or religious traditions (fixed holidays such as New Year's Day).

2. **Cyclical**: employment changes attributed to the business cycle in general or specific events such as the housing bubble bursting in 2007 or cyclical variation in aerospace employment.

3. **Trend**: shifts in long-term employment growth trends driven by fundamental structural change and productivity trends in industries, rather than the cyclical fluctuations in employment. Structural changes in employment can be initiated by productivity improvement, policy changes or permanent changes in resources, technology or society. Technological innovation has introduced entirely new industries and caused other industries to decline.

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[9] Historical data for employment covered by the unemployment insurance system was categorized by NAICS (North American Industrial Classification System) code, at the 3-digit code level with some 4-digit level detail (aerospace product and parts manufacturing, ship and boat building, software publishers and wired and wireless telecommunications carriers). Private and public education services employment data were combined under the education and health services industry category. Private and public employment data were also combined under the postal services and ship and boat-building industries. The remainder of public-sector employment was aggregated and categorized by ownership (federal, state and local government). Three industries were excluded from the analysis due to data limitations and/or significant code changes: oil and gas extraction, rail transportation and internet publishing and broadcasting. Altogether, the historical time series data included 97 industries and one series for total employment.

In addition, it has reshaped the entire labor market through increased efficiencies, such as automated manufacturing, data collection and analysis and communications.

4. **Irregular**: random employment changes not picked up by regular seasonal and cyclical components (e.g., non-regular seasonality, weather variation and labor strikes).

Seasonal industries

Based on an analysis of 97 industries in Washington state, 18 industries were identified as having high levels of seasonality, with a seasonal factor over 4.0 percent. Crop production, scenic and sightseeing transportation, and support activities for agriculture and forestry were the most seasonal industries (*Figure 3-1*).

Figure 3-1. Industries with high levels of seasonality[10]
Washington state, 1990 to 2015
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

NAICS	Industry	Seasonal factor
111	Crop production	37.6%
487	Scenic and sightseeing transportation	18.1%
115	Support activities for agriculture and forestry	15.2%
711	Performing arts, spectator sports and related industries	9.1%
237	Heavy and civil engineering construction	9.0%
213	Support activities for mining	9.0%
114	Fishing, hunting and trapping	8.1%
525	Funds, trusts and other financial vehicles	8.1%
814	Private households	7.3%
721	Accommodation	5.7%
611	Educational services	5.0%
311	Food manufacturing	4.9%
448	Clothing and clothing accessories stores	4.7%
713	Amusement, gambling and recreation industries	4.6%
312	Beverage and tobacco product manufacturing	4.5%
492	Couriers and messengers	4.5%
512	Motion picture and sound recording industries	4.4%
519	Other information services	4.2%

Crop production, scenic and sightseeing transportation and support activities for agriculture and forestry have been the industries with the highest degree of seasonality in Washington state.

[10] In 2013, private household employment was moved into the health services and social assistance sector. Unlike the previous year's report, in this year's industry series decomposition, the private household sector was not adjusted. As a consequence, this year, the private household sector displays a higher level of seasonality.

Structural and cyclical industries

There were 23 industries where the structural (trend) component accounted for at least two thirds of the change in employment (*Figure 3-2*). Ambulatory healthcare services, software publishers, and food services and drinking places were the most highly influenced by the trend factor and consequently less by the cyclical factor.

Figure 3-2. Industries most influenced by structural factors
Washington state, 1990 to 2015
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics,
Quarterly Census of Employment and Wages

NAICS	Industry	Structural factor
621	Ambulatory healthcare services	83.3%
5112	Software publishers	78.7%
722	Food services and drinking places	77.7%
611	Educational services	77.3%
453	Miscellaneous store retailers	76.6%
454	Nonstore retailers	76.3%
622	Hospitals	72.1%
532	Rental and leasing services	71.6%
903	Local government (other)	71.3%
531	Real estate	70.7%
238	Specialty trade contractors	70.4%
623	Nursing and residential care facilities	70.4%
812	Personal and laundry services	70.4%
425	Wholesale electronic markets and agents and brokers	70.1%
452	General merchandise stores	69.3%
323	Printing and related support activities	68.0%
236	Construction of buildings	67.9%
312	Beverage and tobacco product manufacturing	67.5%
541	Professional, scientific and technical services	67.5%
331	Primary metal manufacturing	67.4%
491	Postal service	67.2%
423	Merchant wholesalers, durable goods	66.9%
511	Other publishers	66.8%

These Washington industries have been most influenced by structural factors such as technology changes, policy changes and changing demographics.

For 18 industries, the cyclical component accounted for more than half of the change in employment (*Figure 3-3*). Support activities for mining, scenic and sightseeing transportation, and crop production were the most highly influenced by the cyclical factor and consequently less by the structural (trend).

Figure 3-3. Industries most influenced by cyclical factors
Washington state, 1990 to 2015
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics,
Quarterly Census of Employment and Wages

NAICS	Industry	Cyclical factor
213	Support activities for mining	68.1%
487	Scenic and sightseeing transportation	66.7%
111	Crop production	63.7%
324	Petroleum and coal products manufacturing	61.8%
316	Leather and allied product manufacturing	57.1%
515	Broadcasting (except internet)	56.5%
486	Pipeline transportation	55.3%
313	Textile mills	54.6%
112	Animal production	53.7%
443	Electronics and appliance stores	53.5%
446	Health and personal care stores	52.8%
521	Monetary authorities-central bank	52.8%
114	Fishing, hunting and trapping	52.1%
518	Data processing, hosting and related services	51.0%
221	Utilities	50.6%
901	Federal government (other)	50.4%
493	Warehousing and storage	50.2%
902	State government (other)	50.1%

These Washington industries have been most sensitive to cyclical movements and have exhibited shifts of relatively rapid employment growth and decline.

See *Appendix 2* for a description of the statistical methodology used to categorize and measure the major factors behind employment change by industries and *Appendix figure A2-2* with the full results of these analyses.

Chapter 4: Unemployment

This chapter discusses two important indicators of Washington's labor market: unemployment benefits and unemployment rates.

Unemployment benefits

In September 2016, fewer than 50,000 people received unemployment benefits. *Figure 4-1* shows that the number of beneficiaries has continued to decrease, by 84 percent in September 2016 from a peak of just over 300,000 in January 2010. The drop in beneficiaries reflects factors including: individual beneficiaries finding jobs, fewer people being laid off and needing to apply for benefits, and beneficiaries exhausting all of their unemployment benefits.

Figure 4-1. Unemployment benefit recipients by month, all benefits[11]
Washington state, January 2012 through September 2016
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse
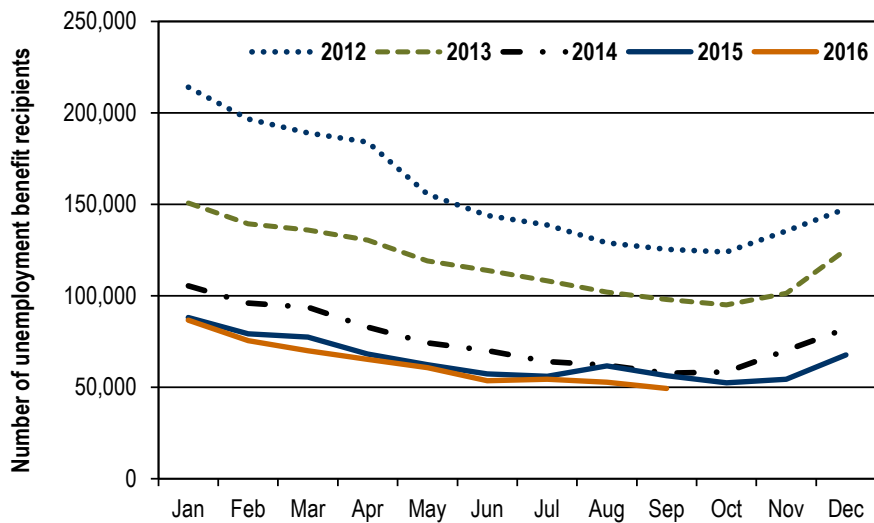
From year to year, the number of people receiving unemployment benefits has continued to decline since 2012.

Duration of unemployment benefits

Typically, workers covered by unemployment insurance can receive up to 26 weeks of regular unemployment benefits in a 52-week benefit year. The 52-week benefit year begins when an individual applies for unemployment benefits.

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[11]All benefit programs include regular, emergency unemployment compensation (EUC) and extended benefits (EB).

More weeks of unemployment benefits available after the recession

Because of the unusually steep loss of jobs during the Great Recession, additional weeks of federally funded unemployment benefits were made available to unemployed workers after they used all of their regular unemployment benefits. At one point, claimants could receive up to a total of 99 weeks of benefits – 26 weeks of regular benefits, 53 weeks of emergency unemployment compensation (EUC) benefits and 20 weeks of extended benefits (EB). Federal extensions have been phased out during the recovery. As of September 2016, claimants could receive up to 26 weeks of state benefits.

The impact of these additional weeks of benefits is evident in the average duration (number of weeks) of benefits received. *Figure 4-2* compares the average duration of benefits in Washington state for those who were receiving only regular benefits (up to 26 weeks) to the duration of all benefits, including the EUC and EB.

The annual average duration for regular benefits and all benefits peaked in 2010 at 20.7 weeks and 42.0 weeks, respectively. In 2011, average duration of regular benefits declined to 17.9 weeks and 39.5 weeks for all benefits. The average duration of both regular benefits and all benefits, in 2015, was 15.3. From January 2016 through September 2016, the average duration for both regular benefits and all benefits decreased to 14.8 weeks.[12]

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[12] Federal extensions have been phased out during the recovery. As of September 2016, claimants could receive up to 26 weeks of state benefits.

Figure 4-2. Average duration of regular unemployment benefits compared to all benefits
Washington state, January 2000 through September 2016
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse
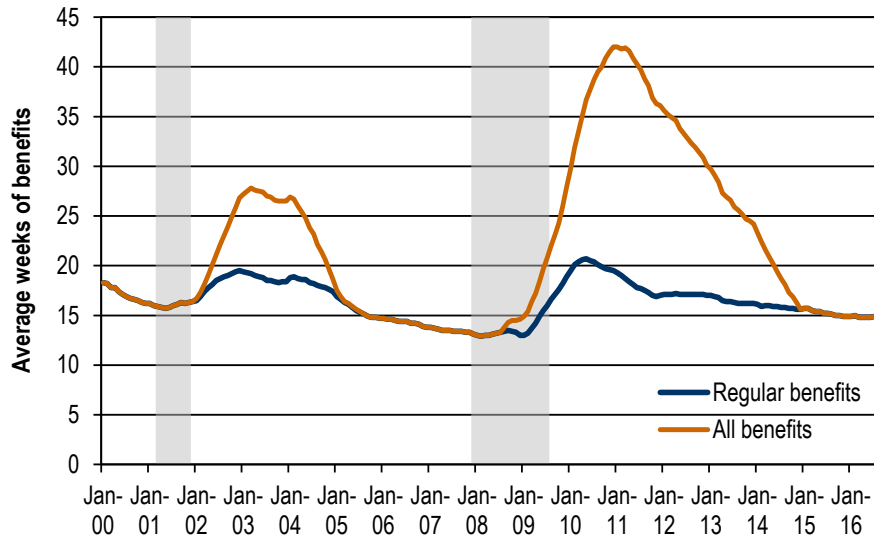
Shaded areas are U.S. recession periods.

The number of weeks claimants received benefits has decreased from the post-recession peak.

More people have exhausted all benefits

Unemployed individuals exhaust their benefits when they have received all regular, EUC and EB available to them. *Figure 4-3* shows the monthly exhaustions for Washington unemployment benefits. The level of exhaustions have continued to decline since May 2010 when 15,227 individuals exhausted their benefits. By September 2016, 3,087 people had used all of their available unemployment benefits
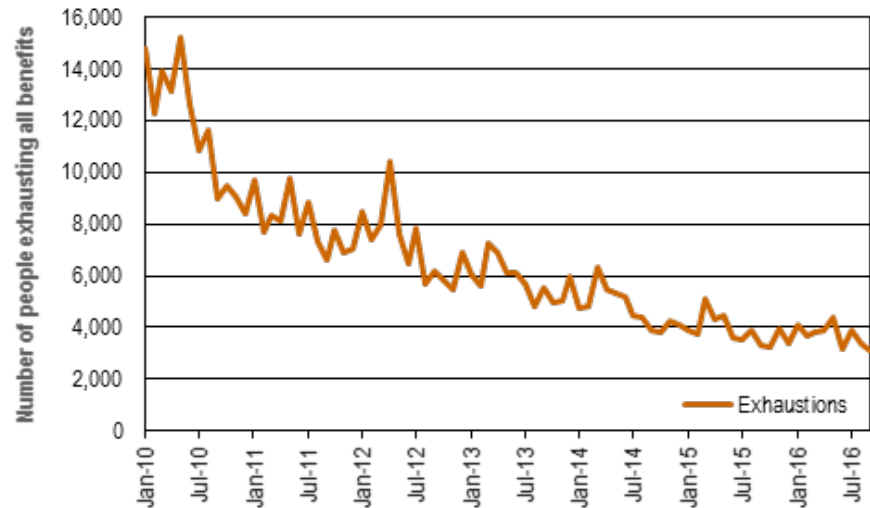
In September 2016, 3,087 people exhausted all of their unemployment benefits.

Benefit exhaustions by industry, occupation and area

Higher levels of benefit exhaustions are generally associated with long-term unemployment. The following figures detail patterns of benefit exhaustions by industry, occupation and location.

Exhaustions by industry

Figure 4-4 presents exhaustions by industry for the 12 months ending in September 2016. To provide further context, the figure also includes each industry's percent of total nonfarm employment and exhaustion-to-employment ratio. The exhaustion-to-employment ratio can be used to identify industries characterized by long-term unemployment and that continue to struggle in their recovery from the recent recession. The larger the exhaustion-to-employment ratio, the more likely workers were to exhaust.

From October 2015 through September 2016, workers in the construction industry were most likely to exhaust unemployment benefits with an exhaustion-to-employment ratio of 2.9. Utilities and administrative and support and waste management and remediation services followed as second and third most likely to exhaust (2.7 and 2.4, respectively).

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[13] Nonfarm employment does not include farm workers, private households or non-profit organization employees. Exhaustion totals were not comparable to nonfarm employment totals.

The manufacturing industry accounted for the greatest portion of exhaustions at 12.4 percent. The manufacturing industry's share of total covered employment was 9.0 percent and the exhaustion-to-employment ratio was 1.9. Construction had the second-largest portion of exhaustions at 12.0 percent followed by administrative and support and waste management and remediation at 8.7 percent.

Figure 4-4. Unemployment benefit exhaustions by industry, all benefits
Washington state, October 2015 through September 2016
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse; U.S. Bureau of Labor Statistics, Current Employment Statistics

NAICS	Industry sector	Annual exhaustions, all benefits	Percent of all exhaustions	Industry share of nonfarm employment	Exhaustions-to-employment ratio
11	Agriculture, forestry, fishing and hunting	2,228	5.0%	N/A	N/A
21	Mining	86	0.2%	N/A	N/A
22	Utilities	140	0.3%	0.2%	2.7%
23	Construction	5,300	12.0%	5.6%	2.9%
31 - 33	Manufacturing	5,479	12.4%	9.0%	1.9%
42	Wholesale trade	2,247	5.1%	4.2%	1.7%
44 - 45	Trade	3,550	8.0%	11.3%	1.0%
48 - 49	Transportation and warehousing	1,399	3.2%	3.1%	1.4%
51	Information	1,383	3.1%	3.7%	1.2%
52	Finance and insurance	1,372	3.1%	0.0%	1.4%
53	Real estate, rental and leasing	786	1.8%	1.7%	1.5%
54	Professional, scientific and technical services	3,256	7.4%	6.0%	1.7%
55	Management of companies and enterprises	90	0.2%	1.3%	0.2%
56	Administrative and support and waste management and remediation services	3,851	8.7%	5.0%	2.4%
61	Educational services	867	2.0%	1.8%	1.5%
62	Healthcare and social assistance	3,684	8.3%	12.5%	0.9%
71	Arts, entertainment and recreation	658	1.5%	1.5%	1.3%
72	Accommodation and food services	1,818	4.1%	8.4%	0.7%
81	Other services	1,161	2.6%	3.7%	1.0%
GOV	Government	1,191	2.7%	17.8%	0.2%
	Unknown	3,618	8.2%	N/A	N/A
	Total	**44,164**	**100.0%**	**100.0%**	**N/A**

N/A = Nonfarm employment does not include farm workers, private households or non-profit organization employees. Exhaustion totals were not comparable to nonfarm employment totals.

Construction and Utilities industry workers were most likely to exhaust unemployment benefits from October 2015 through September 2016 (2.9 and 2.7 exhaustion-to-employment ratios, respectively).

Exhaustions by occupation

Figure 4-5 examines unemployment benefit exhaustions by occupation. Management, office and administrative support and construction and extraction occupations combined for more than 38.7 percent of all exhaustions. Since total covered employment is reported only by industry and not by occupation, each occupation's percent of total covered employment and exhaustion-to-employment ratio were not available to be included in *Figure 4-5*.

Figure 4-5. Unemployment benefit exhaustions by major occupational groups, all tbenefits
Washington state, October 2015 through September 2016
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse

SOC	Major occupational group	Annual exhaustions, all benefits	Percent of all exhaustions
11	Management	5,851	13.2%
43	Office and administrative support	5,760	13.0%
47	Construction and extraction	5,541	12.5%
51	Production	4,438	10.0%
41	Sales and related	3,004	6.8%
53	Transportation and material moving	2,930	6.6%
45	Farming, fishing and forestry	2,119	4.8%
49	Installation, maintenance and repair	1,863	4.2%
15	Computer and mathematical	1,793	4.1%
13	Business and financial operations	1,655	3.7%
35	Food preparation and serving related	1,625	3.7%
39	Personal care and service	1,166	2.6%
17	Architecture and engineering	947	2.1%
37	Building and grounds cleaning and maintenance	923	2.1%
27	Arts, design, entertainment, sports and media	856	1.9%
31	Healthcare support	758	1.7%
29	Healthcare practitioners and technical	744	1.7%
33	Protective service	523	1.2%
25	Education, training and library	464	1.1%
19	Life, physical and social science	445	1.0%
21	Community and social services	424	1.0%
23	Legal	266	0.6%
55	Military specific	68	0.2%
	Unknown	1	0.0%
	Total	**44,164**	**100.0%**

Unemployed workers in management, office and administrative support and construction and extraction occupations accounted for more than one-third of all individuals to exhaust unemployment benefits from October 2015 through September 2016.

Exhaustions by workforce development area

Figure 4-6 shows exhaustions by workforce development area (WDA) for October 2015 through September 2016. The Seattle-King, Pierce and Snohomish WDAs are the largest in the state in terms of population and have had the largest numbers of unemployed workers throughout the recent recession and recovery. Collectively, they accounted for 46.2 percent of all exhaustions. The Seattle-King WDA had more than twice the number of exhaustions observed in either the Tacoma-Pierce or Snohomish WDAs. The lowest level of exhaustions occurred in the Eastern Washington WDA.

Figure 4-6. Unemployment benefit exhaustions by workforce development area, all benefits
Washington state, October 2015 through September 2016
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse

Workforce development area	Annual exhaustions, all benefits	Percent of exhaustions
Seattle-King	11,192	25.3%
Tacoma-Pierce	4,983	11.3%
Snohomish	4,242	9.6%
Out of state	4,062	9.2%
Pacific Mountain	2,939	6.7%
South Central Washington	2,778	6.3%
Spokane	2,715	6.1%
Southwest Washington	2,533	5.7%
Northwest Washington	2,363	5.4%
North Central Washington	1,956	4.4%
Benton-Franklin	1,943	4.4%
Olympic Consortium	1,634	3.7%
Eastern Washington	824	1.9%
Total	**44,164**	**100.0%**

Areas containing higher populations accounted for more exhaustions of unemployment benefits.

