

Job Polarization in Oregon

An Examination of Occupational Growth by Wage Level, 1980-2012

Josh Lehner

October, 2013

The majority of Oregon's workers are employed in occupations that pay between \$25,000 and \$50,000 per year. Although occupations in this pay range still represent a majority of the workforce, their share of the job market is shrinking rapidly. For the past three decades, employment growth has become polarized, with the majority of job gains occurring at the high and low extremes of the wage distribution. The primary factors contributing to this polarization, including the effects of both technology and globalization, are expected to continue throughout this decade. The following analysis applies the methodology from national studies to examine the extent to which job polarization is occurring within Oregon's regional labor market. Aside from a brief respite during the boom years of the 1990's, Oregon's job market has become polarized at roughly the same pace as has the overall U.S. job market.

Introduction

Job polarization represents a key labor market development of the past thirty years across the globe. Job polarization refers to an increasing concentration of jobs in occupations at both the high and low ends of the wage scale, with a relative shrinking share of middle-wage jobs. For now, the majority of Americans, and Oregonians, continue to be employed within middle-wage occupations. However, employment growth over the past three decades has become very polarized, with this trend projected to continue in the coming decade.

A growing body of research has illustrated these changes at the national level and at least a partial consensus is forming as to why this polarization is occurring. The two most common explanations involve technological change and globalization—factors which certainly are not mutually exclusive. The role of technology, including the computerization of the workplace, is generally considered the most significant contributor to job polarization. Technological investments often involve the automation of what may be termed routine work, allowing each individual worker to be more productive and allowing firms to get by with fewer workers.

As defined by Autor, Levy, and Murnane (2003), routine jobs have sufficiently well-defined tasks that can be satisfactorily completed by a computer program. As discussed in Autor (2010), examples include bookkeeping, clerical work and repetitive production tasks (manufacturing). For example, use of modern software allows each bookkeeper to serve more clients than in the past. Similarly, for occupations where globalization is a contributing factor, routine jobs can be performed abroad by workers who are willing to accept lower wages and who possibly have less education or less experience.

Relative to routine occupations, jobs that require abstract thinking and decision making and/or in-person interactions and communications are more difficult to replace. For example, the face-to-face interaction required for lower wage consumer service occupations (e.g. hairdressers, and childcare workers) make automation or offshoring of these services nearly impossible with current technology. Also, occupations that require specialized capital stocks or

access to natural resources face less pressure than do routine occupations.

While job polarization has been reshaping the labor market for decades, the Great Recession exacerbated the process in both the nation and in Oregon. As noted by Jaimovich and Siu (2012), in their “The Trend is the Cycle” research paper, most job losses among middle-wage occupations occur during recessions. Making matters worse, the lack of growth among middle-wage occupations in the early stages of the expansions has resulted in the jobless recoveries experienced in recent decades. This job polarization trend has resulted in the characterization or nature of the recent business cycles, hence their paper’s title. In other words, many jobs in middle-wage occupations are eliminated during economic downturns and are not replaced to the same degree as both high- and low-wage jobs during the subsequent expansion.

Although much national and international research has focused on measuring job polarization, little has been done on a regional or local level. This report is designed to highlight the job polarization trends in Oregon over the past thirty years, how the Great Recession has impacted the state, and also how the jobs of tomorrow will further alter the state’s economy.

Much of Oregon’s job polarization has occurred during periods when its manufacturing firms have downsized. Many middle-wage jobs were lost during the 1980’s when the wood product industry restructured, and once again in the 2000’s due to both the dotcom recession and the Great Recession. Although the pace of job polarization in Oregon has been severe during these downturns, the state has fared better than most at creating middle-wage jobs during periods of economic expansion. In particular, due to healthy job gains during its technology expansion in the 1990’s, job polarization in Oregon has not been as severe over the past three decades as in other states. Even so, Oregon’s workforce began, and remains, somewhat more polarized than that of the typical state due to a higher concentration of low paid Farming, Fishing and Forestry jobs.

The remainder of the report is organized as follows. The next two sections briefly describe the study methodology, data used and wage group

classifications. Employment changes over the past thirty years are then examined for Oregon and compared with national trends over the same time period, followed by an analysis of the Great Recession's impact on Oregon's occupational structure. Additional consideration is given to differences seen in job polarization in Oregon's metropolitan or urban areas compared with the remainder of the state. Finally, the economic outlook in the coming years reveals that job polarization is expected to continue in the coming decade. The final two sections conclude, discuss implications of job polarization and highlight possible areas for further research.

Methodology

This report analyzes employment in Oregon at the occupational level and its growth and changes over recent decades. Generally, most analyses of employment refer to industries – manufacturing, leisure and hospitality, government, etc. – however examining the labor market through the occupational lens provides a somewhat different look. Occupations, such as accountants or managers, span all industries and should a trend, either cyclical or structural, emerge among these occupations, it may not be detected when examining just industry employment. Using both industry and occupational data provides a more complete picture of the labor market than just one or the other.

Following the Federal Reserve Bank of New York's research (2012), this report uses two main classifications to examine occupational trends in Oregon. First, using the Standard Occupational Classification system, 840 individual occupational categories are classified within 23 overarching occupational groups¹. A second categorization is also made that sorts these occupational groups into four wage groups based on their 2012 median wages.

The analysis contained in this report examines employment changes and trends based on both the 22 non-military occupational groups and the broader set of four wage groups. The analysis covers multiple

time frames depending upon the exact data set used. U.S. Census Bureau (Census) data is available for 1980, 1990, 2000 and 2010. Occupational Employment Statistics are available for 1997-2012 from the U.S. Bureau of Labor Statistics (BLS).

Using decennial Census data as the basis for the long run trends over the past 30 years has both positive and negative attributes. The consistency with which Census is able to compile data and information across both regions and time is the data's greatest strength and provides a solid foundation on which to analyze these trends. However, the Census occurs only once per decade and the exact years do coincide with distinct points in the business cycle. 1980, 1990 and 2000 are all considered to be at, or near, the relative peak of business cycles, however 2010 certainly is not and is considered the labor market trough of the Great Recession. Oregon's business cycles overall, in terms of timing, match the U.S. business cycles however given the volatility of the state's economy, Oregon tends to fare better than the nation as a whole during expansions and worse than the average state during recession. These facts are likely to influence some of the information as it is only available once every ten years.

One additional item to highlight is the fact that data from different sources or different surveys do vary somewhat when calculating exact figures. Occupational data from Census, occupational data from BLS and industry data from BLS or OED, while certainly exhibiting the same underlying labor market trends over time, will yield somewhat different results when examining specific changes over a given period.

One common step made in the literature is to link high-wage occupations with high-skilled employment and also low-wage occupations with low-skilled employment. There is an overall positive correlation between skill and wages however this is not a perfect relationship. Economic theory suggests that in a properly functioning labor market, the value of what a worker produces for a firm is the primary determinant of what that worker gets paid.

Unfortunately, data available at the regional or local level is unable to provide a long enough history with consistently defined occupations to assess these occupational changes based on skill levels instead of

¹ This report uses the first 22 occupational groups and does not include the 23rd. military specific occupations. For more detailed information on which individual occupations are classified in which occupational groups, please see Appendix A.

wage levels. Therefore, in this report, job polarization refers to employment by wage level and not explicitly by skill level. Nevertheless, these concepts are closely interconnected. Avenues for future research include a more thorough examination of each of the hundreds of detailed occupations in an effort to create a consistently defined set of occupations at the regional level over time.

Wage Group Classification

Each of the 22 occupational groups is categorized into one of four main wage groups based on their 2012 median annual wage². Each group is defined as follows. Please see Appendix A for more information on the classification of individual occupations and Appendix B for each occupational group’s median wage.