Unemployment rate

The overall unemployment rate is a ratio of the estimated number of unemployed individuals looking for work divided by the civilian labor force. The labor force is made up of individuals who are employed or who are actively seeking work. This is the most familiar unemployment rate and includes both workers covered by unemployment insurance and those who are not.[14]

[14] Workers covered by unemployment insurance are unemployed through no fault of their own, as determined by state law. In order to qualify for this benefit program, they must have worked at least 680 hours in covered employment during the past 12 to 18 months. At least some of these hours must have been earned in Washington State. They must also be able to work and be available for work each week that they are collecting benefits.

Particularly in the context of a discussion about unemployment benefits, the insured unemployment rate can be useful. The insured unemployment rate is a ratio of the number of insured unemployed (those drawing unemployment benefits) divided by the total number of individuals (working and not working) covered by unemployment insurance.

Figure 4-7 compares the overall and insured unemployment rates for Washington. The rates have basically moved in tandem, with the insured rate historically about half the overall unemployment rate. In late 2008, both measures of unemployment began a dramatic rise, with rates peaking during the first quarter of 2010. However, since early 2009, the gap between the overall and insured unemployment rates widened. This means there were increasing numbers of unemployed workers not eligible for unemployment benefits.

Figure 4-7. Overall unemployment rate, seasonally and not seasonally adjusted, and insured unemployment rate
Washington state, January 2000 through September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics
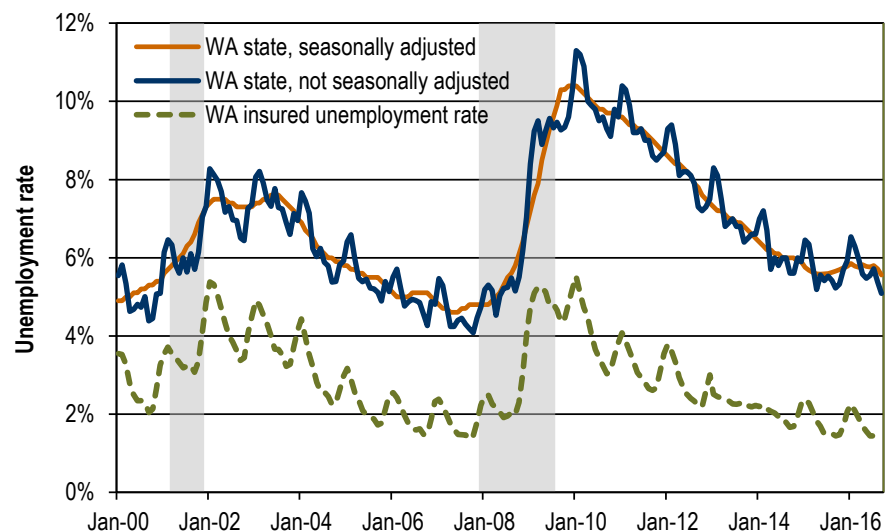
Shaded areas are U.S. recession periods.

The gap between unemployed workers who are eligible for unemployment benefits and those who are not has widened following recent recessions.

The overall unemployment rate

The overall unemployment rate is widely used in economic analysis as a lagging indicator of the direction of the economy. As noted previously, the unemployment rate is a ratio of the estimated number of unemployed who are seeking work, divided by the labor force. The labor force is limited to individuals who are employed or seeking work.

As shown in *Figure 4-8*, the state unemployment rate peaked in the first quarter of 2010. During most of 2010, 2011 and 2012, the unemployment rate for Washington state remained higher than the national rate. Starting in July 2012, the state unemployment rate fell below the national rate and remained below the national rate through August of 2014 before rising above the nation in September 2014 at 6.0 percent. For 2015 and 2016, to date, the state remained above the national rate. By September 2016, the state and national rates were at 5.6 and 5.0 percent, respectively.

The Seattle-Bellevue-Everett Metropolitan Division (MD) has reported a lower unemployment rate than the rest of Washington and the nation since 2004. From July 2012 through September 2016, the unemployment rate for the Seattle MD declined by 2.8 percentage points. For comparison, the balance of the state declined by 2.5 percentage points over the same period. The national rate dropped by 3.2 percentage points.

Figure 4-8. Historical U-3 unemployment rates, seasonally adjusted
United States and Washington state, January 2000 through September 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics,
Local Area Unemployment Statistics; National Bureau of Economic Research
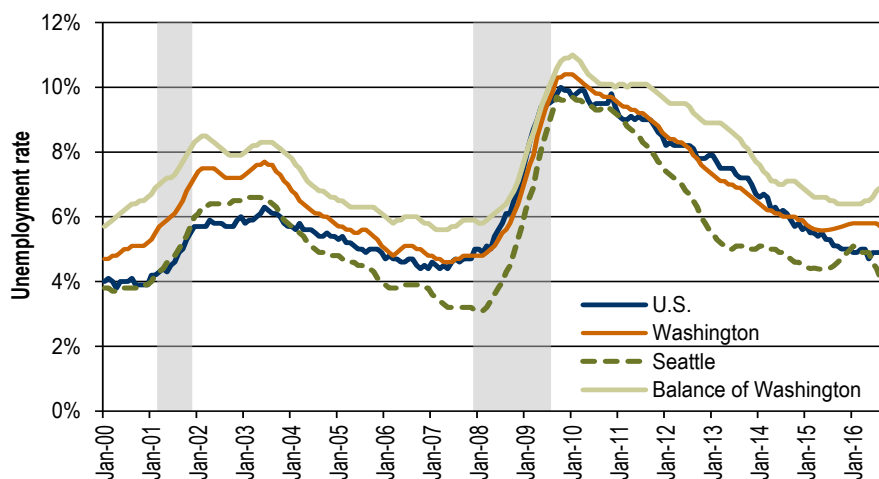
Shaded areas are U.S. recession periods.

National and state unemployment rates tracked closely during the recent recession. From July 2012 through September 2016, the Seattle unemployment rate declined more rapidly than the state rate.

Other measures of unemployment

Other measures of unemployment include alternative unemployment rates and the labor force participation rate.

Alternative unemployment rates

The U.S. Bureau of Labor Statistics (BLS) reports six alternative measures of labor underutilization, or unemployment. The commonly used definition of the unemployment rate, shown in *Figure 4-8*, is a ratio of the estimated number of unemployed who are seeking work, divided by the labor force. This is equivalent to what the BLS calls "U-3." A common criticism of the standard measurement of unemployment is that it is too narrow – for instance, it excludes individuals who are not working and would like to work, but have given up looking for work.

In response to criticism, the BLS has made available alternative measurements that are progressively more inclusive than the commonly reported unemployment rate. The standard measurement (U-3), along with two of the six alternative measurements, are defined as:

- U-3 – Unemployed as a percent of the labor force.

- U-4 – Unemployed plus discouraged workers, as a percent of the labor force plus discouraged workers.

- U-6 – Unemployed plus all marginally attached workers and employees working part time for economic reasons, all as a percent of the labor force plus all marginally attached workers.

The U-4 measure rose faster and remained higher in Washington state than for the country as a whole during the recent recession (*Figure 4-9*). The moving average for the third quarter of 2009 through the second quarter of 2010 had Washington state and the nation both at 10.3 percent. From the fourth quarter of 2011 through the third quarter of 2012, the Washington state rate decreased to 9.1 percent while the nation's rate has decreased to 8.8 percent. This indicates that relatively more Washington residents had given up looking for work and had dropped out of the labor force during that period. The Washington U-4 rate is now 6.1 percent and the U.S. rate is 5.3 percent for the period fourth quarter 2015 through third quarter 2016.

Figure 4-9. U-4 unemployment rate (includes discouraged workers), four-quarter moving average
United States and Washington state,, first quarter 2009 through third quarter 2016
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics,
Local Area Unemployment Statistics
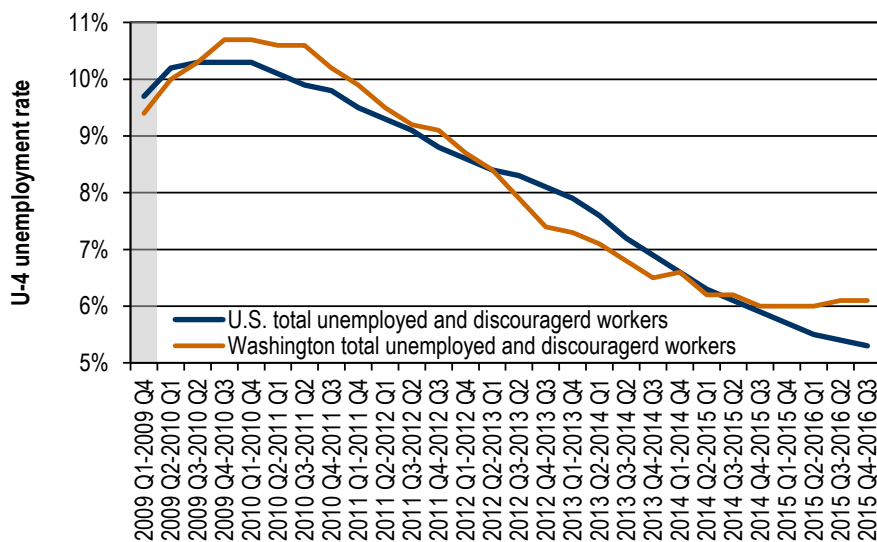
Shaded areas is a U.S. recession period.

The U-4 measure of unemployment has been declining throughout the recovery. As of September 2016, Washington state's U-4 is currently 6.1 percent and the U.S. is at 5.3 percent.

U-6 is the broadest measure of unemployment. The gap between the U-6 and U-3 rates has narrowed to its lowest level since the first quarter of 2010. This demonstrates the decrease in the ranks of discouraged workers; marginally attached workers and those working part time involuntarily even more dramatically than the number of unemployed (*Figure 4-10*). This holds true for the state of Washington, where the majority of underutilized workers are in the employed part time for economic reasons category. Washington's U-6 four-quarter moving average remained higher than the nation's from the second quarter of 2009 until the fourth quarter of 2013. Most recently, Washington remains 0.90 percentage points above the national rolling average from fourth quarter of 2015 through third quarter of 2016.

Figure 4-10. U-3 (standard) and U-6 (includes marginally attached workers and those working part time involuntarily) unemployment rates, four-quarter moving average United States and Washington state, first quarter 2009 through third quarter 2016
Source: U.S. Bureau of Labor Statistics, Current Population Survey,
Local Area Unemployment Statistics
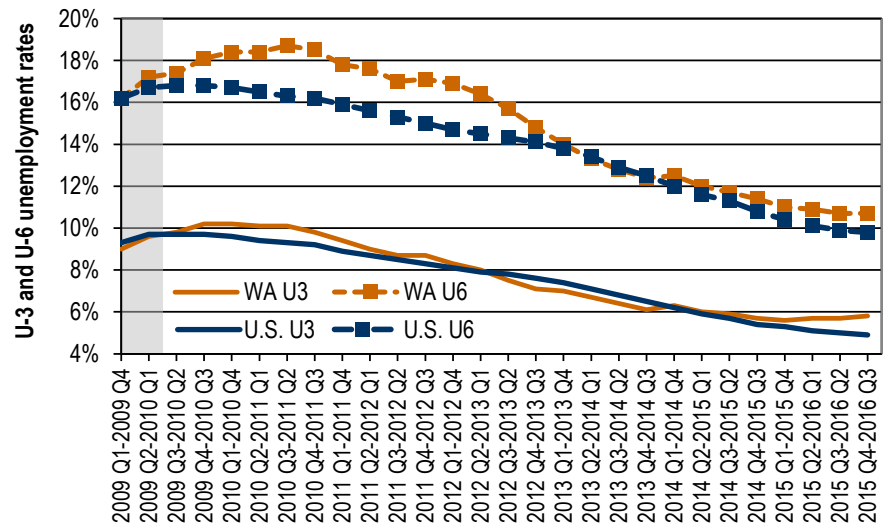
Shaded area is a U.S. recession period.

The most broadly defined U-6 measure of unemployment for Washington remains above the national rolling average.

Mass layoffs and dislocated workers reports discontinued

The Mass Layoff Statistics (MLS) program was a federal-state cooperative program that collected data on mass layoffs for establishments having at least 50 initial unemployment claims within a five-week period. The program was used to help identify distressed areas and distressed industries in the state. It was also used as a resource to help identify areas and industries with dislocated workers following plant closures or mass layoffs.

In 2013 as part of federal spending cuts (commonly referred to as "sequestration"), the Bureau of Labor Statistics (BLS) eliminated the MLS program. The last published data for Washington state covered first quarter 2013. Consequently, we are unable to provide more current data on dislocated workers, mass layoffs and plant closures in this publication.

Chapter 5: Employment projections

This chapter provides information on the Employment Security Department's (ESD) short, medium- and long-term industry and occupational employment projections.[15]

Industry and occupational employment projections provide a general outlook for Washington state. They are used by policymakers, job seekers, training providers, economic analysts and others. While the projections may not provide a complete picture of Washington's future labor market, they do provide a reasonably plausible view about Washington industry and occupational employment in the future.

Annually, ESD produces industry forecasts for two-, five- and 10-year time horizons. The occupational staffing pattern for each industry is used to convert industry projections into occupational projections. Occupational projections show how many job openings are expected due to overall growth as well as replacement or turnover.

Total openings from occupational projections do not represent total demand, but can be used as an indicator of demand.

The base period for short-term projections is second quarter 2015 and the base period for medium- and long-term projections is 2014.[16]

Industry employment projections

Total nonfarm industry employment in Washington state is projected to reach about 3.36 million jobs by 2019 and about 3.59 million jobs by 2024 (*Figure 5-1*).

Figure 5-1. Base and projected nonfarm industry employment
Washington state, 2014, 2019 and 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics
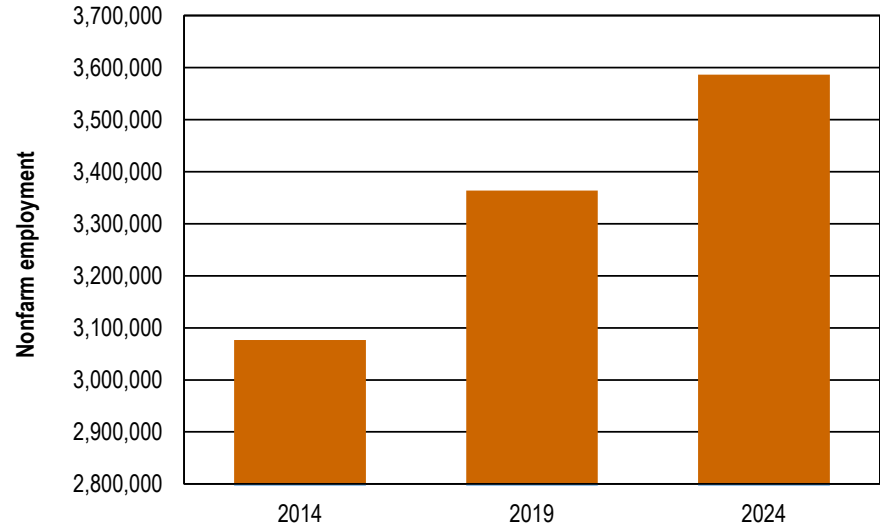
Nonfarm employment in Washington is expected to reach 3.36 million jobs by 2019 and 3.59 million jobs by 2024.

Washington state is projected to have an estimated 287,400 net new nonfarm jobs from 2014 to 2019 with an average annual growth rate of 1.80 percent. This growth rate is less than the growth rate of 2.12 percent projected for the state from 2013 to 2018. The state is projected to have an estimated 510,000 net new nonfarm jobs from 2014 to 2024 with an average annual growth rate of 1.55 percent. This growth rate is less than the growth rate of 1.79 percent projected for the state from 2013 to 2023.

2016 industry projections results

Figure 5-2 presents 2014 estimated employment, 2014 and 2024 employment shares, and changes in employment shares from 2014 to 2024 by industry for Washington state and the nation.

By 2024, the three industry sectors with the largest increases in employment shares in Washington state are projected to be professional and business services, health services and social assistance and information.

For this same time period, the two industry sectors with the largest decreases in employment shares are projected to be manufacturing and state and local government (including education).

The changes in employment shares for the state and the nation are generally close. The two sectors with the largest increases in shares are identical for the state and the nation, but in different order. For the state, professional and business services has the largest increase, while for the nation it is the health services and social assistance sector. The third largest increase for the state is the information sector, while for the nation it is construction.

The largest decrease in shares for the state and nation are in the manufacturing sector. The second and third largest decreases for the state are in the state and local government and financial activities sectors. The second and third largest decreases for the nation are in the federal government and state and local government sectors.

Figure 5-2. Base and projected nonfarm industry employment
United States and Washington state, 2014 to 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and wages

Industry sector[1]	WA state est. empl. 2014	WA state est. empl. shares 2014	WA state proj. empl. shares 2024	WA state percentage point change in empl. shares 2014-2024	National estimated empl. shares 2014	National projected empl. shares 2024	National percentage point change in empl. shares 2014-2024
Natural resources and mining[2]	2,300	0.07%	0.07%	0.00%	0.60%	0.62%	0.02%
Construction	160,400	5.22%	5.35%	0.13%	4.39%	4.65%	0.26%
Manufacturing	288,400	9.39%	8.11%	-1.28%	8.72%	7.63%	-1.09%
Wholesale trade	130,400	4.24%	4.23%	-0.01%	4.17%	4.12%	-0.05%
Retail trade	342,700	11.15%	11.01%	-0.14%	10.99%	10.82%	-0.17%
Utilities	4,800	0.16%	0.14%	-0.02%	0.40%	0.34%	-0.06%
Transportation and warehousing	92,700	3.02%	2.96%	-0.06%	3.32%	3.20%	-0.12%
Information	109,400	3.56%	3.87%	0.31%	1.96%	1.82%	-0.14%
Financial activities	152,900	4.98%	4.48%	-0.50%	5.71%	5.69%	-0.02%
Professional and business services	374,100	12.18%	13.79%	1.16%	13.66%	14.07%	0.41%
Education services	54,300	1.77%	1.91%	0.14%	2.44%	2.52%	0.08%
Health services and social assistance	397,400	12.93%	13.49%	0.56%	12.92%	14.65%	1.73%
Leisure and hospitality	298,000	9.70%	9.93%	0.23%	10.52%	10.49%	-0.03%
Other services	113,900	3.71%	3.62%	-0.09%	4.57%	4.47%	-0.10%
Federal government	71,300	2.32%	2.00%	-0.32%	1.95%	1.57%	-0.38%
State and local gov. (including education)	479,500	15.61%	15.05%	-0.56%	13.69%	13.34%	-0.35%

[1]The sectors in the table are based on Current Employment Statistic (CES) definitions.
[2]Logging is not included in natural resources and mining to match national data.

The largest growth sectors for the state are projected for professional and business services, health services and social assistance, and information.

Historical and projected growth rates

Figure 5-3 shows the historical and projected growth rates for the state and Washington's 12 workforce development areas (WDAs).

The largest positive difference between historical growth rates and projected growth rates is in the Olympic Consortium WDA. For this area, the difference between the historical and projected rates is 0.97 percent. The Eastern Washington WDA had the second largest positive difference with 0.78 percent.

The only two areas where projected growth is less than the previous 10 years is in the Snohomish and Benton-Franklin WDAs.

Figure 5-3. Historical and projected total nonfarm employment growth
Washington state and workforce development areas, 1990 to 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Workforce development area[1]	Historical growth rate[2] 2004-2014	Projected growth rate 2014-2024	Historical trend growth[3] 1990-2014
Statewide	**1.33%**	**1.55%**	**1.37%**
Olympic Consortium	0.27%	1.24%	1.13%
Pacific Mountain	0.76%	1.41%	1.26%
Northwest	0.96%	1.44%	1.79%
Snohomish County	2.55%	1.17%	2.05%
Seattle-King County	1.36%	1.68%	1.13%
Tacoma-Pierce County	1.29%	1.53%	1.65%
Southwest Washington	1.39%	1.77%	1.69%
North Central Washington	1.33%	1.41%	1.29%
South Central Washington	0.77%	1.41%	0.80%
Eastern Washington Partnership	0.63%	1.41%	0.97%
Benton-Franklin	2.04%	1.62%	2.17%
Spokane Area	0.83%	1.51%	1.26%

[1] Workforce development areas are regions within Washington state with economic and geographic similarities.
[2] Historical growth is based only on covered employment.
[3] Trend growth is defined as growth rate of linear trend line.

Projected growth is less than the previous 10 years' growth in the Snohomish County and Benton-Franklin WDAs.

2016 Occupational projection results

Occupational projections represent total employment. Total employment includes nonfarm employment, private households, self-employment, agriculture, forestry and fishing.

In occupational projections, the average annual growth rate for total employment is projected to be 1.84 percent from 2014 to 2019 and 1.26 percent from 2019 to 2024. The Employment Security Department predicted average annual growth rates for total employment growth of 1.99 percent from 2013 to 2018 and 1.44 percent from 2018 to 2023.

The detailed state-level occupational projections cover 815 occupations, 805 of which are publishable. This publication, however, provides only a summary of the top occupations. For a complete list of occupations and projected employment, see the 2016 Employment Projections data files available at: https://esd.wa.gov/labormarketinfo/projections.

Figure 5-4 shows occupational employment estimates and employment shares for Washington state and the nation.

At the state level, one occupational group stands out, with increases in employment shares from 2014 to 2024. Computer and mathematical occupations are projected to increase employment shares by 0.57 percentage points. The next highest increase in shares is projected for building and grounds cleaning and maintenance occupations with an increase of 0.26 percentage points.

The largest decreases in employment shares at the state level are in production occupations, with a projected decrease of 0.48 percentage points, and in office and administrative support occupations, with a projected decrease of 0.33 percentage points.

At the national level, the largest increases in employment shares are in healthcare practitioners and technical, 0.51 percentage points, and healthcare support, 0.44 percentage points. The nation's largest decreases are in office and administrative support, 0.63 percentage points, and production, 0.55 percentage points.

By 2024, the top three state occupational groups for shares of employment are projected to be:

1. Office and administrative support occupations (12.26 percent).

2. Sales and related occupations (9.82 percent).

3. Food preparation and serving related occupations (7.82 percent).

By 2024 combined, these three major groups are projected to represent nearly 30 percent of total employment shares for the state.

Figure 5-4. Estimated and projected occupational employment
United States and Washington state, 2014 to 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Occupational Employment Statistics

2-digit SOC	Major occupational group	WA state est. empl. 2014	WA state est. empl. shares 2014	WA state est. empl. shares 2024	Nat'l est. empl. shares 2014	Nat'l est. empl. shares 2024	WA state percentage point change in empl. shares 2014-2024	Nat'l percentage point change in empl. shares 2014-2024
11	Management	189,887	5.42%	5.48%	6.08%	6.03%	0.06%	-0.06%
13	Business and financial operations	204,536	5.84%	5.89%	5.03%	5.11%	0.05%	0.09%
15	Computer and mathematical	163,875	4.68%	5.24%	2.70%	2.87%	0.57%	0.17%
17	Architecture and engineering	85,364	2.44%	2.23%	1.68%	1.62%	-0.20%	-0.06%
19	Life, physical and social sciences	37,122	1.06%	1.06%	0.87%	0.88%	0.00%	0.01%
21	Community and social services	59,769	1.71%	1.67%	1.64%	1.70%	-0.03%	0.06%
23	Legal	28,568	0.82%	0.76%	0.84%	0.83%	-0.05%	-0.01%
25	Education, training and library	205,610	5.87%	5.92%	6.12%	6.18%	0.05%	0.06%
27	Arts, design, entertain., sports and media	74,290	2.12%	2.15%	1.74%	1.70%	0.03%	-0.04%
29	Healthcare practitioners and technical	160,508	4.58%	4.74%	5.47%	5.98%	0.15%	0.51%
31	Healthcare support	87,675	2.50%	2.64%	2.82%	3.25%	0.14%	0.44%
33	Protective service	63,295	1.81%	1.82%	2.29%	2.24%	0.01%	-0.04%
35	Food preparation and serving related	266,079	7.60%	7.82%	8.28%	8.28%	0.23%	0.00%
37	Building and grounds cleaning and maint.	113,923	3.25%	3.51%	3.73%	3.72%	0.26%	-0.01%
39	Personal care and service	151,535	4.33%	4.48%	3.99%	4.24%	0.16%	0.25%
41	Sales and related	353,880	10.10%	9.82%	10.25%	10.10%	-0.28%	-0.14%
43	Office and administrative support	441,080	12.59%	12.26%	15.12%	14.49%	-0.33%	-0.63%
45	Farming, fishing and forestry	90,587	2.59%	2.43%	0.65%	0.57%	-0.16%	-0.08%
47	Construction and extraction	186,865	5.33%	5.42%	4.32%	4.47%	0.08%	0.15%
49	Installation, maintenance and repair	128,093	3.66%	3.49%	3.77%	3.77%	-0.17%	0.00%
51	Production	185,402	5.29%	4.81%	6.13%	5.58%	-0.48%	-0.55%
53	Transportation and material moving	225,266	6.43%	6.35%	6.48%	6.37%	-0.08%	-0.10%

Over the 2014-to-2024 period, the largest increases in employment shares are expected for computer and building maintenance occupations.

The projected average annual growth rates for the major occupational groups in Washington state are presented in *Figure 5-5*.

Computer and mathematical occupations (2.72 percent), building and grounds cleaning and maintenance occupations (2.34 percent) and healthcare support occupations (2.10 percent) are projected to grow faster than other occupational groups from 2014 to 2024. In the long term, four occupational groups are projected to fall below a 1 percent average annual growth rate: farming, fishing and forestry occupations (0.90 percent), legal occupations (0.87 percent), architecture and engineering occupations (0.67 percent) and production occupations (0.59 percent).

Figure 5-5. Projected average annual growth rates for major occupational groups
Washington state, 2014 to 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Occupational Employment Statistics
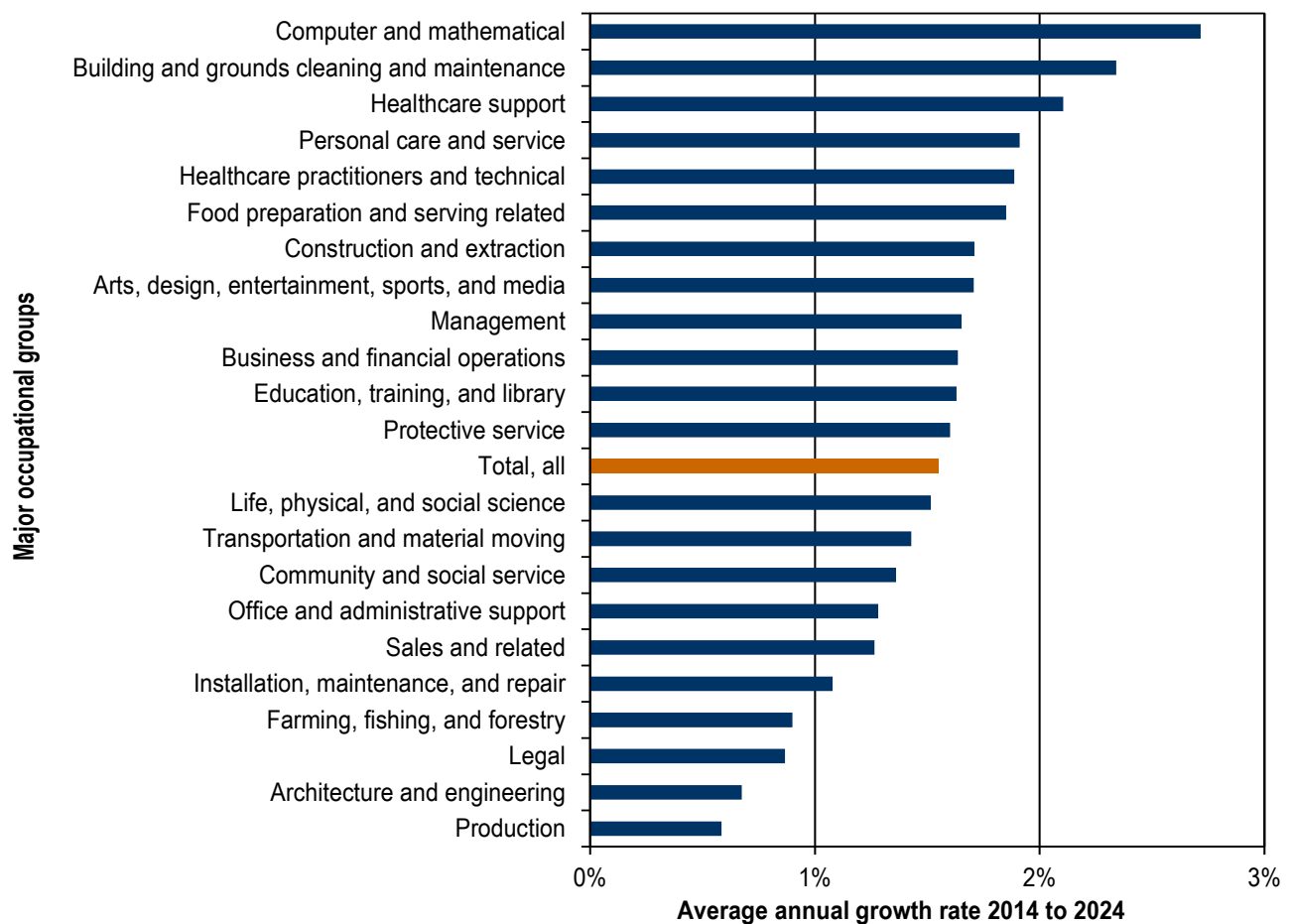
Computer and mathematical, building and grounds cleaning and maintenance, and healthcare support occupations are projected to experience the largest growth rates from 2014 to 2024 (2.72, 2.34 and 2.10 percent, respectively).

Separations, replacement and growth openings

The Bureau of Labor Statistics (BLS) concluded that the current replacement methodology undercounts occupational openings. As a result, they created a new occupational separations methodology. BLS created replacement and separation results for the 2012 to 2022 and 2014 to 2024 projections. They will not completely omit the replacement methodology until the 2016 to 2026 projections. This gives states time to convert their projections software over to the separations methodology.

More detailed information about the separation and replacement approaches can be found at: **https://www.bls.gov/emp/ep_ separations_methods.htm** and **https://www.bls.gov/emp/ep_ replacements.htm**, respectively.

On average, separations openings are approximately 4.67 times greater than replacement openings at the detailed occupational level (six-digit SOC). Also, the total number of average annual openings due to separations is more than seven times greater than the number of openings due to growth. Average total replacement openings are 1.50 times greater than growth openings.

In addition to tracking more openings, the separations methodology has the notable effect of reversing a projections trend for average annual total openings. At the state level, under the replacement methodology, the first five years (2014-2019) of average annual total openings are higher (151,433) than the second five years (2019-2024) of openings (140,091). This has been a typical replacement rate trend over time. Under the separations methodology, though, the reverse is true. The first five years (2014-2019) of average annual openings are lower (459,933) than the second five years (2019-2024) of openings (473,732).

Using either the separations or replacement methodology, average annual openings due to growth are calculated by subtracting base year values from projected year values and then dividing by the number of years used for the calculation period.

Figure 5-6 presents a comparison between the replacement and separations methodologies, two-digit Standard Occupational Classification (SOC), for average annual total openings.

Figure 5-6. Comparison of replacement and separations methodologies on total openings
Washington state, 2014 to 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

2-digit SOC	Major occupational group	Est. empl. 2014	Est. empl. 2024	Replacement average annual total openings 2014-2024	Separations average annual total openings 2014-2024	Ratio separations to replacements
11	Management	189,887	223,721	8,069	18,778	2.33
13	Business and financial operations	204,536	240,557	7,978	22,490	2.82
15	Computer and mathematical	163,875	214,228	7,902	16,801	2.13
17	Architecture and engineering	85,364	91,298	2,780	6,404	2.30
19	Life, physical, and social science	37,122	43,149	1,755	4,279	2.44
21	Community and social service	59,769	68,422	2,250	7,403	3.29
23	Legal	28,568	31,143	769	1,875	2.44
25	Education, training, and library	205,610	241,676	8,438	23,567	2.79
27	Arts, design, entertain., sports and media	74,290	87,983	3,394	9,638	2.84
29	Healthcare practitioners and technical	160,508	193,511	7,139	12,164	1.70
31	Healthcare support	87,675	107,976	4,056	13,123	3.24
33	Protective service	63,295	74,199	2,699	8,428	3.12
35	Food preparation and serving related	266,079	319,624	16,147	56,155	3.48
37	Building and grounds cleaning and maint.	113,923	143,581	5,546	18,989	3.42
39	Personal care and service	151,535	183,111	6,401	27,062	4.23
41	Sales and related	353,880	401,303	15,362	54,664	3.56
43	Office and administrative support	441,080	500,972	15,686	57,508	3.67
45	Farming, fishing, and forestry	90,587	99,084	3,352	15,196	4.53
47	Construction and extraction	186,865	221,380	6,562	23,225	3.54
49	Installation, maintenance, and repair	128,093	142,602	4,623	13,835	2.99
51	Production	185,402	196,545	5,473	22,475	4.11
53	Transportation and material moving	225,266	259,617	9,386	32,777	3.49

On average, separation openings are more than three times larger than replacement openings.

Projections for specific occupations

Figure 5-7 shows the top 20 specific occupations (six-digit SOC) by total openings based on the Bureau of Labor Statistics (BLS) separations methodology.

Figure 5-8 shows the top 20 specific occupations (six-digit SOC) by total openings based on the BLS replacement methodology

For both methodologies, the retail salespersons occupation is projected to have the largest number of total openings. Fifteen of the top 20 detailed occupations are the same in both methodologies.

The number of openings due to job growth did not exceed openings due to separations in any of top 20 occupations.

Four occupations had job growth that exceeded openings due to replacement needs:

- Software developers, applications
- Janitors and cleaners, except maids and housekeeping cleaners
- Landscaping and groundskeeping workers
- Personal care aides.

Figure 5-7. Top 20 specific occupations by average annual total openings, separations methodology Washington state, 2014 to 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Occupational Employment Statistics
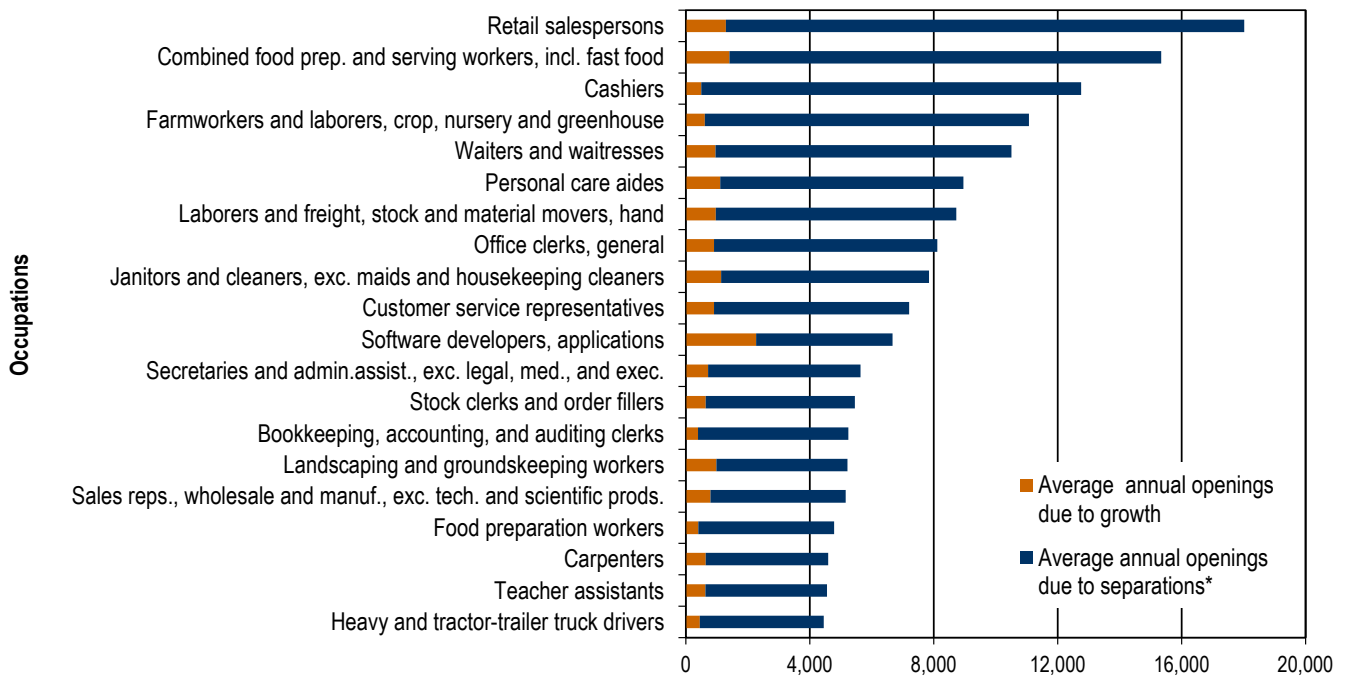
*The separations rate methodology tracks when workers leave occupations entirely and when workers leave the labor force entirely.

In the new separations methodology, the number of openings due to job growth did not exceed openings due to separations in any occupations.

Figure 5-8. Top 20 specific occupations by average annual total openings, replacement methodology
Washington state, 2014 to 2024
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages, Occupational Employment Statistics
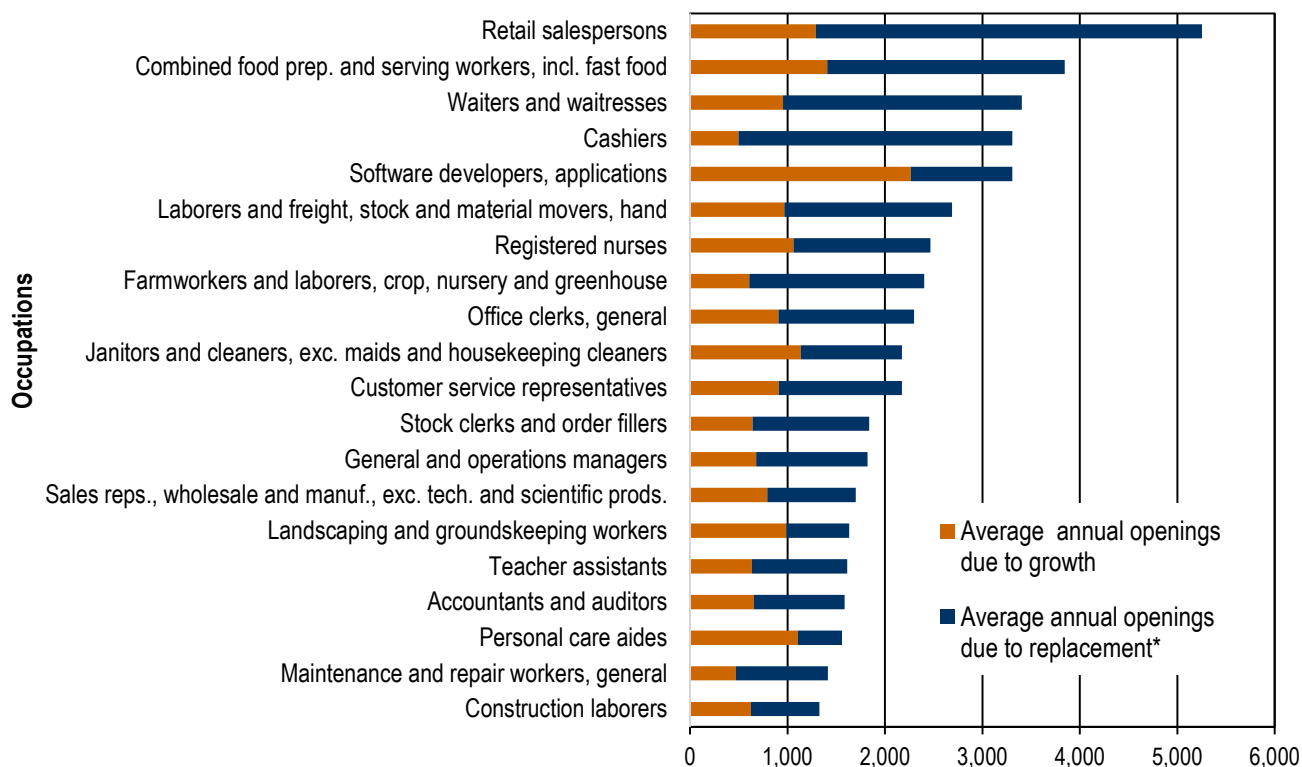
*The replacement rate methodology tracks when workers leave occupations entirely.