High Wage (> \$50,000)

Business and Finance, Computer and Mathematical, Engineers and Architects, Health Practitioners, Legal, Management, and Scientists, including Social

Upper Middle (\$40,000 - \$50,000)

Arts and Entertainment, Community Service, Construction, Installation and Repair, Protective Services, and Teachers

Lower Middle (\$25,000 - \$40,000)

Administrative Support, Health Support, Production, Sales, and Transportation

Low Wage (< \$25,000)

Building Maintenance, Farming, Food Preparation, and Personal Care

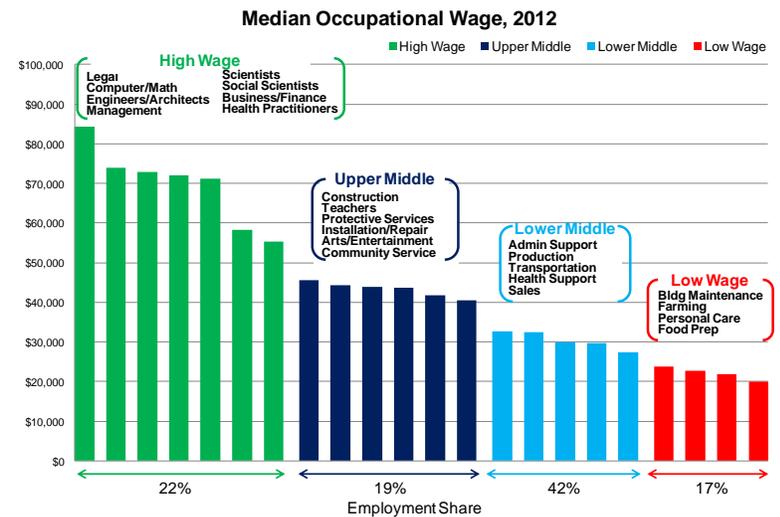
Panel A in Figure 1 shows the occupational groups in each of the four main wage groups. The employment

² Even though 2012 is the basis for these categorizations, there has been surprising consistency of occupational groups across categories over time. High-wage occupational groups tend to always be high-wage while low-wage groups tend to be low-wage over time. The same is true for both upper middle and lower middle-wage occupational groups. Counterexamples do exist and include Installation and Repair which was high-wage in the 80s and 90s but is upper middle today, Arts and Entertainment which were lower middle-wage in earlier decades but upper middle today, Healthcare Support which were low-wage in earlier decades but lower middle today and Farming which were lower middle-wage in earlier decades but low-wage today.

share of each wage group is shown on the horizontal axis. The largest group, representing 42 percent of all Oregon jobs in 2012, is the lower middle-wage group. Within these occupations, Administrative Support is the largest occupational group, followed by Sales and Transportation. Combined, the two middle-wage groups employ nearly 62 percent of Oregonians, while at the national level these same groups employ nearly 63 percent.

Another way to examine the wage groups and their relative employment sizes is shown in Panel B. The occupations are listed in the same order as in Panel A and the size of each bubble represents each occupational group’s employment.

Figure 1
Panel A



Panel B

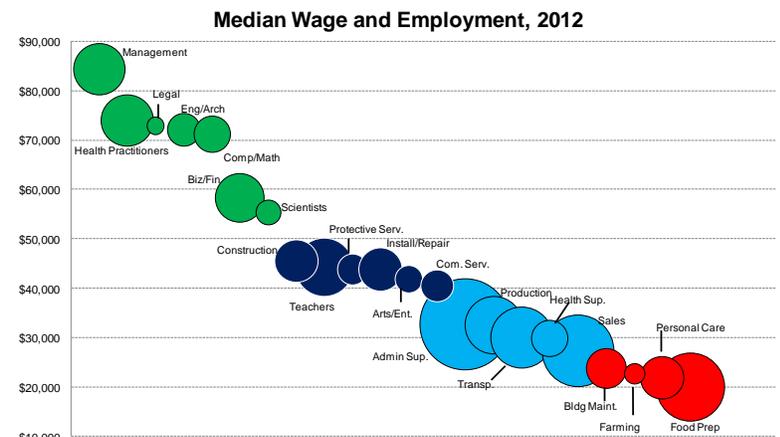
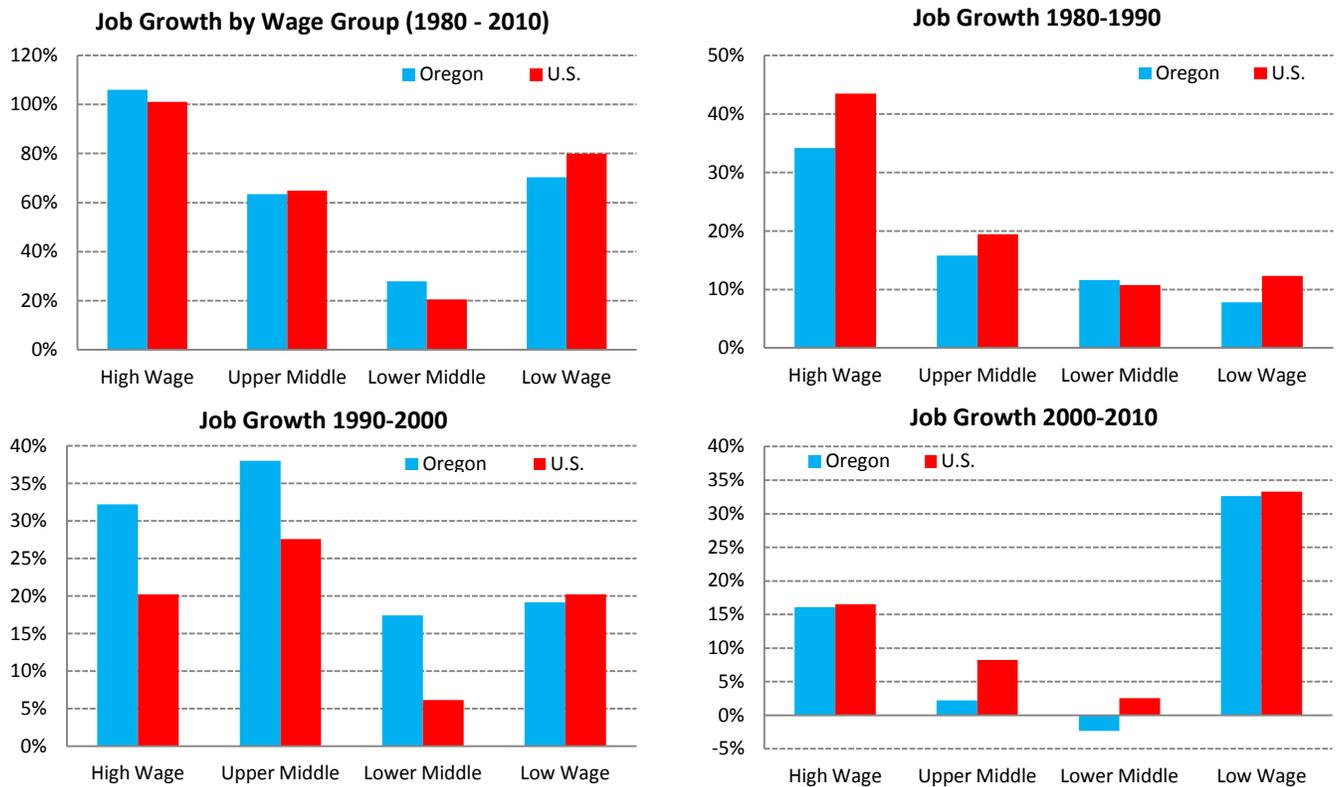


Figure 2



Three Decades of Polarization

Job polarization has been ongoing in the United States for three decades and the same is true in Oregon. Figure 2 shows the employment change by wage group over both the entire 1980 to 2010 time period and each decade therein, while Figure 3 shows each wage group’s share of total employment in Oregon over the same period. Both figures use data from the U.S. Census Bureau, courtesy of the Federal Reserve Bank of New York³.