Job growth exceeded replacement needs in four occupations: software developers, applications; janitors and cleaners, except maids and housekeeping cleaners; landscaping and groundskeeping workers and personal care aides.

Specific occupations by area

Tables showing projections for specific occupations by state and each workforce development area are available on Employment Security's website.[17]

Occupations in Demand list

Employment projections are the basis of the Occupations in Demand (OID) list covering Washington's 12 workforce development areas and the state as a whole. This list is used to determine eligibility for a variety of training and support programs, but was created to support the unemployment insurance Training Benefits program.

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[17] https://esd.wa.gov/labormarketinfo/projections.

The full OID list is accessible through the "Learn about an occupation" tool located at: https://esd.wa.gov/labormarketinfo/LAAO.

All occupations in the list have demand indication definitions. The definitions come in three forms: "in demand," "not in demand" or "balanced." These definitions indicate the probability of a job seeker gaining employment in a given occupation. The term "in demand" indicates a greater probability of gaining employment. "Not in demand" indicates a lesser probability, and "balanced" indicates an uncertain probability between success and failure in gaining employment. The definitions are created through a four-step process as follows:

The data sources for the OID list

The 2016 list is based on projections:

- Five-year projections from 2014 to 2019, using average annual growth rates and total job openings.

- Ten-year projections from 2014 to 2024, using average annual growth rates and total job openings.

- A combination of two-year (second quarter 2015 to second quarter 2017) and ten-year (2014 to 2024) projections, using average annual growth rates and total job openings.

All of these time frames use unsuppressed occupations with employment in a base year (2014), consisting of 50 or more employees, for the state and WDAs.

In addition to projections, the OID list is created using supply and demand data:

- Supply data - average annual counts of WorkSource registered job seekers and unemployment claimants for WDAs for the most recent full year (April 2016 and the preceding 11 months).

- Demand data - average annual counts of job announcements from Help Wanted OnLine (HWOL) mid-monthly time series (April 2016 and the preceding 11 months).

Step one: Identify initial "in demand" and "not in demand" categories for each period.

- For each time frame, occupations with average annual growth rates of at least 90 percent of their respective geographic areas (statewide or WDA) total average annual growth rates and a share of total openings of at least .08 percent are defined as "in demand."

- Occupations with average annual growth rates less than 70 percent of their respective geographic areas total growth rates and a share of total openings of less than 1 percent are defined as "not in demand."

Step two: Identify provisional occupational categories.

- If within any of the three projection time frames (five-year, 10-year and two-/10-years combined), an occupation is categorized as being "in demand," it receives the first provisional identification as "in demand."

- If within any of the three projection time frames an occupation is categorized as "not in demand," it receives a second provisional identification of "not in demand."

Step three: Create final projections definitions.

- If an occupation has only one provisional definition, it equals the final projections definition.

- If an occupation has two provisional definitions of "in demand" and "not in demand," it gets identified as "balanced."

- All other occupations, without provisional definitions (i.e., not meeting the thresholds from step one), are identified as "balanced."

Step four: Create final adjustment definitions.

The projections definitions are now put through an adjustment process, using current labor market supply/demand data, which compares online job postings to information on unemployment claimants and WorkSource job seekers. An adjustment is applied when current supply/demand data significantly contradicts the model-based projections definitions. Only data for occupations with new annual job announcements of at least 100 are used in further calculations.

The adjustment methodology:

- If the projections definition is "in demand" or "balanced" but the ratio of supply to demand is more than 2, then the adjusted definition is "not in demand."

- If the projections definition is "in demand" and the ratio of supply to demand is not larger than 2, but more than 1.5, then the adjusted definition is "balanced."

- If the projections definition is "not in demand" or "balanced," but the ratio of supply to demand is less than 0.5, then the adjusted definition is "in demand."

- If the projections definition is "not in demand" and the ratio is at least 0.5, but less than 0.75, then the adjusted definition is "balanced."

- If the number of new job announcements for a current month is at least 10 and supply data are not available, the adjusted definition is "in demand."

The final list: Local adjustments.

The Employment Security Department's Labor Market and Performance Analysis division uses the methodology outlined above to prepare the initial lists for the state as a whole and by WDA. Those lists are then given to local workforce development councils to review, adjust and approve based on their local, on-the-ground experience.

Skill projections

This is the second year we have converted occupational projections into skills projections. We rely on the content of employers' job postings rather than the predefined, general O*NET skills. While the results of this attempt should be considered as preliminary, we believe that the attempt to use skills identified by employers in their job postings deserves some attention.

Data Sources

The main source for this analysis was a download of the top 100 hard skills for each detailed (six-digit SOC) occupation for Washington state from WANTED Analytics. The downloaded files represent the extracted hard skills from online job announcements posted in the last three years (from May 2013 to April 2016). Each skill is displayed with the number of job announcements from which it was extracted. This skill-announcement(s) pairing permits every occupation to display the relative importance of each skill. Theoretically, each occupation could contain a vector of up to 100 components with announcement numbers indicating the relative importance of each skill. A vector is a single entity (i.e., a column) consisting of an ordered collection of numbers. A skill drawn from a greater number of job announcements is relatively more important. The number of job announcements is summed for each occupation. Only vectors with a summation value of at least five and not less than 1 percent of base year employment were used. Some occupations contain very limited (if any) numbers of skill components.

Vectors were normalized (i.e., scaled) to totals of one. With this type of normalization, we created skill–to-occupation matrices. These matrices were used to convert occupational estimations and projections into comparable numbers expressed as hard skills.

The skill matrices are similar in structure and function to normalized matrices used for occupational-industrial staffing patterns. The skill matrices were based on statewide data and were used to convert occupational projections for the state and all areas into skill projections.[18]

After conversion, we deleted all records where estimated or projected employment numbers were below five since we consider estimations below five as unreliable. As a result of filtering out missing skill/occupation vectors and removing results below five, only a portion of the occupational employment estimates were converted into skills.

The conversion size (occupational employment to skills), calculated on base year employment, varies between about 84.5 percent for Seattle-King WDA, 60 percent for the state, Snohomish and Spokane WDAs, to a low of 63 percent for the North Central Washington WDA. The conversions are around 80 percent for the majority of the areas and approximately 20 percentage points larger than the numbers in last year's report. The main reason for this increase was the larger sample size this year.

Some results

The skills to occupational matrices have different dimensions for the state's areas based on data availability. As a result, the largest number of detailed skills were 3,016 for Washington state, followed by King County at 2,594. These numbers are between 1.5 to 2.35 times larger than last year's limited sample results.

The top three detailed hard skills, based on projected numbers of openings (for both net replacement and separations methodologies) as well as available number of jobs were: "Food preparation," "Bilingual" and "Quality assurance." They are the same top three skills as were in last year's limited sample projections. It is no surprise these three skills are the same for all areas since the same statewide matrix was used for all areas.

The top detailed hard skills were not the same when we increased the number to the top five. This is due to differences in occupational employment structure by area. However, last year's and this year's numbers remained close. For the state and major areas, the next two top skills are "Quality control" and "Forklifts." The numbers of total annual projected openings from 2014 to 2024 associated with the top five skills for Washington state are 19,925 (replacement) and 65,259 (separation). Combined, they represent 16.7 percent of total openings for net replacement and 17.8 percent for separation calculations.

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[18] WANTED Analytics data includes duplicated job announcements. Normalization of the matrices eliminates these inflated totals, but bias is still possible.

It is interesting to note that the replacement projected openings, for the years 2019 to 2024 are lower than the same numbers for 2014 to 2019. The results are inverse for the separations methodology. Projected separations openings for 2019 to 2024 are larger than 2014 to 2019. These results seem logical since the separations methodology tracks workers leaving the labor force, while the net replacement methodology does not. However, skills with the largest number of openings are not on top of the separations list based on growth rates.

The fastest growth is projected for skills related to information technology (IT). The IT skills are very specific, vary from area to area and the majority, individually, are not large in terms of employment and job openings. The largest average annual growth rates between 2014 and 2024 for skills with separations openings of at least 50 are expected to be: "Asynchronous JavaScript" and "XML," "Spring" (Spring framework), "Simple Object Access Protocol," "Object-oriented design" and "Representational state transfer." However, the combined totals for these top detailed occupations represented an insignificant share, just 0.12 percent of total openings represented in the skill projections.

The top 20 detailed skills for Washington state based on a combined rank of average annual openings and growth for 2014 to 2024 are presented in *Figure 5-9*.

Figure 5-9. Top 20 skills by combined growth and openings
Washington state, 2014 to 2024
Source: Employment Security Department/LMPA; WANTED Analytics

Combined rank	Hard skill titles	Estimated hard skill employment numbers 2014	Projected hard skill employment numbers 2024	Average annual growth rate 2014 to 2024	Total average annual openings 2014 to 2024
1	JavaScript	3,665	4,876	2.90%	414
2	Lawn care	7,884	10,129	2.50%	1,238
3	Java	8,815	11,383	2.60%	1,011
4	C-sharp	6,284	8,165	2.70%	674
5	Cascading Style Sheets	2,328	3,104	2.90%	274
6	C/C++	3,816	4,993	2.70%	397
7	Hypertext markup language	3,715	4,806	2.60%	440
8	Microsoft SQL Server	3,916	5,060	2.60%	418
9	Systems Development Life Cycle	3,355	4,374	2.70%	342
10	Distributed system	2,317	3,068	2.80%	255
11	Microsoft .NET Framework	2,813	3,679	2.70%	291
12	Linux	5,634	7,154	2.40%	578
13	Graphical User Interface design	2,947	3,792	2.60%	336
14	Extensible markup language	2,114	2,777	2.80%	232
15	Amazon Web Services	2,063	2,720	2.80%	220
16	Statistical Analysis System	2,368	3,026	2.50%	294
17	Object-oriented design	1,349	1,830	3.10%	146
18	Practical Extraction and Reporting Language	3,228	4,106	2.40%	340
19	Medical software	1,722	2,186	2.40%	344
20	Machine learning techniques	2,185	2,806	2.50%	253

Nineteen of the top 20 skills are related to information technology.

With one noticeable exemption, "Lawn care," 19 of the top 20 skills are related to information technology (IT). The top 20 occupations only represent about one percent of total openings in the skills forecast.

In the entire list of skills, some skills are quite general and represent a significant share of total numbers and openings. Examples are the top three skills based on openings: "Food preparation," "Bilingual" and "Quality assurance." The majority of the skills, especially related to IT and high-tech, are very specific and their numbers are dispersed among all occupations. As a result, such detailed skills normally do not represent a significant share of the total numbers. Among the 19 IT related skills in this year's report, 14 were the same as last year's report.

Results change significantly if we group all detailed skills together, based on their primary fields. This type of grouping is quite challenging since a significant number of skills are a combination of specific fields and IT skills. A good example of this is the grouping of CAD software with the field of architectural drawing.

In the skills forecast, by far the largest group of skills are IT related. They represent more than one-fourth of estimated skill numbers and openings for replacement and 23.2 percent for separations. Among 20 groups with large skill numbers (more than 10,000), the IT group is projected to be the fastest growing with an annual average growth rate of 1.78 percent. The second and third largest groups of skills are related to production and healthcare, which accounts for almost 11.2 and 8.2 percent of all openings in the separation methodology. Healthcare also has the third largest projected growth rate of 1.74 percent among the twenty groups with large numbers.

It is interesting to note that out of a total of 562 occupations, IT skills are present in 530 occupations. For 257 of these occupations, IT skills comprise more than one-quarter of total numbers and for 104 they comprise more than one-half of total numbers.

The IT skills naturally dominated shares in computer-related occupations, but also have a very high share in occupations whose primary occupational focus is not computers. The top 15 occupations with high computer skill requirements, based on IT shares (with IT skill numbers more than 100) are presented in *Figure 5-10*.

Figure 5-10. Occupations, not primarily computer related, with the largest shares of computer skill requirements
Washington state, 2015 second quarter occupational estimations (June 2013 to May 2016 sample, skills/occupations matrices)
Source: Employment Security Department/LMPA; WANTED Analytics

SOC	Title	Share of skills that are IT
492095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	0.973
271025	Interior Designers	0.938
171011	Architects, Except Landscape and Naval	0.901
171012	Landscape Architects	0.878
271022	Fashion Designers	0.842
173011	Architectural and Civil Drafters	0.823
271014	Multimedia Artists and Animators	0.813
193011	Economists	0.791
191029	Biological Scientists, All Other	0.788
271024	Graphic Designers	0.779
439111	Statistical Assistants	0.766
271021	Commercial and Industrial Designers	0.764
131161	Market Research Analysts and Marketing Specialists	0.750
413041	Travel Agents	0.738
152031	Operations Research Analysts	0.737

Nine of the current occupations are the same as in last year's report, which was produced with a limited sample.

Skill based related occupations

Skills–to-occupations matrices allowed us to create a tool for defining related occupations, based on common skills. To achieve this, we calculated a matrix of correlations based on skills between occupations. The results are presented in the file, **reloccup_ skills_2016.xlsm**. The matrix in the file's "main" tab is symmetric around the main diagonal. The main diagonal has all 1s in it. There are two ways of using the file's data when opened with the enabled-macros feature:

1. You can select an occupational title of interest, from a column heading, in the "main" tab and then sort the numbers below the title of interest from largest to smallest. Starting from row "3" in column B you would see the sorted list of related occupations (row "2" will be the same occupation as selected). To restore the original sort-configuration, sort the key-column (column A) from smallest to largest.

2. You can select an occupation of interest, from a column heading, in the "main" tab and then click the Ctrl and A keys simultaneously. This will execute a macro. The macro opens a table in a "table" tab. In the table, you will find a list of the top 15 occupations related to your occupation of interest.

An example of a list for computer programmers is in *Figure 5-11*.

Figure 5-11. Top 15 occupations related to computer programmers
Washington state
Source: Employment Security Department/LMPA; WANTED Analytics

SOC	Title	151131-Computer Programmers
151132	Software Developers, Applications	0.802
151121	Computer Systems Analysts	0.74
151134	Web Developers	0.64
151199	Computer Occupations, All Other	0.639
151141	Database Administrators	0.63
152031	Operations Research Analysts	0.509
151111	Computer and Information Research Scientists	0.422
131161	Market Research Analysts and Marketing Specialists	0.404
131111	Management Analysts	0.402
151133	Software Developers, Systems Software	0.391
113021	Computer and Information Systems Managers	0.39
111021	General and Operations Managers	0.378
151142	Network and Computer Systems Administrators	0.351
132099	Financial Specialists, All Other	0.345
251191	Graduate Teaching Assistants	0.331

Numbers in table represent coefficients of correlations for normalized vectors of skill shares.

The related occupations tool could be useful for job seekers. The results are specific for Washington state since the skills come from job announcements in this state.

Conclusions

Some significant data limitations were encountered when converting occupational data to skills using skills from job announcements. In spite of these limitations, useful results were produced. It is our conclusion that it is more important to connect education and training programs with real world skill requirements than with generic occupational skill definitions.

Some skills with large projected numbers of openings are well defined and can be linked to different levels of training. Examples of skills with the largest numbers of projected openings are: "Food preparation," "Bilingual" (with a separate skill in bilingual Spanish), "Customer relationship management," "Pediatrics," "Behavioral health," etc.

A second significant group of skills which for the most part are well defined in terms of primary activities, but which require significant secondary skills related to information technology are: "Quality control," "Risk assessment," "Lean" and different engineering skills. These types of skills are much more dispersed than the first group. Relating this second skill group to training is more complicated. While primary fields are relatively stable and well defined, IT skill sets are ever changing. IT skills are concentrated mainly in software, algorithms, some hardware and in web applications. Since required IT skill sets change frequently, specific software applications should be given a secondary emphasis in training.

Though IT skills are a very large group, they are highly dispersed amongst detailed skills and are subject to frequent changes. Some specific skills, like those in *Figure 5-11*, are important and help graduates enter the labor market or move to higher paid jobs. However, in the long run, it might be worth giving priority to foundational academic subjects like math and formal logic, multidimensional design, and foundational concepts in object oriented programing. In other words, foundational abilities to learn, develop and implement new knowledge and technology in the long run should take priority for career preparation.

Future possibilities

Our skills forecasting process used three years of sample files, which was a longer timeframe than last year's three-month sample. In the future, we hope to be able to use an even longer timeframe. It will also be important to establish a direct connection between specific skills required by employers and education and training programs.

Chapter 6: Income and wages

All income and wage data in this chapter have been adjusted for inflation to 2015 dollars. Data from previous annual reports will differ from figures for corresponding years in this report because of that adjustment.

Household[19] and family income

The Great Recession was characterized in Washington state by deep employment losses over the course of two years from 2008 to 2010. Since 2010, employment has improved, with the state reaching pre-recession levels in 2013. Employment estimates tell an important part of the story, but the translation of employment into quality of life requires additional investigation. This chapter explores measures related to household incomes and wages earned by Washington workers. Household income has five sources: earnings from wages, earnings from self-employment, investment income, transfer payments such as Social Security and private retirement payments.

In step with widespread employment losses, household incomes fell during the recent recession. Unlike employment, which bottomed out in 2010 and subsequently climbed to pre-recession peak levels in 2013, income recovery has taken much longer to materialize (*Figure 6-1*). According to the U.S. Census Bureau's American Community Survey (ACS), the real median household wage in Washington state declined each year from 2008 to 2012, with the first green shoots of recovery tentatively appearing in 2013, when the median household income in Washington rose by $67. Household income growth has since gained momentum, increasing by more than $2,000 in 2014 and again in 2015. From 2011 to 2015, the median household income in Washington rose by 7.3 percent – with most of that growth occurring in 2014 and 2015. Family household incomes grew by 6.6 percent and non-family households grew by 6.5 percent. In comparison, the national median wage grew by a lesser extent of 5.0 percent over the same period.

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[19] The U.S. Census Bureau divides households into two types. A family household contains at least two persons, and at least one other person in the household is related to the householder by birth, marriage or adoption. A non-family household may contain only one person or additional persons that are not related to the householder.

Figure 6-1. Median household income in 2015 dollars
United States and Washington state, 2011 through 2015
Source: U.S. Census Bureau, American Community Survey

Household type	2011	2012	2013	2014	2015	Change, 2011 to 2015
All households, U.S.	$53,112	$53,022	$53,222	$53,845	$55,775	5.0%
All households, Washington	$59,773	$59,424	$59,491	$61,581	$64,129	7.3%
Family households	$72,175	$72,185	$72,698	$74,453	$76,954	6.6%
Non-family households	$37,725	$37,723	$37,130	$38,260	$40,194	6.5%

Real median household income increased by 7.3 percent in Washington state from 2011 to 2015.

The following information describes select household statistics for Washington state from the American Community Survey.

According to the ACS (*Figure 6-2*):

- The poverty rate for all individuals was in the 13 percent range over the course of the recession and recovery period, and rose to 14.1 percent in 2013 before finally declining in 2014 and again in 2015. In 2015, 12.2 percent of all Washington residents fell under the poverty threshold.[20] Despite recent improvements in the poverty rate, the 2015 poverty rate remains well above the pre-recession level (11.4 percent) observed in 2007 and 2008. Children tend to have the highest poverty rates. In 2015, 16.3 percent of children under age 5 residing in Washington state were living under the poverty threshold. This is a significant drop from the level observed in 2014 (19.3 percent). The 2015 drop in the poverty rate for children brought the poverty rate below those observed in the years prior to the recession, which were in excess of 17 percent.

- The share of households with earnings from a job did not change significantly in 2015 (78.5 percent) and remained below 2011 levels. Average earnings for households with job-related income did, however, increase in 2015 by $4,251 or 5.1 percent. Average household earnings from a job in 2015 (inflation adjusted) exceeded pre-recession levels.

[20] The U.S. government establishes a poverty threshold every year. The threshold varies based on family size and composition. In 2015, the threshold for a family of two adults and two children under age 18 was $24,036. Thresholds for other family sizes can be found at http://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html.

- The proportion of the workforce that reported working in full-time jobs (35 or more hours per week) fell sharply during the recession and began to rebound in 2012. In 2015, the proportion of full-time jobholders rose by 0.6 percent over the previous year and by 2.5 percent since 2011, but at 58.2 percent remained 3.4 percentage points below the pre-recession level of 61.6 percent observed in 2007. The proportion of part-time workers rose somewhat during the depths of the recession, and declined each year from 2011 to 2015.

- Median earnings for all workers in 2015 were $35,414. This estimate amounts to an increase of just over $2,000 over the year, and is the largest single-year increase observed in the past decade. The 2015 median exceeds the pre-recession median observed in 2007 ($35,130) and the median observed in 2011 ($33,533). From 2014 to 2015, full time year-round workers' earnings increased by $866 or 1.7 percent. Within that estimate, male full-time workers' earnings rose 2.4 percent from $55,579 to $56,899 and female full-time workers' wages increased by 5.8 percent from $42,182 to $44,624.

- An estimated 5.9 percent of the workforce identified as primarily self-employed from 2013 through 2015; this is down from 6.3 percent observed in 2012 and much lower than the 6.8 percent from 2007, on the eve of the recession.

- The percentage of households with a Social Security beneficiary has been increasing over the past several years. It increased from 26.9 percent in 2011 to 29.0 percent in 2015; this comes as no surprise as the baby boomer generation has begun to enter retirement.

- The proportion of households receiving private pension payments increased from 18.6 percent in 2014 to 19.2 percent in 2015. Five years ago, 17.7 percent of households received private pensions. The increase is again not surprising in light of aging demographics. The average monthly payout in 2015 was $2,075, compared to a higher $2,090 in 2011.

- Just under 5 percent of households had members who received Supplemental Security Income (largely for people with disabilities) in 2015, with an average payout of $815 per month—a slight increase in the average payment of $779 per month observed in 2011.

- The share of households receiving welfare remained virtually unchanged from 2014 to 2015. Three and a half percent of households in 2015 received welfare payments. This is down from 4.3 percent observed in 2011. The proportion of

Washington households receiving welfare payments reached a peak of 4.6 percent in 2010—at the height of the jobs recession and has fallen since then. The average benefit in 2015 was about $230 per month. This is down from a monthly benefit of $324 in 2011.

- The share of households receiving food stamps dropped from 14.1 percent in 2014 to 13.4 percent in 2015. In 2012, the share of households receiving food stamps reached 15.1 percent.

- Health insurance coverage increased in 2014 and again in 2015. The proportion of Washington state residents without health insurance dropped from 14.0 percent in 2013 to 6.6 percent in 2015—a decrease on the order of 493,014 residents or 51 percent over a two year period. Private sector health insurance coverage increased from 68.5 percent to 71.1 percent over the same two-year period and the number of people relying on public health insurance rose from 17.5 percent to 22.3 percent.

- In 2015, the homeownership rate increased for the first time since 2006. From 2014 to 2015, the rate increased from 61.7 percent to 62.4 percent. Despite the increase, the 2015 homeownership rate still falls well below the pre-recession peak of 67.3 percent observed in 2006.[21]

- The federal government considers any household paying more than 30 percent of its income towards housing costs to be under duress. The percent of households in economic distress due to high housing costs rose in the first few years of the recession, but then declined through the foreclosure process as homeowners transitioned to renters. The percentage of renters exceeding that threshold increased during the recession, reaching 51.1 percent in 2010. By 2015, that proportion was down to 48.0 percent—still a very high rate. Homeowners with a mortgage paying more than 30 percent of their income toward housing rose in the lead up to the recession, exceeding 41 percent in 2008 and 2009. Over the course of the recovery, that proportion has shifted downward, in part due to foreclosures, short sales, and the overall decline of home ownership. By 2015, the proportion was down to 29.6 percent.

[21] For expanded data from 2005 through 2015, see *Appendix figure A3-1* in *Appendix 3.*

Figure 6-2. Selected household statistics
Washington state, 2011 through 2015
Source: U.S. Census Bureau, American Community Survey

Household statistic	2011	2012	2013	2014	2015
Median household income	$59,773	$59,424	$59,491	$61,581	$64,129
Median family income	$72,175	$72,185	$72,698	$74,453	$76,954
Poverty rate, all individuals	13.9%	13.5%	14.1%	13.2%	12.2%
Poverty rate, children under 5	20.4%	21.0%	19.1%	19.3%	16.3%
Households with earnings from a job*	79.0%	78.7%	78.5%	78.6%	78.5%
Average household earnings from a job**	$78,486	$79,599	$80,986	$82,718	$86,969
Full-time workers, percent of population aged 16-64***	55.7%	56.5%	57.1%	57.6%	58.2%
Part-time workers, percent of population aged 16-64	19.9%	19.5%	19.2%	19.1%	18.8%
Median earnings for all workers	$33,533	$33,017	$32,950	$33,292	$35,414
Median earnings for full-time, year-round workers	$51,027	$50,366	$50,632	$50,338	$51,204
Median earnings for male full-time, year-round workers	$57,404	$55,245	$54,736	$55,579	$56,899
Median earnings for female full-time, year-round workers	$43,193	$42,514	$42,733	$42,182	$44,624
Percent of workers who are self-employed	6.1%	6.3%	5.9%	5.9%	5.9%
Households receiving Social Security	26.9%	27.3%	28.1%	28.5%	29.0%
Households receiving private pension payments	17.7%	18.3%	18.2%	18.6%	19.2%
Avg. mo. payout for households receiving private pensions	$2,090	$2,033	$2,013	$2,065	$2,075
Households receiving Supplemental Security Income (SSI)*	4.8%	4.7%	4.6%	4.9%	4.9%
Average monthly payout for those receiving SSI	$779	$794	$801	$795	$815
Households receiving welfare cash payments*	4.3%	4.0%	4.0%	3.6%	3.5%
Average monthly payout for welfare recipients	$324	$288	$238	$231	$230
Households receiving food stamps*	14.5%	15.1%	14.8%	14.1%	13.4%
Residents without health insurance	14.2%	13.9%	14.0%	9.2%	6.6%
Number of residents without health insurance	953,789	944,238	960,981	642,654	467,967
Residents with private health insurance	68.8%	69.0%	68.5%	70.3%	71.1%
Residents relying solely on public health insurance	17.0%	17.1%	17.5%	20.5%	22.3%
Renters paying more than 30 percent of income for housing	50.7%	50.7%	50.9%	50.0%	48.0%
Homeownership rate	62.8%	62.3%	61.9%	61.7%	62.4%
Homeowners with a mortgage paying more than 30 percent of income for housing	39.4%	36.7%	34.3%	31.7%	29.6%

*Households may fall into more than one of these categories.
**Includes earnings from all members in the household.
***Full-time workers usually worked at least 35 hours per week (but may not be year-round workers).

In 2015, a number of indicators about the well-being of households in Washington showed continued improvement.

Many of the metrics presented in *Figure 6-2* tell the story of a gradual recovery; however, in many cases the recovery appears to have gained momentum from 2014 to 2015. *Figure 6-3* illustrates the share of households that fell within certain income ranges in 2015 dollars. Examining household income ranges allows for a more nuanced view of how the economic recovery differs socioeconomically.

During the early part of Washington's recovery from the Great Recession, the share of households at the lowest income ranges increased. Households with incomes less than $25,000 in 2015 adjusted dollars increased from 19.2 percent of Washington households in 2011 to 20.2 percent by 2013. As the recovery began to take hold, the trend reversed. By 2015, the share of households with incomes less than $25,000 dropped to 17.5 percent.

Middle-income households remained relatively stagnant over the same time period. From 2011 to 2013, the share of households with incomes between $25,000 and $150,000 shifted downward from 70.0 percent to 68.5 percent. The share of middle-income households in Washington increased to 69.3 percent by 2015 – below the share observed in 2011. From 2014 to 2015, the only increases within this group were observed at the upper end – those households with incomes between $75,000 and $150,000. One possible interpretation is that the number of low-income households that edged up into middle-income ranges was matched by upward movement by households into higher income ranges.

Upper income households, meanwhile, increased as a share of total Washington households throughout the early-, mid- and recent-recovery periods. Households earning more than $150,000 per year increased as a share of total households each year from 2011 through 2015. Over that time period, their share expanded from 10.7 percent in 2011 to 13.3 percent.

Figure 6-3. Percent of households by income range, 2015 dollars
Washington state, 2011 through 2015
Source: U.S. Census Bureau, American Community Survey

Household income range in 2015 dollars
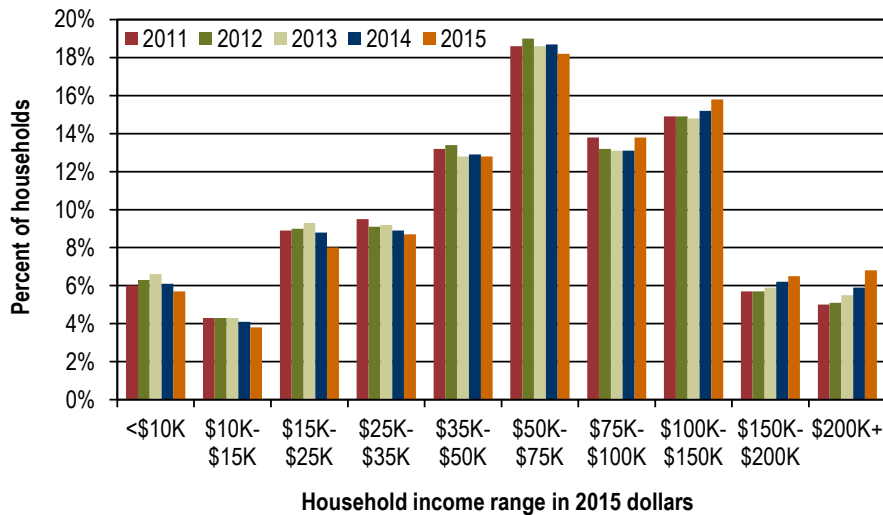
The share of households in upper income brackets rose in 2015.

Wages

Income includes money from a variety of sources, and in the cases of families and households, can include the contributions of more than one person. This section focuses on one source—and for many the most important source of income—wages from a job. More specifically, it will analyze trends for those jobs covered by the Washington state unemployment insurance system.

In 2015, a tightening labor market pushed wages up across the board in Washington state. The median hourly wage rose by 2.0 percent to $23.15 per hour (*Figure 6-4*). The rate of change was substantially higher than the previous two years (0.6 percent in 2013, 0.8 percent in 2014). The average hourly wage for all jobs increased by 1.9 percent, slightly less than the median.

Wage increases were spread across the wage spectrum. The average wage for the bottom 10 percent of jobs increased by 2.0 percent, and the next highest 10 percent of jobs ("decile") climbed by 2.8 percent. The highest decile had the lowest increase (1.3 percent), a very unusual development in an era when widening wage disparities have been the rule (*Figure 6-5*). For example, from 2009 to 2014, wages in the highest decile rose by an average of 2.4 percent per year, while the median hourly wage declined slightly and the lowest decile had zero change. One way to quantify the widening inequality is to compare the

average wage for the top 10 percent of jobs to the average wage for the lowest 10 percent of jobs. That ratio climbed from 10.0 in 2010 to 10.9 in 2014 and slipped to 10.8 in 2015; it was only 7.6 back in 1990.[22]

Since 2002, the state has experienced an expansion, a deep recession and an uneven recovery. During the 2002 to 2007 expansion, wages were stagnant in the bottom half of the spectrum, with the median wage increasing by only 1.3 percent over the five-year period. Wage gains on the upper end were more robust, especially for jobs not quite at the top; the average wage for the second-highest tier of jobs increased by 6.4 percent. The median wage jumped in 2008, but this was a perverse effect of the initial year of the recession—the first wave of job losses was concentrated in lower wage jobs.

From a longer-term perspective, wages in the state have generally moved upward, but more so at the upper end. The median hourly wage increased by 6.8 percent from 2002 to 2015, with 2015 being the first solid year of expansion. Wages at the top grew much more rapidly, with the average wage for the top 10 percent of jobs climbing by 20.2 percent, and the average for the next-highest 10 percent rising by 19.7 percent. In contrast, wages for the second-lowest job tier increased by 4.5 percent, and the lowest 10 percent of jobs increased by 5.2 percent. This indicates that while the state's inflation-adjusted minimum wage has supported wages at the very bottom of the pay scale, it has put very little upward pressure on wages for the tier of jobs just above that minimum.

[22] The upper 10-percent paying jobs does not include many corporate officers (generally the highest-paid employees), and wages do not include stock options or income from capital gains.

Figure 6-4. Median and average hourly wage, 2015 dollars
Washington state, 1990 through 2015
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse
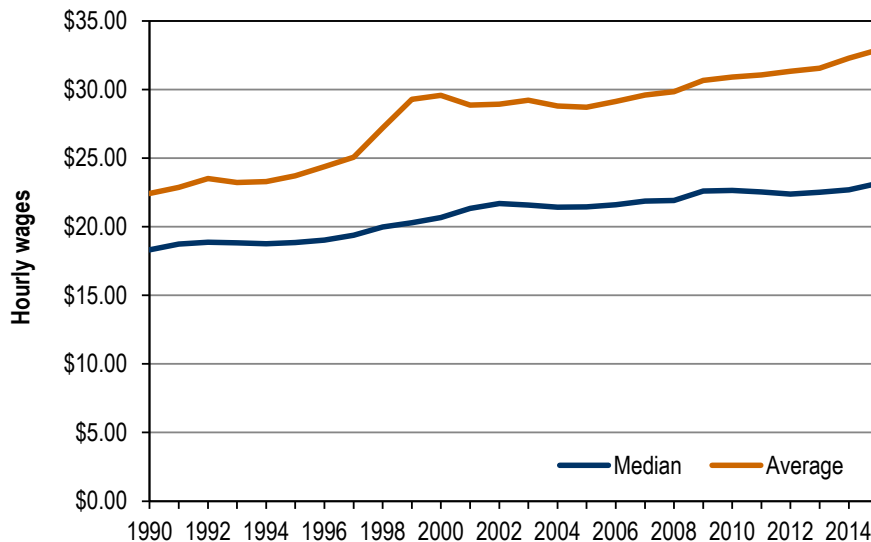
The median hourly wage increased by 2.0 percent in 2015, reaching an all-time high; the average hourly wage increased at a slightly slower rate, indicating an easing of wage inequality.

Figure 6-5. Measuring the wage gap, 2015 dollars
Washington state, 2010 through 2015
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse

Hourly wages	2010	2011	2012	2013	2014	2015	Percent change, 2014-2015
Median hourly wage	$22.64	$22.71	$22.38	$22.50	$22.69	$23.15	2.0%
Average hourly wage for:							
Lowest paid 10 percent of jobs	$9.66	$9.65	$9.65	$9.67	$9.74	$9.94	2.0%
Second-lowest 10 percent of jobs	$11.98	$11.93	$11.83	$11.92	$12.07	$12.41	2.8%
All jobs	$30.91	$31.07	$31.34	$31.55	$32.27	$32.88	1.9%
Second-highest 10 percent of jobs	$47.90	$48.18	$48.04	$48.64	$49.57	$50.54	2.0%
Highest paid 10 percent of jobs	$96.16	$98.66	$101.42	$102.20	$106.35	$107.78	1.3%
Ratio of highest 10 to lowest 10	10.0	10.2	10.5	10.6	10.9	10.8	N/A
Ratio of highest 10 to median	4.2	4.3	4.5	4.5	4.7	4.7	N/A
Ratio of median to lowest 10	2.3	2.4	2.3	2.3	2.3	2.3	N/A

The gap between the highest and lowest paid jobs closed slightly from 2014 to 2015.

For the state, 2015 was a good year for job growth. The total number of jobs covered by unemployment insurance (with the exclusions noted in *Figure 6-6*) increased by 3.2 percent. These are based on average monthly counts of jobs, with full-time and part-time work getting equal weight. When jobs were weighted by the number of hours worked (full-time equivalent, or FTE, jobs), job growth was even stronger (3.5 percent), indicating that the average hours worked per job increased.

Figure 6-6. Covered employment vs. FTE employment
Federal employment, NAICS 814 and DSHS/COPES employment excluded
Washington state, 2007 through 2015
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse

Year	Covered employment	Change from previous year	FTE employment	Change from previous year	Ratio of FTE to covered
2007	2,851,632	3.6%	2,308,634	3.8%	81.0%
2008	2,873,760	0.8%	2,323,601	0.6%	80.9%
2009	2,727,272	-5.1%	2,206,562	-5.0%	80.9%
2010	2,687,065	-1.5%	2,163,630	-1.9%	80.5%
2011	2,726,775	1.5%	2,214,158	2.3%	81.2%
2012	2,779,638	1.9%	2,264,864	2.3%	81.5%
2013	2,845,589	2.4%	2,316,139	2.3%	81.4%
2014	2,927,800	2.9%	2,407,159	3.9%	82.2%
2015	3,020,552	3.2%	2,491,657	3.5%	82.5%

FTE employment has increased as a percent of total covered employment, indicating average hours per job has increased.

Employment grouped by hourly wages paid in 2015 is shown in *Figure 6-7*, with the wage spectrum being divided into nine wage ranges; the first three wage ranges contain the majority of jobs: 13.7 percent paid below $12.00 per hour, 22.3 percent paid from $12.00 to $17.99 per hour and 16.4 percent paid from $18.00 to $23.99 per hour.

[23] In this analysis, jobs are weighted by the number of hours worked, with one full-time equivalent (FTE) job equaling 2,080 hours of work in a typical year. A job that lasts 208 hours, for example, would be counted as 0.1 FTE.

Figure 6-7. FTE jobs by hourly wage range, 2015 dollars
Washington state, 2015
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse
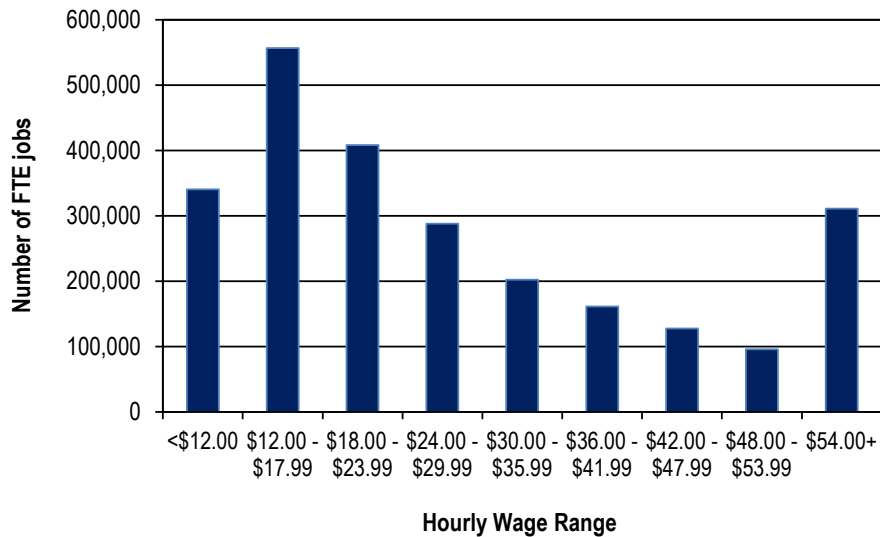
A majority of jobs on an FTE basis paid below $24.00 per hour.