Overall, Oregon’s pattern is similar to that of the U.S. as a whole. However, a few differences do emerge. Specifically, Oregon’s growth in both high-wage and lower middle-wage occupations has outpaced the national average while the state’s growth in low-wage occupations over these years has been less than the national average. While the end result may be that Oregon has experienced somewhat less job polarization relative to the nation, the process of job polarization has been pronounced within the state

³ The data were obtained from the Federal Reserve Bank of New York and are based on information from the 1980, 1990 and 2000 Census and the 2010 American Community Survey.

nevertheless. Middle-wage occupations in Oregon have grown at consistently lower rates than high- and low-wage groups in recent decades.

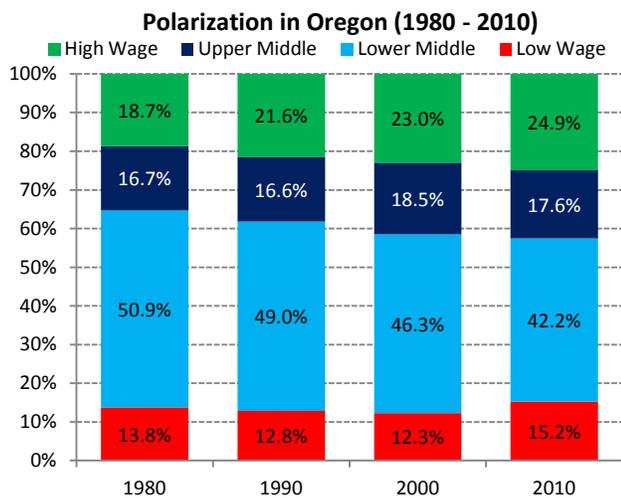
As detailed in Autor (2010), employment growth during the 1980s was concentrated in high-wage occupations, while middle-wage occupations remained relatively steady as a share of overall employment and relative declines occurred among low-wage jobs. Within the high-wage occupations, Computer and Math grew at the strongest rate in Oregon during the time period (108%), while the Management and Health Practitioners groups led the increase in the number of workers with gains of 20,654 and 13,960, respectively. While the pattern of growth was similar to the nation’s, Oregon experienced slower growth, throughout the decade due to the severity of the early 1980s recessions in the state.

Late 1979 or early 1980 represented the peak of the business cycle for both Oregon and the U.S., however Oregon’s relative peak was much higher than the nation overall. Throughout the 1970s employment in Oregon grew approximately 4.0 percent annually

while the U.S. experienced growth of approximately 2.5 percent. Oregon also saw stronger population growth leading up to 1980 and underwent a housing construction boom throughout the late 1970s. From this higher peak, Oregon's economy suffered a more severe recession than the U.S. as a whole. The state lost over 12 percent of its employment and in both 1982 and 1983 the state experienced actual net outmigration as the population declined. The loss of middle-wage jobs associated with timber production was particularly pronounced. Even as the state recovered rapidly in the latter half of the decade, over the course of the full ten years between Census', Oregon saw less net job creation than the average state.

During the 1990s, Oregon's growth differed significantly from the national pattern, as the state experienced a very strong economic expansion characterized by the ramp-up of the high technology sector, and accompanied by strong population growth. Oregon's growth across the top three wage groups significantly outpaced the national average while low-wage occupational growth essentially matched the national average in percentage terms. Thus, while the nation experienced an increase in the relative size of the low-wage occupations, Oregon did not. Oregon's strong employment growth was seen nearly across the board. Growth was significantly stronger than the national average for all occupational groups except Farming and Food Preparation both of which are low-wage groups.

Figure 3



In the 2000s, Oregon's growth pattern once again mirrored the national pattern. Concentration in both the high-wage and low-wage occupational groups increased, leading to substantially more job polarization.

Oregon's only difference relative to other states in recent years has been weak local job growth among middle-wage occupational groups. Surprisingly, Oregon has gained just as many jobs in high-wage occupations as the typical state over the past decade, despite seeing fewer job gains overall.

Oregon suffered two recessions during the decade, both of which hit Oregon harder than the typical state, and reduced manufacturing and headquarters operations significantly. The relative severity of Oregon's recessions during the 2000's manifested itself in a loss of many middle-wage jobs.

Early in the decade, Oregon lost many of its metal makers, technology firms and its last major headquarters operation for the timber industry. At the end of the decade, the housing downturn cost Oregon many construction and wood product jobs. Local recreational vehicle and other transportation equipment producers have also become significantly smaller in recent years.

The two middle-wage occupational categories experienced slight gains at the U.S. level over the decade (+4.2%) while in Oregon they actually declined outright (-1.0%). This decline was a function of losses in Construction, Production and Administrative Support occupations not being fully offset by gains in Teachers, Sales and Healthcare Support positions within the state.

The drag from Oregon's manufacturing losses in aggregate is larger than in the typical state because we have more manufacturing jobs to lose. In percentage terms, however, Oregon's manufacturers usually do better than most in both good times and in bad in aggregate⁴.

One measure of relative dependence on manufacturing is called an employment location

⁴ Industries such as wood products and paper have fared worse than the nation in recent decades while Oregon metal manufacturers and computer and electronic manufacturers have outperformed.

quotient. A location quotient (LQ) compares the share of jobs in manufacturing locally to the share nationally. An LQ greater than one implies Oregon depends more on manufacturing than does the typical state. Oregon's manufacturing LQ has been increasing over time, helping to support the lower middle-wage occupational group relative to the nation, or average state. Oregon added manufacturing jobs during the 1980s and 1990s while the nation overall was losing these jobs. More importantly, Oregon lost relatively fewer during the 2000s when compared to the nation overall. Following the timber industry restructuring in the 1980s, Oregon's manufacturing LQ was just 1.01 in 1990, indicating that the relative size of the manufacturing sector in Oregon was just slightly larger than the national average. However by 2000, the state's LQ had increased to 1.06, by 2010 it had increased to 1.15 and by 2012 it had increased further to 1.17.

A heavy dependence on struggling manufacturing industries remains a primary factor behind job polarization in Oregon. However, the state's economy would be much worse if our local manufacturers performed as poorly as those in other states.

Low-wage occupations in Oregon have grown slower than the nation over the past thirty years. This difference is largely due to slower growth during Oregon's dark period of the 1980s. Since 1990, Oregon's growth in low-wage occupations has essentially matched the national rates of growth. From 1990-2010, U.S. low-wage occupations have grown 60 percent, compared to 58 percent in Oregon.

The Impact of the Great Recession

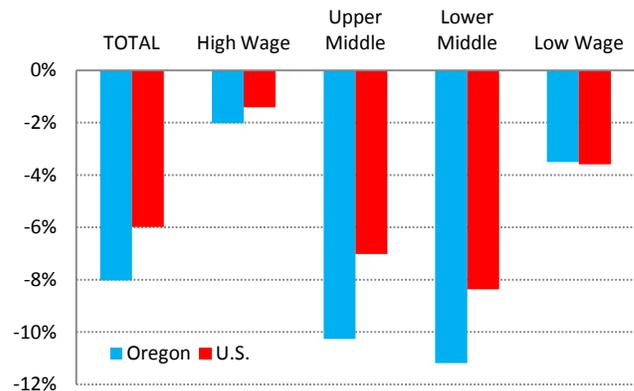
During the Great Recession many occupations were scaled back significantly. The economy is currently recovering, and jobs are being created and filled, but not necessarily the same jobs that were lost. In particular, many manufacturing jobs are gone for good, and the construction industry remains a shell of its old self. It is important to examine how, if at all, job polarization has been affected by the post-recession mix of industries in Oregon.