Job growth by hourly wage for 2015 in terms of total jobs added and percentage change are shown in *Figures 6-8* and *6-9*. Overall, there was faster job growth in higher wage categories in 2015.

- The number of jobs paying below $12.00 per hour declined by a substantial amount (26,974, or 7.3 percent). Tightening labor markets likely pushed wages up into the next bracket for these lower wage jobs.

- There were 30,596 more jobs paying $12.00 to $17.99 per hour. In isolation, this wage range had the largest numerical increase, a faster than average growth rate (5.8 percent, vs. 3.5 percent for all jobs) and accounted for more than a third of net new jobs for the year. However, when combined with the lower wage bracket, the percent change in jobs paying below $18.00 per hour was only 0.4 percent.

- Accommodations and food services (3,448 FTE jobs), healthcare and social assistance (2,143), staffing agencies (1,913) and agriculture, forestry and fishing (1,802) all had net increases in jobs paying below $18.00 per hour. Meanwhile local government (2,415), manufacturing (1,818), state government (1,837) and finance and insurance (1,094) all reduced the number of jobs paying below $18.00 per hour.

- Job gains were positive but slightly below average in percentage increase in the third wage range ($18.00 to $23.99 per hour) and positive and above average for the next three wage ranges ($24.00 to $29.99, $30.00 to $35.99 and $36.00 to $41.99 per hour).

- The three top wage ranges had more rapid growth rates, with the number of jobs paying $54.00 per hour and above increasing the fastest (25,272 jobs, 8.8 percent).

- At the top of the wage distribution, jobs paying $54.00 or more also expanded in most industries. The greatest increases were found in information services (5,088, with software contributing 1,859); retail trade (3,969, mostly in electronic commerce); healthcare and social assistance (3,449); local government (2,491); and computer systems design (1,485). An exception was aerospace, which shed 3,851 high wage jobs.

Figure 6-8. Change in FTE jobs by hourly wage range, 2015 dollars
Washington state, 2014 to 2015
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse

Job gains were largest in two wage ranges in 2015.

Figure 6-9. Percent change in FTE jobs by hourly wage range, 2015 dollars
Washington state, 2014 to 2015
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse
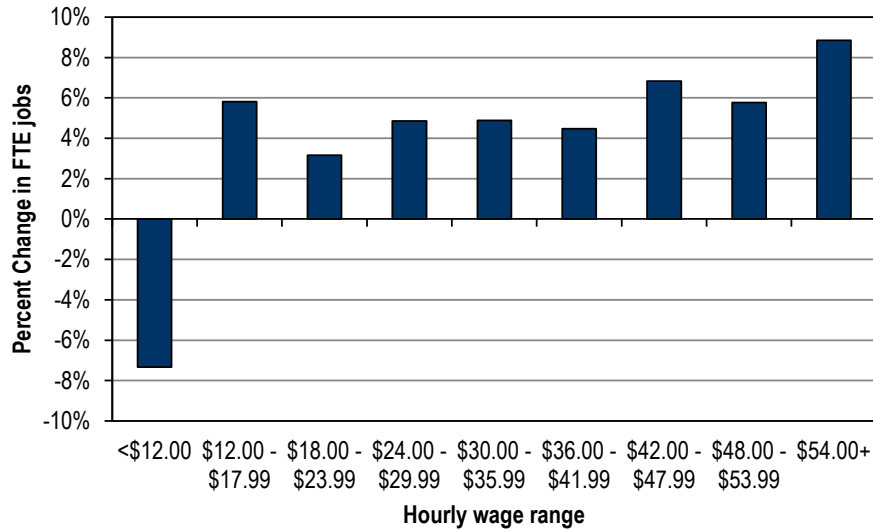
Jobs grew the most at the upper end of the wage scale.

Shifting to a longer-term outlook, *Figures 6-10* and *6-11* show the total change and percentage change in jobs in the nine wage ranges going back to 2002. During that time, the number of high wage jobs almost doubled. While many of these net new jobs were in industries well known for higher wage jobs (e.g., software, healthcare, aerospace and computer systems design), retail trade, wholesale trade and local government were also major sources.

In summary, wages improved in 2015 with across-the-board gains and a slight decrease in wage inequality. The median hourly wage hit an all-time high. Since 2002, there has been a marked shift towards more higher wage jobs. While total FTE employment grew by 24.0 percent, jobs paying below $42.00 per hour increased at that rate or at a slower pace, while jobs paying above that mark grew much faster.

A final note: the median hourly wage increased in all but two counties in 2015. Six counties saw their median increase by at least 3 percent: Pend Oreille (6.3 percent), Kittitas (3.8 percent), King (3.7 percent), Clark and Skamania (3.2 percent each) and Whitman (3.0 percent). Only Snohomish County suffered a significant decline (-5.2 percent), driven primarily by the aerospace industry.

Figure 6-10. Change in FTE employment by hourly wage range, 2015 dollars
Washington state, 2002 to 2015
Source: Employment Security Department/LMPA; Unemployment Insurance Data Warehouse
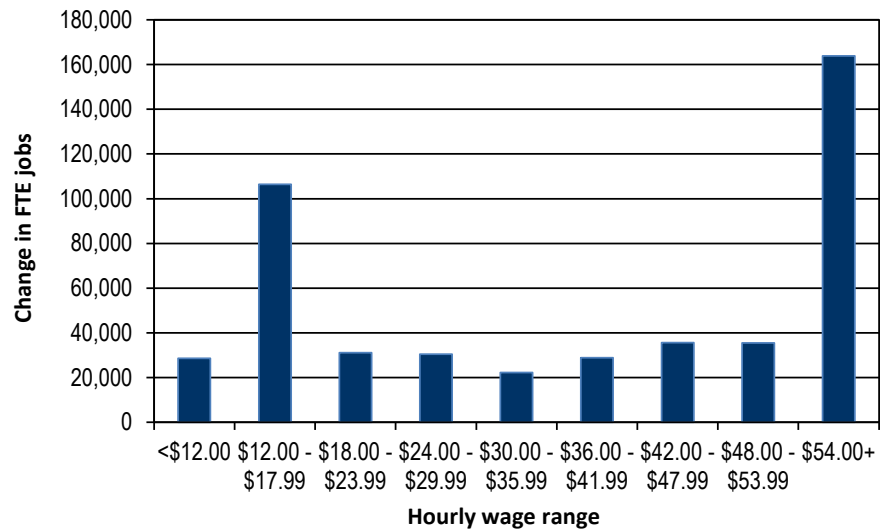
*Employment growth over the past dozen years was heavily weighted on the higher end of
the wage scale.*

Figure 6-11. Percentage change in FTE employment by hourly wage range, 2015 dollars
Washington state, 2002 to 2015
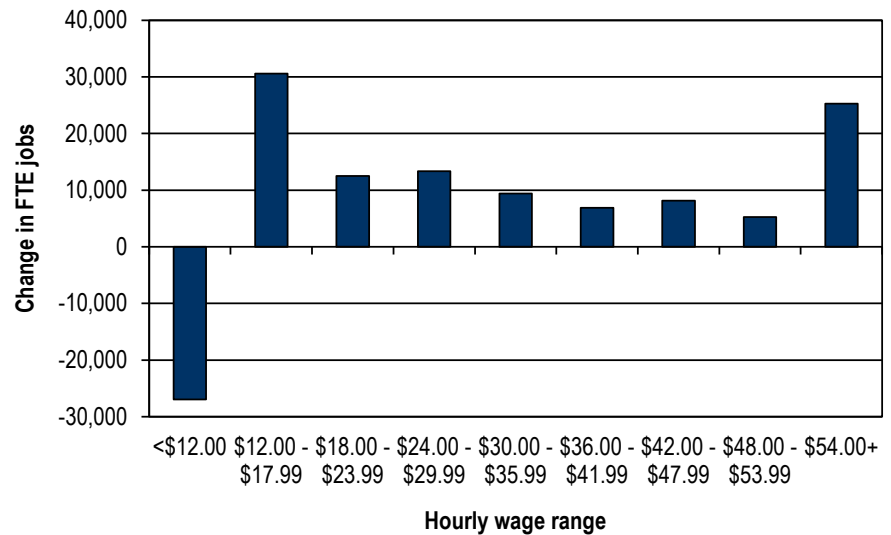Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse
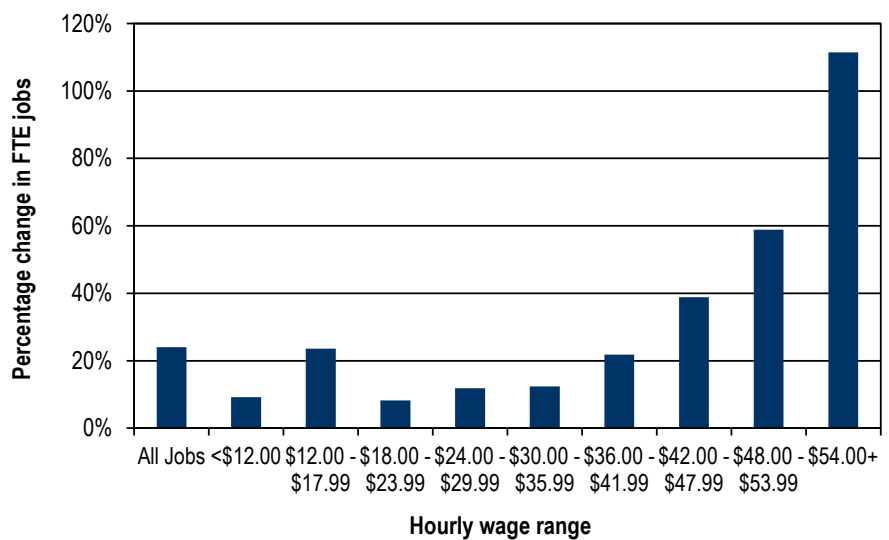
The number of high wage jobs more than doubled from 2002 to 2015.

Personal and per capita income[24]

Personal income is the sum of earned income (from owning a business or holding a job), investment income and transfer payments chiefly from government programs such as Social Security, Medicare and Medicaid, welfare, food stamps, Supplemental Security Income (SSI) and unemployment benefits. Per capita personal income is the total personal income of an area divided by the population of the area. Since per capita income is an average, it is influenced by factors such as relative concentration of high-income households, family size and the number of retirees in an area.

Per capita income, as shown in *Figure 6-12*, dropped sharply in 2009, slid a bit more in 2010 and then started an uneven recovery in 2011. Preliminary estimates showed a solid increase of 2.7 percent in 2015. That was somewhat slower than the 3.8 percent gain in 2014, but there were unusual factors in play that year. Personal income was estimated at $372 billion in 2015, or $51,898 on a per capita basis. Historically the state's per capita income has been 5 to 8 percent above the U.S. and that was true again in 2015, when per capita income was 7.9 percent above the national figure.

Changes in income over the past few years can be clarified by disaggregating income into its three major components.

First, total earned income, which makes up almost two thirds of total income, rose by 5.5 percent in 2015, and served as the primary driver for increased incomes that year. After a big drop in 2009 and no change in 2010, income from wages and business ownership rose by 3.6 percent in 2011, 6.2 percent in 2012, 0.7 percent in 2013 and 5.2 percent in 2014. The reason for the aberration in 2013: a substantial increase in contributions to government social insurance programs, likely related to the implementation of the Affordable Care Act (ACA). These payments are netted out of gross earnings. On a per capita basis, the changes were 2.4, 5.0, 0.4, 2.5 and 4.0 percent in 2015. Earned income accounted for 64 percent of total personal income in 2015. It has been a shrinking proportion of the total since 1999, when it was 69 percent. It will likely continue to ebb over the long term due in part to the aging population.

Investment income correlates strongly with the stock market. It declined sharply in 2009 and tumbled further in 2010, roared back in 2011 and 2012 before declining slightly in 2013. This was followed by a strong year in 2014 (+8.0 percent) and a tepid one in 2015 (2.6 percent). The 2015 total was an all-time high, but was still slightly below the 2008 peak on a per capita basis.

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[24] All data on personal and per capita income are produced by the U.S. Bureau of Economic Analysis; inflation adjustment provided by Employment Security Department/LMPA.

For almost two decades, total transfer payments had grown along with the economy, consistently comprising about 13 percent of personal income. The composition has changed, however (*Figure 6-13*). The percentage of transfer payments going to medical benefits (primarily Medicare and Medicaid) has risen from 33 percent to 39 percent, while that going to family assistance (TANF) has fallen from 4 percent to 1 percent and the percent going to unemployment insurance benefits has declined from 5 percent to 2 percent.

With the onset of the recession, transfer payments played a countercyclical role, climbing by 12 percent in 2008, 13 percent in 2009 and 9 percent in 2010, when they made up 17 percent of total income. Social Security retirement payments, which had been trending upward by about 4 percent per year, jumped by 9 percent in 2009, as people were forced into early retirement.

During the recovery, transfer payments have stabilized, with slight declines in 2011 and 2012 and small increases in 2013 and 2015. Countercyclical payments like unemployment insurance and food stamps abated. The exception was 2014, when with the onset of the ACA, Medicaid payouts jumped by 40 percent, pushing up transfer payments as a whole by 7 percent.

Figure 6-12. Personal income including transfer payments, 2015 dollars
Washington state, 2007 through 2015
Source: Employment Security Department/LMPA; U.S. Bureau of Economic Analysis

Type of income	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total personal income (billions)	**$314.8**	**$321.8**	**$305.6**	**$306.6**	**$317.2**	**$336.9**	**$339.4**	**$356.9**	**$372.1**
Earned income	$205.9	$206.3	$194.5	$194.4	$201.5	$213.9	$217.1	$225.3	$237.8
Investment income	$69.5	$71.4	$61.4	$58.1	$63.1	$71.3	$70.4	$76.0	$77.9
Transfer payments	$39.4	$44.1	$49.7	$54.0	$52.6	$51.7	$51.9	$55.6	$56.4
Social Security/retirement	$15.8	$16.3	$17.9	$18.3	$18.5	$19.4	$20.1	$20.8	$21.7
Medicare and Medicaid	$15.2	$15.8	$17.0	$17.9	$18.4	$18.7	$18.9	$22.4	$21.8
Welfare, food stamps, Social Security Income	$3.9	$4.3	$5.8	$6.3	$5.9	$5.7	$5.5	$5.3	$5.3
Unemployment benefits	$0.9	$1.4	$4.1	$4.7	$3.4	$2.6	$1.8	$1.1	$1.0
Per capita personal income (dollars)	**$48,721**	**$49,032**	**$45,833**	**$45,465**	**$46,481**	**$48,845**	**$48,667**	**$50,533**	**$51,898**
Earned income	$31,864	$31,442	$29,169	$28,834	$29,526	$31,013	$31,137	$31,902	$33,165
Investment income	$10,760	$10,873	$9,206	$8,619	$9,249	$10,331	$10,090	$10,756	$10,868
Transfer payments	$6,097	$6,716	$7,457	$8,012	$7,706	$7,501	$7,440	$7,875	$7,865
Social Security/retirement	$2,451	$2,487	$2,678	$2,718	$2,718	$2,819	$2,888	$2,942	$3,028
Medicare and Medicaid	$2,355	$2,406	$2,546	$2,660	$2,695	$2,707	$2,704	$3,168	$3,044
Welfare, food stamps, Supplemental Security Income	$600	$661	$867	$934	$872	$824	$790	$755	$746
Unemployment benefits	$135	$209	$620	$690	$494	$373	$265	$158	$143

Transfer payments, chiefly from government programs, grew during the recession and remained high in 2015 due primarily to a large increase in Medicaid, government-provided healthcare for low-income residents.

Figure 6-13. Per capita transfer payments, and components as a percent of total
Washington state, 1995 and 2015
Source: Employment Security Department/LMPA; U.S. Bureau of Economic Analysis

Type of transfer payment	1995	2015	1995	2015
Total transfer payments	$4,586	$7,865	100%	100%
Social Security	$1,659	$2,705	36%	34%
Workers' compensation	$251	$277	5%	4%
Medical benefits:	$1,498	$3,044	33%	39%
Medicare	$718	$1,590	16%	20%
Medicaid	$758	$1,381	17%	18%
Income Maintenance:	$486	$746	11%	9%
Supplemental Nutrition Assistance (food stamps)	$110	$214	2%	3%
Family assistance (AFDC/TANF)	$161	$52	4%	1%
Unemployment benefits	$243	$143	5%	2%
Veterans' benefits	$139	$360	3%	5%
All other	$561	$868	12%	11%

Over the past 20 years, the share of transfer payments going to medical benefits and veterans benefits has increased, while the share going to family assistance and unemployment benefits has declined

Chapter 7: Economic comparisons with other states

Figure 7-1. States with minimum wage higher than federal minimum wage, based on 2016 ranking
United states and Washington state, 2006, 2011, 2016
Source: U.S. Department of Labor

Rank	State	2006	2011	2016
	United States	$5.15	$7.25	$7.25
1	District of Columbia	$7.00	$8.25	$11.50
2	California	6.75	8	10
2	Massachusetts	$6.75	$8.00	$10.00
4	Alaska	7.15	7.75	9.75
4	Oregon	$7.50	$8.50	$9.75
6	Connecticut	7.4	8.25	9.6
6	Rhode Island	$6.75	$7.40	$9.60
6	Vermont[1]	7.25	8.15	9.6
9	Minnesota	$5.25	$5.25	$9.50
10	**Washington**	**$7.63**	**$8.67**	**$9.47**
11	Nebraska[2]	$5.15	$7.25	$9.00
11	New York	6.75	7.25	9
13	Maryland	$5.15	$7.25	$8.75
13	West Virginia[3]	5.15	7.25	8.75
15	South Dakota	$5.15	$7.25	$8.55
16	Hawaii	6.75	7.25	8.5
16	Michigan[1]	$5.15	$7.40	$8.50
18	New Jersey	6.15	7.25	8.38
19	Colorado	$5.15	$7.36	$8.31
20	Delaware	6.15	7.25	8.25

[1]Rates applicable to employers of two or more.
[2]Rates applicable to employers of four or more.
[3]Rates applicable to employers of six or more.

Minimum Wage

Unemployment Rates

Figure 7-2. Ten highest and lowest state unemployment rates, not seasonally adjusted, based on 2015 ranking
United States and Washington state, 2005, 2010, 2015
Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics

Rank	State	2005	2010	2015
	United States	**5.1%**	**9.6%**	**5.3%**
1	North Dakota	3.4%	3.8%	2.7%
2	Nebraska	3.8%	4.6%	3.0%
3	South Dakota	3.9%	5.0%	3.1%
4	New Hampshire	3.6%	5.8%	3.4%
5	Utah	4.3%	7.8%	3.5%
6	Hawaii	2.8%	6.9%	3.6%
7	Iowa	4.6%	6.0%	3.7%
7	Minnesota	4.0%	7.4%	3.7%
7	Vermont	3.5%	6.1%	3.7%
10	Colorado	5.0%	8.7%	3.9%
29	**Washington**	**5.6%**	**10.0%**	**5.6%**
42	Alabama	4.0%	10.5%	6.1%
42	Arizona	4.7%	10.4%	6.1%
44	California	5.4%	12.2%	6.2%
45	Louisiana	7.1%	8.0%	6.3%
46	Alaska	6.8%	7.9%	6.5%
46	Mississippi	7.9%	10.4%	6.5%
48	New Mexico	5.3%	8.1%	6.6%
49	Nevada	4.1%	13.5%	6.7%
49	West Virginia	5.0%	8.7%	6.7%

Figure 7-3. Highest and lowest state average annual job growth rates, nonfarm employment
United States and Washington state, 2000 to 2015
Source: U.S. Bureau of Labor Statistics, Current Employment Statistics

Rank	State	Average annual growth rate
	United States	**0.5%**
1	North Dakota	2.2%
2	Utah	1.7%
3	Texas	1.5%
4	Nevada	1.4%
5	Wyoming	1.3%
6	Idaho	1.2%
7	Alaska	1.2%
8	District of Columbia	1.1%
9	Montana	1.1%
10	Arizona	1.1%
11	Hawaii	1.0%
12	**Washington**	**0.9%**
41	Rhode Island	0.1%
42	Missouri	0.1%
43	Maine	0.1%
44	Indiana	0.1%
45	Alabama	0.1%
46	New Jersey	0.0%
47	Connecticut	-0.1%
48	Illinois	-0.1%
49	Mississippi	-0.1%
50	Ohio	-0.2%
51	Michigan	-0.6%

Nonfarm Employment

Annual Exports

Figure 7-4. Ten highest and lowest state annual exports, based on 2015 ranking
United States and Washington state, 2005, 2010 and 2015
Source: U.S. Department of Commerce, Office of Trade and Economic Analysis

Rank*	State	2005	2010	2015
1	Texas	$129,346,156,716	$206,992,356,499	$248,175,140,181
2	California	$116,689,901,804	$143,208,226,608	$165,390,478,367
3	**Washington**	**$33,078,176,892**	**$53,345,329,885**	**$86,376,587,619**
4	New York	$51,840,964,871	$69,684,943,969	$83,139,625,746
5	Illinois	$36,168,606,637	$50,060,707,025	$63,420,740,029
6	Michigan	$37,848,627,094	$44,851,338,759	$53,955,365,487
7	Florida	$33,443,890,512	$55,399,353,874	$53,915,591,947
8	Ohio	$35,110,493,790	$41,504,651,676	$51,138,643,434
9	Louisiana	$19,403,622,081	$41,370,690,441	$48,670,839,881
10	Pennsylvania	$22,333,839,455	$34,942,927,237	$39,436,366,483
42	North Dakota	$1,191,735,128	$2,532,206,235	$3,876,860,784
43	New Mexico	$2,542,942,913	$1,542,649,869	$3,781,131,998
44	Vermont	$4,672,094,793	$4,278,137,163	$3,182,066,366
45	Maine	$2,332,078,650	$3,162,186,695	$2,727,380,268
46	Rhode Island	$1,268,454,948	$1,948,784,173	$2,125,671,769
47	Hawaii	$1,032,143,549	$684,102,935	$1,896,395,013
48	Montana	$715,019,613	$1,393,457,515	$1,404,014,761
49	South Dakota	$948,198,422	$1,259,405,035	$1,396,362,487
50	Wyoming	$670,612,892	$983,304,393	$1,175,169,360
51	District of Columbia	$823,172,455	$1,482,780,613	$1,088,288,133

*Annual exports represent the value of goods flowing through ports/terminals. These goods may originate from places other than the port-state and thus export values do not necessarily reflect the health of the economy in the state where the port(s) are located.

Figure 7-5. Ten highest and lowest state per capita personal income, 2015 dollars, based on 2015 ranking
United States and Washington state, 2005 and 2015
Source: U.S. Bureau of Economic Analysis

Rank	State	2005	2015	Average annual growth rate
	United States	**$35,904**	**$47,669**	**2.9%**
1	District of Columbia	$53,902	$71,496	2.9%
2	Connecticut	$49,481	$66,972	3.1%
3	Massachusetts	$44,596	$61,032	3.2%
4	New Jersey	$45,341	$59,782	2.8%
5	New York	$41,381	$57,705	3.4%
6	Maryland	$43,301	$56,127	2.6%
7	Alaska*	$38,521	$55,940	3.8%
8	Wyoming	$39,164	$55,303	3.5%
9	New Hampshire	$39,609	$54,817	3.3%
10	North Dakota	$31,429	$54,376	5.6%
13	**Washington**	**$37,754**	**$51,146**	**3.1%**
42	Arkansas	$27,915	$39,107	3.4%
43	Arizona	$32,429	$39,060	1.9%
44	Utah	$29,398	$39,045	2.9%
45	Kentucky	$29,171	$38,989	2.9%
46	Alabama	$30,202	$38,965	2.6%
47	New Mexico	$29,005	$38,457	2.9%
48	South Carolina	$29,402	$38,041	2.6%
49	Idaho	$29,815	$37,509	2.3%
50	West Virginia	$26,360	$37,047	3.5%

Personal Income

Figure 7-6. Ten highest and lowest states in number of authorized privately owned building permits, based on 2006 ranking
United States and Washington state, 2006 and 2015
Source: U.S. Census Bureau

Building Permits

Rank	State	2006 building permits	2015 building permits	Percent change 2006 to 2015
	United States	1,838,903	1,182,582	-35.7%
1	Texas	216,642	175,443	-19.0%
2	Florida	203,238	109,924	-45.9%
3	California	160,502	98,188	-38.8%
4	Georgia	104,200	45,549	-56.3%
5	North Carolina	99,979	54,757	-45.2%
6	Arizona	65,363	28,910	-55.8%
7	Illinois	58,802	19,571	-66.7%
8	New York	54,382	74,611	37.2%
9	South Carolina	50,776	31,030	-38.9%
10	Washington	50,033	40,374	-19.3%
42	New Hampshire	5,677	3,763	-33.7%
43	West Virginia	5,645	2,814	-50.2%
44	South Dakota	5,304	4,482	-15.5%
45	Montana	4,542	4,826	6.3%
46	Wyoming	3,537	1,903	-46.2%
47	North Dakota	3,529	6,256	77.3%
48	Alaska	2,739	1,298	-52.6%
49	Vermont	2,626	1,998	-23.9%
50	Rhode Island	2,370	998	-57.9%
51	District of Columbia	2,105	4,956	135.4%

Figure 7-7. Median single-family house prices in thousands, based on 2015 ranking
Selected U.S. metropolitan areas, 2013 and 2015
Source: National Association of Realtors

Home Prices

Rank	Metropolitan area	2013	2015	Percent change 2013 to 2015
	United States	197.4	223.9	13.4%
1	San Jose-Sunnyvale-Santa Clara, CA	780	950.4	21.8%
2	San Francisco-Oakland-Hayward, CA	643.8	782.3	21.5%
3	Urban Honolulu, HI	661.5	707.7	7.0%
4	Anaheim-Santa Ana-Irvine, CA	651.65	707.5	8.6%
5	San Diego-Carlsbad, CA	464.28	542.6	16.9%
6	Los Angeles-Long Beach-Glendale, CA	405.63	476.8	17.5%
7	Boulder, CO	371.8	454.1	22.1%
8	Nassau County-Suffolk County, NY	396.8	422.7	6.5%
9	Naples-Immokalee-Marco Island, FL	310	405	30.6%
10	Boston-Cambridge-Newton, MA-NH	375.9	403.9	7.4%
15	Seattle-Tacoma-Bellevue, WA	336.3	379.7	12.9%
19	Portland-Vancouver-Hillsboro, OR-WA	265.5	312.1	17.6%
55	Salem, OR	168.5	210.3	24.8%
63	Kennewick-Richland, WA	186.6	199.3	6.8%
71	Spokane-Spokane Valley, WA	174.2	191.9	10.2%
99	Yakima, WA	160	166.8	4.3%
174	Rockford, IL	86.6	91.4	5.5%
175	Youngstown-Warren-Boardman, OH-PA	75.4	81.5	8.1%
176	Cumberland, MD-WV	102.2	81.1	-20.6%

Appendix 1: Washington's workforce development areas

Appendix figure A1-1. Washington state workforce development aeas (WDAs)

WDA 1 – Olympic Consortium
WDA 2 – Pacific Mountain
WDA 3 – Northwest Washington
WDA 4 – Snohomish
WDA 5 – Seattle-King
WDA 6 – Tacoma-Pierce

WDA 7 – Southwest Washington
WDA 8 – North Central Washington
WDA 9 – South Central Washington
WDA 10 – Eastern Washington
WDA 11 – Benton-Franklin
WDA 12 – Spokane
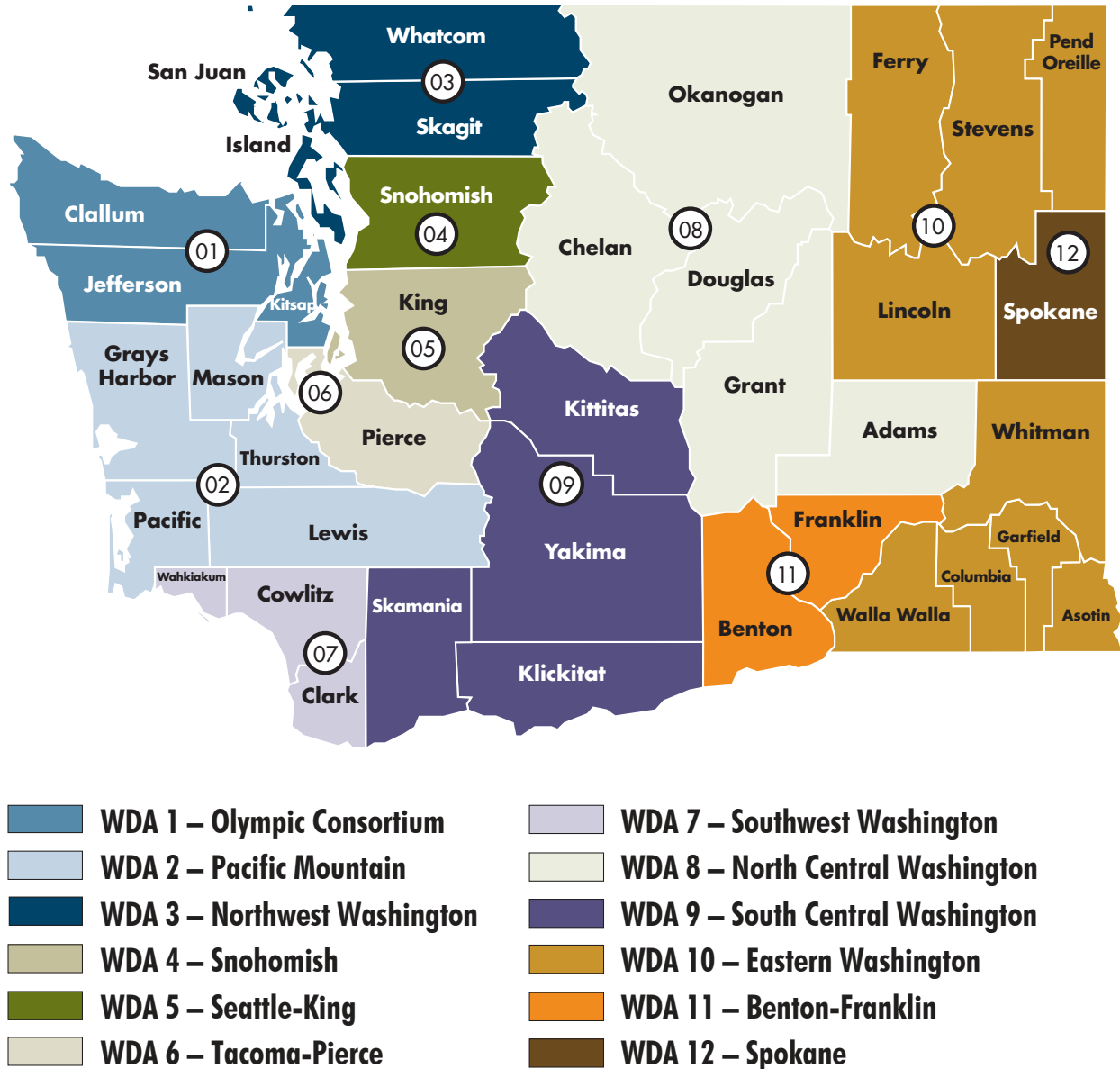
Appendix 2: Seasonal, structural and cyclical industry employment

Theoretical base

We used R's advanced decomposition models for time series.

Decomposition of employment for each point in time (months, in our case) is:

Employment = (trend +cycle) + seasonal + irregular

As it was in previous years' analyses, there are two steps in the process of time series decomposition:

1. We split the series between: combined trend (which includes trend + cycle), seasonal and irregular components.

2. We split the combined trend (trend-cycle) into trend and cyclical components.

Appendix figure A2-1 represents the main components of decomposition for total nonfarm employment. The trend component in the figure is the result of the first step of decomposition and represents the combination of trend plus cycle. The trend plus cycle component is used in further processing steps later in the decomposition process.

Appendix figure A2-1. Total nonfarm employment time series and its main components
Washington state, 1990 to 2015
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics,
Quarterly Census of Employment and Wages
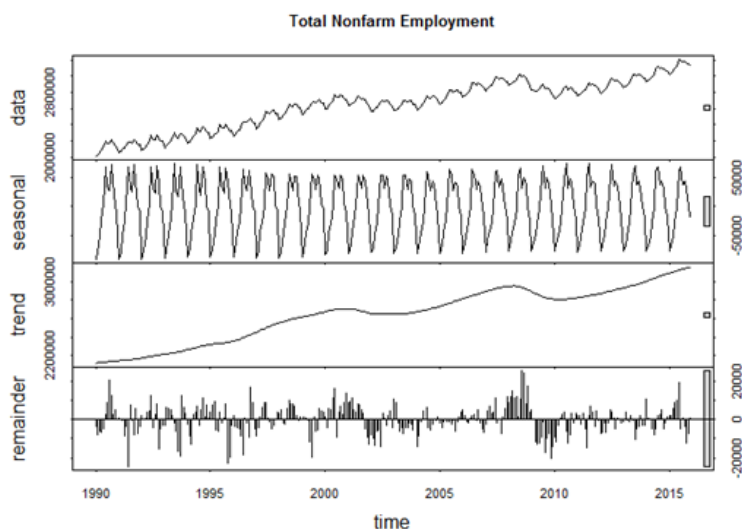
We used a state space model with auto selection of model variations (types of error, trend and seasonality). Model variations can be additive, multiplicative, none, etc. The software also includes the choice of 30 exponential smoothing variations. The main advantages of this type of approach lies in the fact that the types of models are not predefined and thus can vary for different series. Before this type of advanced capability, while parameters were estimated for each series, models were predefined. Previously, we used the U.S. Census Bureau's X-12-ARIMA seasonal adjustment software and the same model applied to all series. In addition, under the new approach, regardless of the selection of seasonal and irregular models (additive or multiplicative), the sum of decomposition components (trend-cycle, seasonal and irregular) remains equal to the initial series for each month.

The state space approach allows for the optimized selection of models for each individual series. Due to the better fitting of models, the quality of initial decomposition into trend-cycles, seasonal and irregular components improved significantly. The impact on seasonal factors and trend contributions for the majority of industries was limited, but the impact on cyclical contributions and consequently on the shares of trend and cyclical components of growth was significant.

In step two, we used the trend-cycle series from step one for our analyses of the contributions of structural and cyclical components to growth. To accomplish this, we used the Hodrick-Prescott (HP) filter. This filter is a smoothing method that is widely used among macroeconomists to obtain a smooth estimate of the long-term trend component of a series.

Technically, the HP filter is a two-sided linear filter that computes the smoothed series s of y by minimizing the variance of y around s, subject to a penalty that constrains the second difference of s. That is, the HP filter chooses s to minimize:

$$\sum_{t=1}^{T}(y_t - s_t)^2 + \lambda * \sum_{t=2}^{T-1}[(s_{t+1} - s_t) - (s_t - s_{t-1})]^2$$

The penalty parameter λ controls the smoothness of the series s. The larger the λ, the smoother the s. As $\lambda=\infty$, s approaches a linear trend.

We used default value $\lambda=14,400$ for monthly frequency of the data. This default value was defined by dividing the number of periods per year by four raised to a power (default value 2^{24}) and multiplying by 1,600.

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[25] The other suggestion is to use value four for the power, but we stayed with two for this analysis.

The Granger causality test is a technique for determining whether one time series is useful in forecasting another. Put another way: this test answers the question of whether a time series "X" causes time series "Y." Also, it tests to see how much of the current "Y" values can be explained by past values of the same series, and then to see whether adding lagged values of "X" can improve the explanation.

In our case, the question is whether employment in specific industries "Granger-causes" total employment.

The results of Granger causality are not always clear enough to be able to state that a series "X" Granger-causes series "Y," but not the other way around. We can find that neither series Granger-causes the other, or that each Granger-causes the other.

Moreover, Granger causality does not imply true causality. If both series "X" and "Y" are driven by a common third process (variable, series), but with different lags, there would be Granger causality. However, the changes in one series would not have a significant effect on the other. To address this issue, we estimated Granger causality in both directions. We estimated specific industry on total employment and total employment on specific industry employment

Industry seasonality levels

The level of employment seasonality for an industry is defined as an average of absolute values of the seasonal component divided by the initial series (mean(|seasonal| /employment)). The levels are presented in column three of *Appendix figure A2-2*. A larger level value indicates a larger seasonality value for the industry. To interpret the seasonal factors, arbitrary thresholds were established. Industries with a seasonal factor value of up to 1.0 percent were identified as nonseasonal. Industries with a factor value greater than 1.0 and up through 2.0 percent were identified as having low levels of seasonality. Industries with a factor value greater than 2.0 and up through 4.0 percent were identified as having moderate levels of seasonality, while industries with a factor value greater than 4.0 percent were considered to have high levels of seasonality. The results are listed in column four.

Structural and cyclical contributions to industry employment changes

Relative contributions to monthly employment change are calculated as the average for all months of absolute differences (one-month difference) for specific factors (presented in columns five and six of the table in *Appendix figure A2-2*). The percentages of relative contributions for trend (structural) and cycle components are presented in columns seven and eight. The industry that had

the lowest cyclical component contribution (16.7 percent) was ambulatory healthcare services, while support activities for mining had the highest cyclical component contribution (68.1 percent). The structural component accounted for the dominant share of change in total covered employment (75.2 percent), while the cyclical component accounted for the residual (24.8 percent).

Relations between industry and total employment

The last five columns of the table represent an attempt to connect employment time series for specific industries with employment time series of total covered employment. The first of these five columns represents correlations of series of monthly employment between industries and total employment, while the second of these columns represents correlations of the first differences (monthly changes) for the same series.

The third of these five columns represents an attempt to identify the industries for which monthly employment could help in predicting the next month's total employment. F-statistics from the Granger causality test for time series, with a lag of one month, are presented in this column. The value of "F" indicates the significance of the impact of employment in the industry on the next month's total employment. Larger values indicate effects that were more significant. Probabilities for the rejection of the hypotheses of significance, associated with F-statistics, are listed in the next to last column. A lower probability indicates higher confidence that the effect is significant. To address the issue of possible mutual causality we also tested inverse causality of total employment on specific industries. As previously noted, if both direct and inverse causality are significant, it means that an industry employment series might not be a good indicator for the next month's total employment. The last column of *Appendix figure A2-2* indicates if significant direct causality of industry on total employment without significant inverse causality exists (indicator "yes"). All other cases have an indicator of "no." The cutoff for such definitions was the following: p-value for direct test is not more than 0.01, but for inverse test not less than 0.1. Only nine of 97 industries have the indicator "yes."