Occupational employment statistics data are available from the U.S. Bureau of Labor Statistics for the 1997

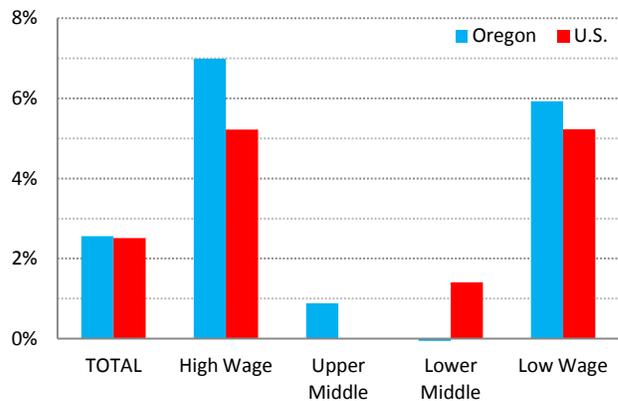
through 2012 time period⁵. The analysis of occupational changes in Oregon over the past decade using this data source closely mirrors that of the Census data discussed previously and is therefore omitted from this report⁶.

As shown in Figure 4, the Great Recession's impact on job polarization has been to exacerbate the occupational employment trends in Oregon.

Figure 4 – The Great Recession's Impact
Changes in Recession (2008-2010)



Changes in Recovery (2010-2012)



During the recession, employment loss in both the high-wage and low-wage occupations was significantly smaller than losses among middle-wage

⁵ Due to technical changes in the data gathering process, such as occupational or geographic definition changes, the Bureau of Labor Statistics does not use the data for time-series analysis. However, given the consistent geographical definitions of both the State of Oregon and the Portland Metropolitan Statistical Area and the fact that the occupational definitions are consistent during the 1999-2009 period and also the 2010-2012 period, the Office of Economic Analysis has been able to combine the annual occupational employment statistics for Oregon that cover the 1999-2012 period.

⁶ For more information, please see the accompanying presentation slides

occupations. While Oregon lost 8 percent of its jobs overall, high-wage occupations only lost 2 percent of employment, while low-wage occupations lost 3.5 percent. The vast majority of the job loss during the recession occurred in both the upper middle- and lower middle-wage occupations.

Out of the state’s total job losses of slightly more than 137,000, 88 percent were in either upper middle or lower middle occupational groups. Two-thirds of these losses can be traced to Construction, Production and Administrative Support occupations. The relative strength of the high-wage occupations was partly due to 6.2 percent growth in Health Practitioners during the recession, or nearly 5,000 jobs. However, even when Health Practitioners are excluded, high-wage occupations only fell 4.6 percent, significantly less than the total statewide.

Two years into the labor market recovery the same general job polarization pattern has emerged. From 2010 to 2012, job growth has been dominated by both high- and low-wage occupations. In fact, nearly 23,000 of the 40,000 jobs gained in the past two years⁷ have been among high-wage occupations, while just over 15,000 of the jobs gained have been among low-wage occupations.

Approximately 10,000 of the high-wage gains have been within the Management occupational group however Business and Finance, Computer and Mathematical and Architecture and Engineering occupational groups have each added around 5,000 jobs over the past two years.

Low-wage occupational gains have been concentrated in Personal Care and Services – 9,000 jobs gained – while both Food Preparation and Farming, Fishing and Forestry have each added nearly 2,400 jobs.

The counterweight to the gains at the high and low ends, are the small gains seen in the upper middle-wage group and continued losses in the lower middle-wage group. Employment gains were seen in the Teacher and Arts and Entertainment occupations in 2011 and 2012, while job losses continued in

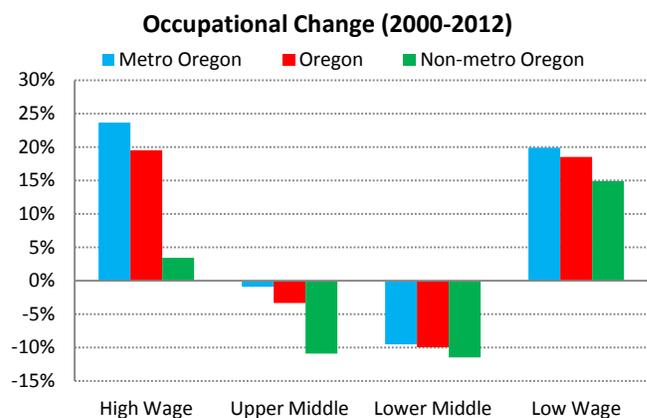
Construction, Protective Services and Healthcare Support occupations. Even within these occupational groups, there is substantial variation. For example, even though employment in Teaching occupations increased, this was due to strong growth in Postsecondary occupations as college enrollment skyrocketed during and after the recession in a tough labor market. K-12 teaching positions, however, continued to see job losses as local governments, including school districts, faced budget reductions and difficult spending decisions.

Regional Divide

While job polarization is a nationwide issue, the extent of the occupational changes does vary at the local level. Figure 5 illustrates the effects of job polarization in Oregon’s metropolitan areas⁸ and the rest of the state.

Like the nation as a whole, both Oregon’s metropolitan and non-metropolitan areas have seen job polarization occur. However the nature of this polarization differs as the larger cities have experienced a more “high-wage heavy” job polarization, while the more rural areas have experienced a more “low-wage heavy” polarization.

Figure 5 – Metro and Non-Metro Job Polarization



The fact that the occupational data show the state’s urban areas are recovering faster than the rest of the state is consistent with what we are observing in alternative data on job gains across industries. New

⁷ Job gains across different data sources indicate similar growth. Occupational data shows gains of 40,210 while corresponding gains from the CES show 34,300 and the QCEW gains number 39,613.

⁸ Oregon’s metropolitan areas are defined here as the Corvallis, Eugene, Medford, Portland and Salem MSAs. Bend is excluded due to data availability.

high-wage jobs are in occupational groups such as Legal, Management, Business and Finance, which tend to be housed in professional service industries that can be found in large and economically diverse metropolitan areas.

The Outlook

While examining historical changes helps place current events in their proper perspective, what does the future hold for Oregon employment? Both our office's economic forecast and the Oregon Employment Department's 10-Year Employment Projections by Industry and Occupation reveal that the same general job polarization pattern is expected to continue going forward.

The job gains seen in these first two years of expansion following the Great Recession have been very polarized, as shown previously. While polarization is expected to continue, it will likely be somewhat muted over the next few years as there will be some cyclical bounce following such a deep recession.

Specifically, Construction and Teachers – both upper middle-wage occupations – will see job gains in the near term. The housing market continues to recover and new construction activity is just now returning to a level commiserate with job gains. Similarly, state and local government budgets are being repaired, both from a revenue and expenditure perspective, and moving forward school districts are expected to hire additional teachers. These gains will help stem the tide of polarization in the near term, as the economy continues to recover.

However, despite the cyclical improvement in some middle-wage occupations, there will remain structural impacts on jobs due to globalization and technology. In particular, manufacturing in both Oregon and the U.S. continues to be pressured by both forces as today's production workers are much more productive than their predecessors even as their ranks have declined considerably in the past two decades. Going forward, it is expected that manufacturers will continue to need to become more productive in order to survive. With each manufacturing worker expected to produce more, job counts will continue to lag output for much of the industry.

Administrative Support workers – bookkeeping, payroll, clerks, etc – are likely to continue to face technological advancements in the workplace as these occupations, generally, perform routine tasks which are prime candidates for automation. This process has been ongoing for decades already. According to the Census data, in 1980 Administrative Support accounted for over 17 percent of the Oregon workforce. In 2010, they accounted for less than 15 percent. This relative decline represents approximately 38,000 Administrative Support jobs in Oregon today. Given that businesses continue to investment in business equipment and technological advancements, this trend is expected to continue. The number of Oregonians employed within these occupations will increase over time, however their relative share of the workforce will continue to erode.

Overall, despite some cyclical improvements in the near term, job polarization is projected to continue to shape the state and national labor market in the years to come.

For more detailed information on occupational projections, please visit the Oregon Employment Department's website: <http://www.qualityinfo.org>⁹.

Policy Considerations of Job Polarization

Job polarization is not necessarily bad. To the extent that the jobs being created today and tomorrow are in high-wage occupations that fit the skill set of Oregon's households, polarization represents a positive development in the economy. Shrinking job opportunities in the middle-wage occupational groups become a problem when these jobs are replaced by corresponding low-wage jobs, or by jobs for which local workers are not qualified.

The lack of hard-to-define "family wage" jobs is problematic when the only available opportunities are either unemployment or a low-wage job. This results in a lower standard of living for those individuals and families that lose a middle-wage job and are unable to find another one with similar wages. It also has negative implications for upward mobility among low-income households.

⁹ <http://www.qualityinfo.org/pubs/projections/projections.pdf>

Over the long run, the primary determinant of what a worker gets paid is the value that worker brings to their employer. As such, in order to improve the income level of Oregon’s workers, either these workers must become more productive, or additional productive employers must be attracted to the region.

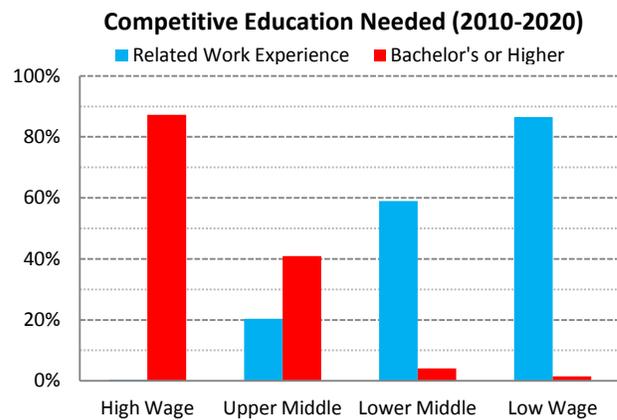
Workers may become more productive by investing in education, by gaining experience within an industry or at a specific firm, or by gaining access to additional equipment, technology or other resources.

Over the past three decades, it has become more difficult to obtain a job in high-wage or upper middle-wage occupation in Oregon without additional training or a college degree. During the 1960s and 1970s, when timber industry employment was booming¹⁰, workers commonly finished high school and began working at the local mill. During this period, timber industry jobs paid wages that were typically 30 percent above the statewide average. This type of employment has declined considerably in the past 30 years and real wages have likewise not kept pace. Continuing with the timber example, the remaining industry jobs now pay the statewide average wage, and employment has declined by approximately two-thirds. This represents not only a decline in the number of middle-wage jobs, but the wages themselves have eroded as well.

Education attainment in the form of four year degrees is not the be-all and end-all for finding a high-wage job, but it does help considerably at the individual level. Inevitably some dropouts will become successful managers, while some graduate degree holders will continue to work food preparation jobs. On aggregate, however, the correlation between education and pay is strong. It is important to point out that educational attainment beyond college degrees may refer to additional training such as a certification process in which individuals further their skills and become more competitive in the labor market. Furthermore, in a weak labor market, such as in the aftermath of the Great Recession, employers can be more selective in their hires as there are more applicants from which to choose.

¹⁰ <http://oregoneconomicanalysis.wordpress.com/2012/01/23/historical-look-at-oregons-wood-product-industry/>

Figure 6 – Job Openings & Education Requirements



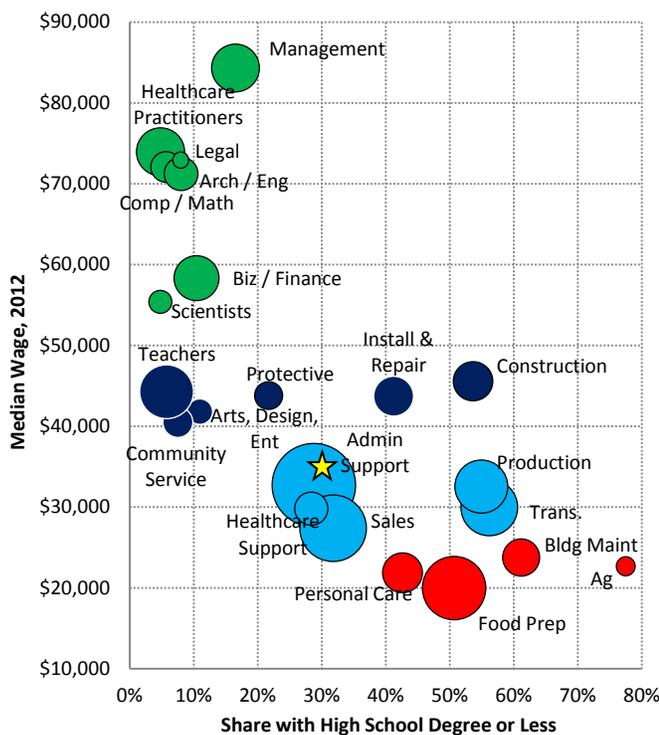
Job polarization cannot be addressed without a focus on educational attainment. That said, Oregon’s success story of the 1990’s was not driven by high enrollment at local colleges and universities. At that time job polarization stalled and educational attainment improved, because Oregon was able to attract many valuable firms and skilled workers to the area.

One important aspect along the education—wage spectrum is to focus on the differences among similar groups (see Figure 7, next page). For example, even among the occupations that have a high concentration of four year degrees, shown in Panel B, there is considerable wage variation. Computer Programmers, Doctors, Engineers, and Lawyers all earn more than double the statewide median wage and approximately two-thirds of these occupational groups have at least a Bachelor’s Degree.

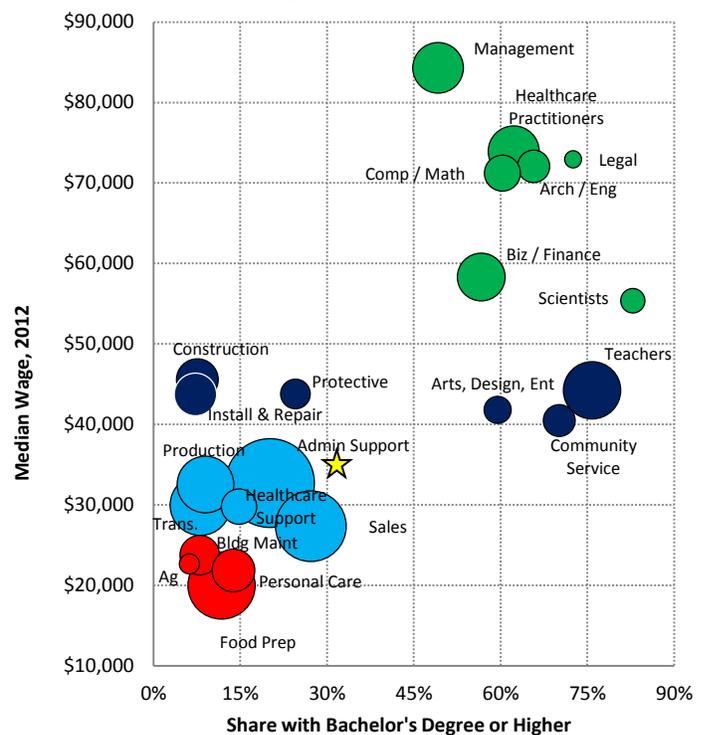
However, interestingly enough, Management, the highest paid occupational group, has the lowest level of educational attainment among this subset. This indicates that there is path forward to high paying jobs for employees without formal education, albeit it is likely a narrower path. One example would be a construction worker who, after years of experience, starts his or her own firm. Or an employee at a business who gains considerable within firm experience and knows the business inside and out who receives a promotion to a management position. These hypothetical examples illustrate that, in addition to education, experience within a given firm or industry can increase worker productivity. The value of experience is likely why the Management group has

Figure 7 – Occupations, Wages and Education

Panel A – High School Degree or Less



Panel B – Bachelor's Degree or Higher



lower formal educational requirements than the other high-wage groups.