The combination of predictive abilities (indicator "yes") and correlation with total employment can be used to identify the main industries that can be used as coincidental and leading (i.e. one-step-ahead) economic indicators. In addition, this combination can be used for the one-step-ahead prediction of employment changes. The industries identified by this process are crop production; heavy and civil engineering construction; electrical equipment, appliance and component manufacturing; building material and garden equipment and supplies dealers; food and beverage stores; warehousing and storage; professional, scientific and technical services; and food services and drinking places.

Appendix figure A2-2. Results of industry analyses
Washington state, 1990 to 2015
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW)

NAICS	Industry	Seas. factor	Level of seas.	Trend (avg. number)	Cycle (avg. number)	Trend (percent)	Cycle (percent)	Correlation with total employ.	Correlation of first differences	F-statistic for Granger test (one-month lag)	Probability	Signif. one-way impact
	Total covered employment	1.54%	Low	3,952	1,301	75.2%	24.8%	100.0%	100.0%			
111	Crop production	37.63%	High	97	170	36.3%	63.7%	27.1%	73.0%	12.39	0.00	Yes
112	Animal production	2.99%	Mod	8	9	46.3%	53.7%	75.1%	59.1%	0.95	0.33	No
113	Forestry and logging	3.31%	Mod	21	14	60.7%	39.3%	-84.4%	51.2%	13.22	0.00	No
114	Fishing, hunting and trapping	8.10%	High	6	7	47.9%	52.1%	-80.7%	-4.0%	0.97	0.32	No
115	Support activities for agriculture and forestry	15.16%	High	47	44	51.7%	48.3%	85.5%	59.8%	6.80	0.01	No
212	Mining (except oil and gas)	3.92%	Mod	10	6	61.9%	38.1%	-47.1%	54.3%	2.66	0.10	No
213	Support activities for mining	8.97%	High	1	2	31.9%	68.1%	-53.8%	25.1%	6.01	0.01	No
221	Utilities	1.14%	Low	9	9	49.4%	50.6%	-63.9%	10.0%	1.12	0.29	No
236	Construction of buildings	3.49%	Mod	148	70	67.9%	32.1%	53.2%	67.9%	2.03	0.16	No
237	Heavy and civil engineering construction	9.04%	High	49	29	62.5%	37.5%	42.3%	71.5%	9.37	0.00	Yes
238	Specialty trade contractors	3.85%	Mod	385	162	70.4%	29.6%	84.2%	72.9%	0.13	0.72	No
311	Food manufacturing	4.93%	High	38	32	54.3%	45.7%	-28.6%	55.5%	17.66	0.00	No
312	Beverage and tobacco product manufacturing	4.52%	High	17	8	67.5%	32.5%	76.3%	62.8%	2.08	0.15	No
313	Textile mills	1.70%	Low	2	2	45.4%	54.6%	-84.1%	23.7%	3.14	0.08	No
314	Textile product mills	1.58%	Low	8	6	58.2%	41.8%	-58.3%	40.6%	0.69	0.41	No
315	Apparel manufacturing	2.53%	Mod	15	10	59.6%	40.4%	-80.4%	41.9%	3.73	0.05	No
316	Leather and allied product manufacturing	3.76%	Mod	1	2	42.9%	57.1%	-79.4%	0.1%	0.19	0.66	No
321	Wood product manufacturing	1.32%	Low	55	41	57.3%	42.7%	-77.2%	50.0%	0.95	0.33	No
322	Paper manufacturing	0.99%	NS	30	15	66.2%	33.8%	-86.2%	24.0%	5.63	0.02	No
323	Printing and related support activities	0.80%	NS	28	13	68.0%	32.0%	-79.1%	49.5%	3.11	0.08	No
324	Petroleum and coal products manufacturing	2.00%	Mod	3	5	38.2%	61.8%	40.6%	36.7%	1.10	0.29	No
325	Chemical manufacturing	0.72%	NS	14	10	58.0%	42.0%	52.3%	22.8%	0.79	0.37	No
326	Plastics and rubber products manufacturing	1.26%	Low	26	15	63.0%	37.0%	35.2%	47.9%	0.02	0.89	No
327	Nonmetallic mineral product manufacturing	2.61%	Mod	21	12	63.0%	37.0%	80.1%	65.3%	0.03	0.85	No
331	Primary metal manufacturing	0.80%	NS	39	19	67.4%	32.6%	-79.4%	14.1%	0.75	0.39	No
332	Fabricated metal product manufacturing	1.04%	Low	47	32	59.9%	40.1%	80.4%	50.7%	1.77	0.18	No
333	Machinery manufacturing	0.75%	NS	51	33	60.9%	39.1%	73.8%	28.4%	1.97	0.16	No

NAICS	Industry	Seas. factor	Level of seas.	Trend (avg. number)	Cycle (avg. number)	Trend (percent)	Cycle (percent)	Correlation with total employ.	Correlation of first differences	F-statistic for Granger test (one-month lag)	Probability	Signif. one-way impact
334	Computer and electronic product manufacturing	0.49%	NS	89	59	60.4%	39.6%	-52.9%	24.7%	0.59	0.44	No
335	Electrical equipment, appliance and component manufacturing	0.87%	NS	11	7	59.2%	40.8%	95.7%	17.5%	13.61	0.00	Yes
3364	Aerospace product and parts manufacturing	1.05%	Low	382	303	55.7%	44.3%	-42.7%	8.5%	0.11	0.74	No
3366	Ship and boat building	0.67%	NS	46	25	64.4%	35.6%	-1.2%	-2.7%	0.55	0.46	No
336*	Other transportation equipment manufacturing	1.03%	Low	28	23	54.3%	45.7%	-36.4%	17.1%	0.14	0.71	No
337	Furniture and related product manufacturing	1.42%	Low	25	14	64.0%	36.0%	-31.7%	44.8%	0.58	0.45	No
339	Miscellaneous manufacturing	1.26%	Low	20	13	60.6%	39.4%	59.6%	34.6%	3.43	0.07	No
423	Merchant wholesalers, durable goods	0.56%	NS	115	57	66.9%	33.1%	76.7%	53.8%	0.19	0.66	No
424	Merchant wholesalers, nondurable goods	1.83%	Low	47	26	64.2%	35.8%	71.7%	75.3%	25.25	0.00	No
425	Wholesale electronic markets and agents and brokers	1.03%	Low	63	27	70.1%	29.9%	71.8%	25.8%	2.05	0.15	No
441	Motor vehicle and parts dealers	1.18%	Low	68	35	65.8%	34.2%	71.7%	54.3%	2.02	0.16	No
442	Furniture and home furnishings stores	1.88%	Low	23	19	54.8%	45.2%	54.7%	18.7%	4.93	0.03	No
443	Electronics and appliance stores	2.55%	Mod	20	24	46.5%	53.5%	56.0%	4.5%	5.17	0.02	No
444	Building material and garden equipment and supplies dealers	3.69%	Mod	53	28	65.1%	34.9%	89.6%	62.6%	27.31	0.00	Yes
445	Food and beverage stores	1.55%	Low	75	65	53.6%	46.4%	38.4%	52.3%	11.07	0.00	Yes
446	Health and personal care stores	1.31%	Low	14	16	47.2%	52.8%	81.9%	24.9%	27.10	0.00	No
447	Gasoline stations	1.86%	Low	17	13	57.2%	42.8%	-52.5%	55.3%	0.55	0.46	No
448	Clothing and clothing accessories stores	4.69%	High	52	49	51.9%	48.1%	14.8%	24.1%	61.72	0.00	No
451	Sporting goods, hobby, book and music stores	3.67%	Mod	32	24	57.9%	42.1%	53.4%	26.5%	46.26	0.00	No
452	General merchandise stores	3.74%	Mod	156	69	69.3%	30.7%	91.2%	19.3%	6.99	0.01	No
453	Miscellaneous store retailers	1.93%	Low	50	15	76.6%	23.4%	45.9%	38.0%	6.47	0.01	No
454	Nonstore retailers	1.77%	Low	114	36	76.3%	23.7%	80.5%	26.5%	2.20	0.14	No
481	Air transportation	0.96%	NS	35	20	64.0%	36.0%	-34.7%	23.4%	0.62	0.43	No
483	Water transportation	3.64%	Mod	5	5	50.3%	49.7%	45.9%	47.0%	0.32	0.57	No
484	Truck transportation	2.48%	Mod	40	24	62.3%	37.7%	84.0%	72.2%	4.55	0.03	No

NAICS	Industry	Seas. factor	Level of seas.	Trend (avg. number)	Cycle (avg. number)	Trend (percent)	Cycle (percent)	Correlation with total employ.	Correlation of first differences	F-statistic for Granger test (one-month lag)	Probability	Signif. one-way impact
485	Transit and ground passenger transportation	3.21%	Mod	12	9	59.0%	41.0%	93.4%	24.0%	3.69	0.06	No
486	Pipeline transportation	1.28%	Low	1	1	44.7%	55.3%	-79.2%	12.1%	4.10	0.04	No
487	Scenic and sightseeing transportation	18.06%	High	3	5	33.3%	66.7%	-43.4%	7.9%	0.41	0.52	No
488	Support activities for transportation	1.10%	Low	34	30	52.8%	47.2%	95.0%	27.4%	6.23	0.01	No
491	Postal service	1.00%	NS	26	13	67.2%	32.8%	-27.9%	13.6%	4.51	0.03	No
492	Couriers and messengers	4.47%	High	40	27	59.3%	40.7%	64.8%	17.5%	9.88	0.00	No
493	Warehousing and storage	3.47%	Mod	28	28	49.8%	50.2%	-4.4%	48.9%	11.50	0.00	Yes
5112	Software publishers	0.91%	NS	161	44	78.7%	21.3%	96.1%	26.0%	7.48	0.01	No
511*	Other publishers	0.67%	NS	37	18	66.8%	33.2%	-45.6%	32.3%	0.91	0.34	No
512	Motion picture and sound recording industries	4.40%	High	14	13	51.1%	48.9%	77.7%	10.7%	9.71	0.00	No
515	Broadcasting (except internet)	0.96%	NS	6	8	43.5%	56.5%	-81.1%	25.0%	10.24	0.00	No
5171	Wired telecommunications carriers	0.99%	NS	47	30	61.6%	38.4%	-62.6%	-2.5%	0.78	0.38	No
5172	Wireless telecommunications carriers (except satellite)	1.79%	Low	50	29	62.7%	37.3%	84.0%	-1.2%	0.34	0.56	No
517*	Other telecommunications	3.06%	Mod	28	20	59.0%	41.0%	-30.5%	9.4%	0.43	0.51	No
518	Data processing, hosting and related services	1.33%	Low	30	32	49.0%	51.0%	56.4%	4.4%	0.52	0.47	No
519	Other information services	4.23%	High	42	22	66.0%	34.0%	75.0%	-10.0%	3.16	0.08	No
521	Monetary authorities-central bank	1.07%	Low	1	1	47.2%	52.8%	-68.0%	7.5%	3.16	0.08	No
522	Credit intermediation and related activities	0.33%	NS	104	79	56.8%	43.2%	42.1%	16.1%	0.00	0.96	No
523	Securities, commodity contracts, and other financial investments and related activities	0.51%	NS	28	18	61.0%	39.0%	94.2%	22.3%	3.45	0.06	No
524	Insurance carriers and related activities	0.41%	NS	56	39	59.0%	41.0%	77.8%	28.3%	0.00	0.98	No
525	Funds, trusts and other financial vehicles	8.08%	High	6	5	55.0%	45.0%	-92.8%	16.8%	15.79	0.00	No
531	Real estate	1.45%	Low	58	24	70.7%	29.3%	96.4%	64.8%	5.29	0.02	No
532	Rental and leasing services	2.36%	Mod	32	13	71.6%	28.4%	-3.7%	53.9%	0.94	0.33	No
533	Lessors of nonfinancial intangible assets (except copyrighted works)	3.58%	Mod	3	3	56.5%	43.5%	17.5%	1.6%	0.04	0.84	No
541	Professional, scientific and technical services	0.42%	NS	316	152	67.5%	32.5%	95.4%	17.8%	10.09	0.00	Yes

NAICS	Industry	Seas. factor	Level of seas.	Trend (avg. number)	Cycle (avg. number)	Trend (percent)	Cycle (percent)	Correlation with total employ.	Correlation of first differences	F-statistic for Granger test (one-month lag)	Probability	Signif. one-way impact
551	Management of companies and enterprises	0.53%	NS	94	48	66.1%	33.9%	82.6%	-4.8%	3.76	0.05	No
561	Administrative and support services	3.22%	Mod	383	198	65.9%	34.1%	97.5%	72.2%	1.37	0.24	No
562	Waste management and remediation services	0.95%	NS	31	30	51.1%	48.9%	27.6%	34.6%	0.83	0.36	No
611	Educational services	4.99%	High	336	99	77.3%	22.7%	84.8%	18.0%	4.56	0.03	No
621	Ambulatory healthcare services	0.36%	NS	235	47	83.3%	16.7%	92.8%	40.0%	4.76	0.03	No
622	Hospitals	0.34%	NS	165	64	72.1%	27.9%	93.9%	24.4%	3.65	0.06	No
623	Nursing and residential care facilities	0.41%	NS	77	32	70.4%	29.6%	94.5%	36.3%	3.55	0.06	No
624	Social assistance	1.27%	Low	312	260	54.5%	45.5%	83.7%	9.6%	4.21	0.04	No
711	Performing arts, spectator sports and related industries	9.09%	High	19	17	53.5%	46.5%	29.4%	46.7%	1.61	0.21	No
712	Museums, historical sites and similar institutions	3.58%	Mod	6	6	50.7%	49.3%	95.3%	16.5%	14.65	0.00	No
713	Amusement, gambling and recreation industries	4.61%	High	76	54	58.4%	41.6%	92.5%	33.1%	12.85	0.00	No
721	Accommodation	5.74%	High	41	35	54.4%	45.6%	83.0%	55.7%	0.79	0.38	No
722	Food services and drinking places	2.08%	Mod	337	97	77.7%	22.3%	98.0%	71.7%	14.79	0.00	Yes
811	Repair and maintenance	1.00%	Low	36	23	60.8%	39.2%	65.9%	52.0%	1.61	0.21	No
812	Personal and laundry services	1.15%	Low	36	15	70.4%	29.6%	92.8%	65.5%	3.83	0.05	No
813	Religious, grantmaking, civic, professional and similar organizations	2.21%	Mod	36	20	64.9%	35.1%	95.8%	45.7%	1.76	0.19	No
814	Private households	7.30%	High	371	272	57.7%	42.3%	50.0%	-0.7%	0.00	0.95	No
901	Federal government (other)	1.65%	Low	62	63	49.6%	50.4%	35.7%	20.6%	0.10	0.75	No
902	State government (other)	1.06%	Low	52	53	49.9%	50.1%	82.9%	21.8%	0.73	0.39	No
903	Local government (other)	2.15%	Mod	205	83	71.3%	28.7%	94.8%	29.8%	2.09	0.15	No

*Wild card symbol, which indicates including all parts of specific 3-digit NAICS, except specified as 4-digit details for this NAICS code.
Mod = Moderate
NS = Not seasonal

Appendix 3: Selected household statistics

Appendix figure A3-1. Selected household statistics
Washington state, 1990 to 2015
Source: Employment Security Department/LMPA; U.S. Census Bureau, American Community Survey

Household statistic	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Median household income	$58,484	$60,800	$62,707	$63,573	$61,938	$59,943	$59,773	$59,424	$59,491	$61,581	$64,129
Median family income	$71,323	$73,660	$75,173	$77,168	$74,876	$72,547	$72,175	$72,185	$72,698	$74,453	$76,954
Poverty rate, all individuals	11.9%	11.8%	11.4%	11.4%	12.3%	13.4%	13.9%	13.5%	14.1%	13.2%	12.2%
Poverty rate, children under 5	17.5%	17.6%	17.8%	17.4%	18.1%	21.8%	20.4%	21.0%	19.1%	19.3%	16.3%
Households with earnings from a job*	81.0%	81.2%	81.3%	81.4%	80.6%	79.2%	79.0%	78.7%	78.5%	78.6%	78.5%
Average household earnings from a job**	$76,503	$79,101	$81,874	$82,138	$80,131	$77,743	$78,486	$79,599	$80,986	$82,718	$86,969
Full-time workers, percent of population aged 16-64***	61.9%	61.1%	61.6%	61.1%	58.9%	56.5%	55.7%	56.5%	57.1%	57.6%	58.2%
Part-time workers, percent of population aged 16-64	19.0%	19.3%	19.0%	19.5%	19.8%	19.8%	19.9%	19.5%	19.2%	19.1%	18.8%
Median earnings for all workers	$34,490	$34,465	$35,130	$34,954	$33,728	$33,801	$33,533	$33,017	$32,950	$33,292	$35,414
Median earnings for full-time, year-round workers	$49,506	$49,111	$50,648	$50,330	$50,931	$50,869	$51,027	$50,366	$50,632	$50,338	$51,204
Median earnings for male full-time, year-round workers	$56,227	$56,715	$57,142	$56,674	$57,161	$56,822	$57,404	$55,245	$54,736	$55,579	$56,899
Median earnings for female full-time, year-round workers	$42,470	$41,892	$42,459	$41,821	$42,391	$43,413	$43,193	$42,514	$42,733	$42,182	$44,624
Percent of workers who are self-employed	6.7%	7.2%	6.8%	6.4%	6.6%	6.2%	6.1%	6.3%	5.9%	5.9%	5.9%
Households receiving Social Security	23.8%	24.2%	24.7%	24.8%	25.2%	25.8%	26.9%	27.3%	28.1%	28.5%	29.0%
Households receiving private pension payments	17.6%	17.8%	18.0%	18.0%	17.7%	17.9%	17.7%	18.3%	18.2%	18.6%	19.2%
Average annual payout for households receiving private pensions	$23,110	$23,101	$23,633	$23,776	$24,165	$24,017	$25,084	$24,400	$24,151	$24,774	$24,903
Households receiving Supplemental Security Income (SSI)*	3.7%	3.9%	3.7%	3.1%	3.2%	4.8%	4.8%	4.7%	4.6%	4.9%	4.9%
Average annual payout for those receiving SSI	$9,016	$8,521	$9,105	$9,318	$8,676	$9,572	$9,344	$9,528	$9,606	$9,536	$9,781
Households receiving welfare cash payments*	3.8%	3.2%	3.1%	3.4%	4.1%	4.6%	4.3%	4.0%	4.0%	3.6%	3.5%
Average annual payout for welfare recipients	$3,455	$3,734	$3,766	$3,728	$4,070	$4,263	$3,889	$3,461	$2,859	$2,770	$2,762
Households receiving food stamps*	8.5%	8.4%	7.7%	8.7%	11.1%	13.3%	14.5%	15.1%	14.8%	14.1%	13.4%
Residents without health insurance			N/A	12.5%	13.4%	14.2%	14.2%	13.9%	14.0%	9.2%	6.6%
Number of residents without health insurance			N/A	841,997	877,184	942,608	953,789	944,238	960,981	642,654	467,967
Residents with private health insurance			N/A	73.6%	71.0%	69.3%	68.8%	69.0%	68.5%	70.3%	71.1%
Residents relying solely on public health insurance			N/A	13.3%	15.6%	16.5%	17.0%	17.1%	17.5%	20.5%	22.3%
Renters paying more than 30 percent of income for housing	49.50%	49.80%	47.2%	47.9%	50.1%	51.1%	50.7%	50.7%	50.9%	50.0%	48.0%
Homeownership rate	66.9%	67.3%	66.1%	65.3%	64.3%	63.1%	62.8%	62.3%	61.9%	61.7%	62.4%
Homeowners with a mortgage paying more than 30 percent of income for housing	36.1%	39.9%	40.7%	41.6%	41.1%	40.9%	39.4%	36.7%	34.3%	31.7%	29.6%

*Households may fall into more than one of these categories.
**Includes earnings from all members in the household.
***Full-time workers usually worked at least 35 hours per week (but may not be year-round workers).