Conversely, on the other end of the highly educated spectrum are occupations that, while certainly paying more than the median statewide wage, do pay less than similar workers in other occupations. Among these are Scientists, Teachers, Community Service (counselors, social workers, clergy and religious workers, etc) and Arts, Design and Entertainment occupations. The majority of these jobs do require a bachelor's degree and may reflect more of a lifestyle occupational choice than a pure salary story, where the workers enjoy additional nonpecuniary rewards in addition to their salary.

Where one sees an even broader divergence is in the variation of educational attainment among the upper middle-wage occupations (the dark blue bubbles). All of these occupations pay approximately the same wage, and are performed by skilled workers, yet require vastly different levels of formal education. The typical construction worker (54% high school degree or less) earns the same the typical teacher (76% bachelor's degree or higher). One reason for this is that these occupations require some abstract thinking and problem solving skills, not to mention nonroutine

physical activities and human interaction. Not all of these skills are learned in the classroom. For example installation and repairmen typically learn on the job and/or through an apprenticeship program.

This has important implications for creating and sustaining upper middle-wage jobs. One good way of categorizing these occupations is they are driven in large part by population and demographics. Stronger population growth leads to an increase in demand for housing, repair work, police officers, social workers and teachers. During the strong 1990s expansion in Oregon, population growth averaged nearly 2 percent per year and the upper middle-wage jobs actually grew the quickest among all wage groups (see Figure 2). It was during this time period that Oregon was able to stem the polarization tide, given the strong gains in these middle-wage jobs.

Lower middle-wage jobs do not tend to require four-year degrees and pay approximately the state median wage, although educational attainment does vary within this larger group. Employing 42 percent of Oregonians, these occupations comprise the largest wage group in the state. These occupations have also been the most prone to the impacts of automation, technology and globalization. Their relative share of

the Oregon labor market has shrunk from 51 percent of all jobs in 1980 to just 42 percent today. This is due to outright losses in Production (manufacturing), slower than average gains in Administrative Support and effectively flat employment in Transportation and Material Moving. These occupations tend to perform more routine and repetitive tasks that require less abstract thinking than other groups. With advancements in technology and automation, these occupations are being eliminated and replaced with computers and programs. Production and Transportation jobs also require less in terms of formal education with over half of all employees obtaining a high school degree or less and not quite 10 percent having obtained at least a bachelor's degree.

Jobs in the Health Support and Sales occupational groups have increased faster than average over the past thirty years and these occupations tend to require more in terms of formal education than their lower middle-wage peers. Forty percent of workers within Sales have an associate's degree or at least some college while 57 percent of Health Support workers do.

While the upper middle-wage jobs can be considered as being driven by population growth, these lower middle-wage jobs can broadly be considered as business support occupations. Administrative Support, Sales and Transportation all act as suppliers of labor and services to other businesses or employees. With increases in business operations, including headquarters, the demand for such occupations will increase even if technological advancements continue to eliminate a portion of these jobs. This provides an opportunity for continued investment into activities that foster both an entrepreneurial business climate and also recruitment and retention efforts of existing firms. The loss of significant headquarter operations in Oregon over recent decades has decreased the demand for some of these business support firms and workers.

Low-wage occupations tend to not require much in terms of formal education although some Personal Care workers, particularly in cosmetology, are required to be certified and some occupations in Food Preparation, such as chefs, do have many workers who have attended a career or trade school. Other

requirements for low-wage work are general physical activities and/or face-to-face interaction with customers and co-workers. While the educational requirements are generally minimal, these occupations have been harder for businesses to automate given the required interaction or nonrepetitive manual labor. Demand for these services (and workers to provide the services) is expected to increase faster than most occupations are the economy continues to recover and expand.

A key question moving forward is whether the coming decades in Oregon will be more like the 1990s or the 2000s. Our office's economic outlook for the state in the next decade is somewhere in between these benchmarks. The expansion is projected to continue and even gather steam in the coming years; however the rate of growth – at least in terms of employment – will not reach the rates seen in previous expansions in the state.

For more information on educational attainment by occupation, please see Appendix B.

Transitions are not Costless

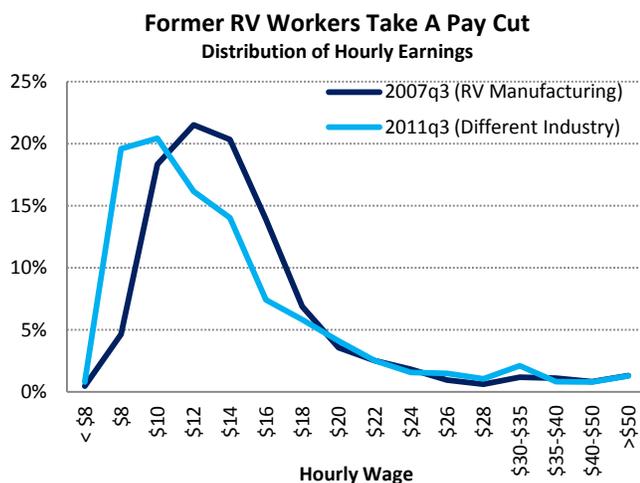
Investments in equipment and technology on the part of Oregon's firms also lead to higher wages for local workers. Although it is often the case that investments in equipment and technology lead to the need for fewer employees, the workers that remain become more productive and valuable, and their jobs more secure, at least in the near-term, before the advent of future technological advancement.

Since many currently low-paid occupations are expected to be in demand in the future, one prescription is to make them better through investment. Over time, automation and computerization of the workplace are making current workers more and more productive, regardless of which occupational group one wishes to discuss. The employees of today are significantly more productive than the employees of yesterday and, most likely, significantly less productive than the employees of tomorrow.

With that being said, the transition for workers displaced by these processes is not costless. It can take considerable time and/or money to find another

job, particularly if the displaced worker has to retrain for a different career path or relocate.

An example of such a transition is the recreational vehicle (RV) manufacturing industry in Oregon. The industry lost nearly 80 percent of its jobs during the Great Recession of which many were high-paying and high-skill. Through wage records, the Oregon Employment Department¹¹ was able to track these former RV employees over time as they found a different job. Overall the median wage for former RV workers declined 11 percent from the wage earned while working in the RV industry to their current position four years later. Approximately one-third of these workers saw a wage gain during this transition, however for the nearly two-thirds who saw wage reductions, the median loss was 27 percent or over \$8,700 on an annual, full-time basis.



During periods of transition, such as the RV example, it is important to have both properly functioning safety net programs to help financially and also appropriate training programs available so that workers may obtain the skills that are in demand from employers.

Conclusion

Job polarization, defined as employment growth at both the high-wage and low-wage level with shrinking job opportunities in the middle-wage occupations, has been ongoing for at least three decades in Oregon. The majority of Americans and Oregonians are still employed within middle-wage occupational groups.

However, new jobs are disproportionately being created in other industries or occupations. The conventional wisdom in recent years is that both the U.S. and Oregon economies are losing middle-wage occupations and are replacing these jobs with low-wage ones. This is undoubtedly true as far as it goes, however the economy is also disproportionately creating high-wage occupations as well. This last fact is either not part of the general conversation of the changing nature of the economy or the conventional wisdom, however is a major component of job polarization overall.

There are a number of contributing factors to this polarization including the effects of both technology and globalization. Given the outlook for growth across occupations, job polarization is expected to continue in Oregon throughout this decade.

With that being said, not all hope is lost. Oregon has many comparative advantages that can be maintained and improved through investment. Oregon enjoys long-term advantages of low electricity costs, partially due to the region's renewable hydroelectricity, a central location between the large markets of California, Vancouver, B.C. and Asia, abundant and clean water, low business rents and living costs, and an increasingly diverse industrial base. These advantages, along with an increasingly educated population and the proven ability to attract young migrants provide growth opportunities to help stem the tide of polarization more than in states that lack such advantages. The march of technology will continue to transform both the economy and the labor market; however having the people and the skills necessary to take advantage of these new opportunities is vital.

Examining the data and identifying trends in job polarization, as this report has attempted to do, is an important first step. Areas of interest for future research include: a more detailed examination of individual occupations, wage distributions within occupations and a more local or regional analysis within the state. Further considerations could also address the state tax revenue implications of increased job polarization and a more tactical discussion of public policy options, including analyzing workers transitioning from a middle-wage occupation to either a high- or low-wage one.

¹¹ <http://www.qualityinfo.org/olmisi/ArticleReader?itemid=00008243>

The author would like to thank the Federal Reserve Bank of New York for their data assistance and both the Oregon Employment Department and the Legislative Revenue Office for valuable comments on the report. Additional thanks to Oregon's State Economist, Mark McMullen, for substantial comments and edits and also to Oregon's State Demographer, Kanhaiya Vaidya, for data assistance on the educational attainment by occupation in Oregon.

References:

The Skill Content of Recent Technological Change: An Empirical Exploration. Quarterly Journal of Economics, 118(4), November 2003, 1279-1334. David Autor, Frank Levy and Richard Murnane. http://economics.mit.edu/faculty/dautor/data/autlevmur_n03

The Trend is the Cycle: Job Polarization and Jobless Recoveries. March 31, 2012. Nir Jaimovich, Duke University and Henry E. Siu, University of British Columbia. <http://faculty.arts.ubc.ca/hsiu/research/polar20120331.pdf>

The Polarization of Job Opportunities in the U.S. Labor Market. David Autor, MIT Department of Economics and NBER. April 2010. Jointly released by The Center for American Progress and The Hamilton Project. <http://economics.mit.edu/files/5554>

Job Polarization in the United States: A Widening Gap and Shrinking Middle. Jaison R. Abel and Richard Deitz. Federal Reserve Bank of New York. November 21, 2011. <http://libertystreeteconomics.newyorkfed.org/2011/11/job-polarization-in-the-united-states-a-widening-gap-and-shrinking-middle.html>

Regional Economic Press Briefing on Job Polarization and Rising Inequality. Jaison R. Abel and Richard Deitz. Federal Reserve Bank of New York. May 30, 2012.

<http://libertystreeteconomics.newyorkfed.org/2012/05/just-released-regional-press-briefing-on-job-polarization-and-rising-inequality.html>

Data Sources:

Census occupational data provided by the Federal Reserve Bank of New York.

Educational attainment data from the Census Bureau's American Community Survey, Public Use Microdata Sample, for 2009-2011.

Occupational data from the U.S. Bureau of Labor Statistics. http://www.bls.gov/oes/oes_dl.htm

Oregon's Occupational Projections data from the Oregon Employment Department. <http://www.qualityinfo.org/pubs/projections/projections.pdf>

Appendix A: Occupational Group Summaries

For a complete list of all occupations, please see the U.S. Bureau of Labor Statistics website:

http://www.bls.gov/soc/2010/soc_alph.htm

Management (SOC 11-0000): Chief Executives, Managers, Administrators and Directors of all industries and business types, Legislators

Business/Finance (SOC 13-0000): Accountants, Appraisers, Budget, Credit and Financial Analysts, Underwriters, Loan Officers, Tax Professionals, Buyers, Purchasing Agents, Claims Adjusters, Compliance Officers, Cost Estimators, Human Resources, Market Research

Computer/Math (SOC 15-0000): Computer Systems and Programmers, Software Developers, Database Administrators, Web Developers, Actuaries, Statisticians, Mathematical Technicians

Engineers/Architects (SOC 17-0000): Architects, Surveyors, Engineers, Drafters

Scientists/Social Scientists (SOC 19-0000): Food, Soil, Life, Medical, Materials and Physical Scientists, Zoologists, Foresters, Physicists, Chemists, Economists, Psychologists, Planners, Biological and Chemical Technicians, Research Assistants, Forensic Science

Community Service (SOC 21-0000): Counselors, Therapists, Social Workers, Treatment and Social Specialists, Clergy, Religious Workers

Legal (SOC 23-0000): Lawyers, Law Clerks, Judges, Adjudicators, Arbitrators, Paralegals, Court Reporters, Title Examiners, Legal Support Workers

Teachers (SOC 25-0000): Primary, Secondary and Postsecondary Teachers including Special Education, Archivists, Curators, Museum Technicians, Librarians, Teacher Assistants

Arts/Entertainment (SOC 27-0000): Art Directors, Craft, Fine and Multimedia Artists, Fashion, Floral, Graphic, Interior and Set Designers, Actors, Producers, Athletes, Coaches, Referees, Dancers, Choreographers, Radio and Television Announcers, Reporters, Editors, Writers, Interpreters, Broadcast Technicians, Photographers

Health Practitioners (SOC 29-0000): Chiropractors, Dentists, Pharmacists, Anesthesiologists, Practitioners, Psychiatrists, Surgeons, Physicians, Registered Nurses, Physical, Radiation and Respiratory Therapists, Veterinarians, Medical Laboratory Technicians, Dental Hygienists, Athletic Trainers

Health Support (SOC 31-000): Home Health, Nursing, Pharmacy and Psychiatric Aides, Physical Therapist, Massage, Dental, Medical and Veterinary Assistants

Protective Services (SOC 33-0000): Firefighters, Bailiffs, Correctional Officers, Detectives, Parking Enforcement, Police and Sheriff Officers, Animal Control, Security Guards, Lifeguards

Food Prep (SOC 35-0000): Chefs, Fast Food, Cafeteria and Restaurant Cooks, Bartenders, Counter Attendants, Waiters and Waitresses, Food Servers, Dishwashers

Bldg Maintenance (SOC 37-0000): Maids, Housekeeping, Building Cleaners, Pest Control, Landscaping, Groundskeeping, Pesticide Handlers, Tree Trimmers

Personal Care (SOC 39-0000): Gaming, Amusement, Recreation, Locker Room and Funeral Attendants, Barbers, Hairdressers, Manicurists, Skin Care, Concierges, Tour Guides, Flight Attendants, Child Care, Fitness Trainers

Sales (SOC 41-0000): Cashiers, Rental Clerks, Advertising, Insurance Sales, Financial Services Agents, Travel Agents, Sales Representatives, Models, Real Estate Brokers and Agents, Telemarketers

Office Support (SOC 43-0000): Bill and Account Collectors, Bookkeeping, Payroll, Procurement, Tellers, Customer Service Representatives, File, Hotel Desk, New Accounts, Office and Order Clerks, Receptionists, Couriers, Emergency Dispatchers, Meter Readers, Postal Service, Shipping, Receiving and Stock Clerks, Executive, Legal and Medical Secretaries, Data Entry

Farming (SOC 45-0000): Agricultural Inspectors, Graders, Sorters, Equipment Operators, Farmworkers, Laborers, Forest and Conservation, Fallers, Logging

Construction (SOC 47-0000): Brick and Stone Masons, Carpenters, Floor Layers, Tile Setters, Construction Laborers, Paving, Drywall, Electricians, Insulation, Painters, Plumbers, Roofers, Sheet Metal, Helpers, Building Inspectors, Highway Maintenance, Septic Tank Servicers

Installation/Repair (SOC 49-0000): Repair and/or Installation of Machines, Motors, Electronics, Automobiles, Glass, Boats, Tires, Security Systems, HVAC, Appliance, Bicycles, Watches and Telecommunications, Mechanics, Locksmiths

Production (SOC 51-0000): Inspectors, Testers, Sorters, Team Assemblers, Fabricators, Welders, Machinists, Electrical Equipment Assemblers, Cabinetmakers, Semiconductor Processors, Bakers, Laundry and Dry-Cleaning, Butchers, Water Treatment Plants, Sewing

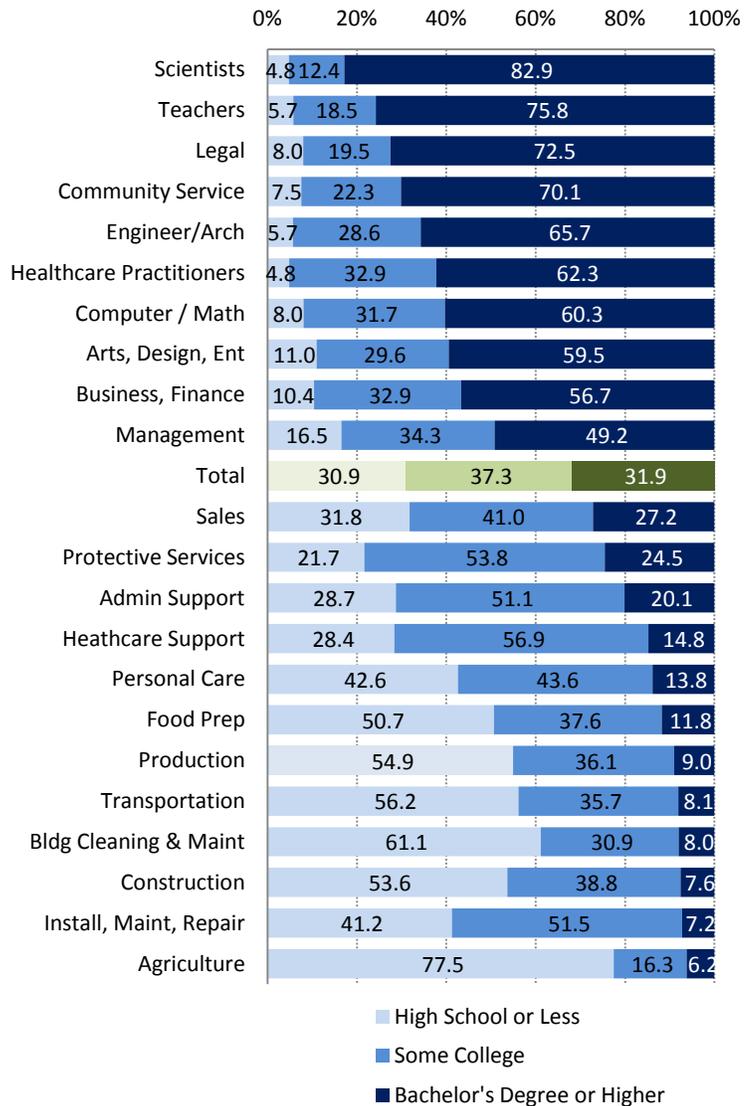
Transportation (SOC 53-0000): Truck Drivers, Taxis, Pilots, Air Traffic Controllers, Bus Drivers, Sailors, Parking Lot and Service Station Attendants, Freight, Stock and Material Laborers, Packers and Packagers, Refuse and Recyclable Collectors

Appendix B: Median Wages and Educational Attainment

Oregon Median Wage, 2012

High-wage Occupations	
Management	\$84,320
Healthcare Practitioners	\$73,950
Legal	\$72,930
Architecture & Engineering	\$72,060
Computer & Mathematical	\$71,220
Business & Finance	\$58,310
Scientists, including Social	\$55,370
Upper Middle-wage Occupations	
Construction	\$45,550
Teachers	\$44,250
Protective Service	\$43,780
Installation & Repair	\$43,710
Arts & Entertainment	\$41,800
Community Service	\$40,480
Lower Middle-wage Occupations	
Administrative Support	\$32,690
Production	\$32,530
Transportation	\$29,960
Healthcare Support	\$29,790
Sales	\$27,360
Low-wage Occupations	
Building Maintenance	\$23,750
Farming and Related	\$22,660
Personal Care	\$21,850
Food Preparation	\$19,970
Total	\$35,650

Educational Attainment by Occupation 2009-11 American Community Survey



Source: U.S. Bureau of Labor Statistics

Appendix C: Employment by Occupational Group, 1980-2010

	1980		1990		2000		2010		1980-2010			
	U.S.	Oregon	U.S.	Oregon	U.S.	Oregon	U.S.	Oregon	U.S. Level	%	Oregon Level	%
High-wage Occupations												
Legal	423,100	4,560	814,091	7,946	1,180,514	12,301	1,435,413	14,439	1,012,313	239%	9,879	217%
Computer & Mathematical	622,700	5,800	1,359,787	12,072	3,093,705	33,851	3,426,170	39,190	2,803,470	450%	33,390	576%
Architecture & Engineering	2,660,800	28,080	3,260,753	31,097	2,702,712	36,052	2,620,312	33,845	(40,488)	-2%	5,765	21%
Management	6,828,000	83,780	9,157,432	104,434	10,417,206	129,395	12,300,815	151,341	5,472,815	80%	67,561	81%
Scientists, including Social	667,100	8,700	901,626	11,408	987,442	13,722	992,485	14,467	325,385	49%	5,767	66%
Business & Finance	2,389,500	25,640	3,882,914	40,580	4,813,379	52,625	5,591,650	61,658	3,202,150	134%	36,018	140%
Healthcare Practitioners	2,975,800	33,340	4,394,491	47,300	5,383,270	58,945	6,933,865	76,162	3,958,065	133%	42,822	128%
Upper Middle-wage Occupations												
Installation & Repair	3,474,700	39,280	3,701,477	40,803	4,510,747	53,530	4,091,169	47,781	616,469	18%	8,501	22%
Protective Service	1,435,600	14,620	1,950,630	18,711	2,497,830	24,783	3,083,156	28,618	1,647,556	115%	13,998	96%
Teachers	4,458,800	52,640	5,434,987	64,651	7,558,371	91,079	9,127,694	108,634	4,668,894	105%	55,994	106%
Arts & Entertainment	806,300	9,640	1,281,808	16,730	1,798,166	24,332	1,901,271	25,561	1,094,971	136%	15,921	165%
Construction	3,797,800	42,380	4,151,863	41,685	4,723,603	59,453	4,402,518	42,986	604,718	16%	606	1%
Community Service	740,400	10,760	1,053,944	13,475	1,332,935	17,465	1,663,422	23,095	923,022	125%	12,335	115%
Lower Middle-wage Occupations												
Production	12,668,500	119,360	11,246,035	120,049	10,671,011	129,434	8,486,633	90,505	(4,181,867)	-33%	(28,855)	-24%
Administrative Support	16,000,000	174,400	18,100,000	188,494	19,995,120	236,312	19,765,290	231,006	3,765,290	24%	56,606	32%
Sales	8,295,800	105,100	11,800,000	134,449	12,992,499	163,906	14,352,421	174,533	6,056,621	73%	69,433	66%
Transportation	8,164,600	102,180	8,655,123	112,919	8,746,504	114,326	9,574,784	104,252	1,410,184	17%	2,072	2%
Healthcare Support	1,606,500	16,460	1,952,356	21,637	2,519,959	34,087	4,129,200	61,776	2,522,700	157%	45,316	275%
Low-wage Occupations												
Building Maintenance	1,904,000	23,480	2,158,078	22,950	1,975,985	25,048	2,594,655	27,262	690,655	36%	3,782	16%
Farming and Related	1,475,100	33,760	1,681,830	39,991	1,956,131	42,132	2,530,694	56,438	1,055,594	72%	22,678	67%
Personal Care	2,216,100	26,440	2,207,250	25,200	3,298,978	37,901	4,416,404	55,123	2,200,304	99%	28,683	108%
Food Preparation	3,906,100	56,520	4,625,327	63,029	5,596,826	75,024	7,559,162	100,068	3,653,062	94%	43,548	77%
Total	87,517,300	1,016,920	103,771,802	1,179,610	118,752,893	1,465,703	130,979,183	1,568,740	43,461,883	50%	551,820	54%

Source: U.S. Census Bureau, Federal Reserve Bank of New York