

Pierce County's Future of Work

Introduction

The topic of automation (e.g. the adoption of robotics, computerization, and algorithms in the workforce) is polarizing. Prognosticators generally split between hailing the technology as a roadmap to future prosperity and issuing strong warnings about a future without work ([ILO Lit Review](#)). The reality, however, is likely a blend of these two futures, varying by region and industry. What businesses choose to automate and how they adopt these technologies will influence the labor force and economy. Similarly, the scale and allocation of resources in response to changing labor demands will dictate the impact to workers and determine our region's capacity to capture new employment opportunities.

For better or worse, we are entering a period of significant change, known as the Fourth Industrial Revolution. This report endeavors to explore what this means for Pierce County - i.e. how emerging technology may shape the labor force, the opportunities for implementation, the distributions of risk, and collaborative solutions to ensure economic vitality for all.

Background

Almost every occupation has the potential for at least partial automation with the adoption of current demonstrated technologies ([McKinsey](#)). Additionally, the proportion of automatable tasks within each job is only increasing with technological advances. That aside, we are well below the hypothetical ceiling for automation, and our future adoption of autonomous technologies will be determined not by technological feasibility, but by more traditional economic drivers, such as:

Cost

While some occupations could be easily automated today, there might not always be a strong business case to reduce labor costs. The cost of maintenance can be high - the cost of upskilling or replacing labor for management and operation of automotive technologies can be comparable to the technology itself. However, because of the steady rise in the cost of labor and the advances in robotics and AI (factors rapidly driving down the cost of automation), the shift to machine-driven labor becomes more financially accessible every day.

Labor and Skill Availability

Scarcity of labor is often misinterpreted as a condition that means an occupation may be insulated from automation, however, a lack of labor can be a very strong motivator for employers to automate certain tasks and occupations. In the World Economic Forum's 2018 Future of Jobs Survey, 81% of employers stated that they are likely to look to automation as a strategy to address shifting skill needs ([WEF Report](#)).

Real-World Application

Anecdotally, we regularly hear that the promised productivity from robotics is overstated or heavily dependent upon environment. This is a significant hurdle, but the technology is clearly trending in a positive direction with AI improvements, more adaptive robotics, and expanding capacity to apply autonomous technologies in more uncertain environments.

Social Response

There has been limited pushback to date on automation in the workforce, though this may change if the adoption outpaces the creation of new labor opportunities in the region.

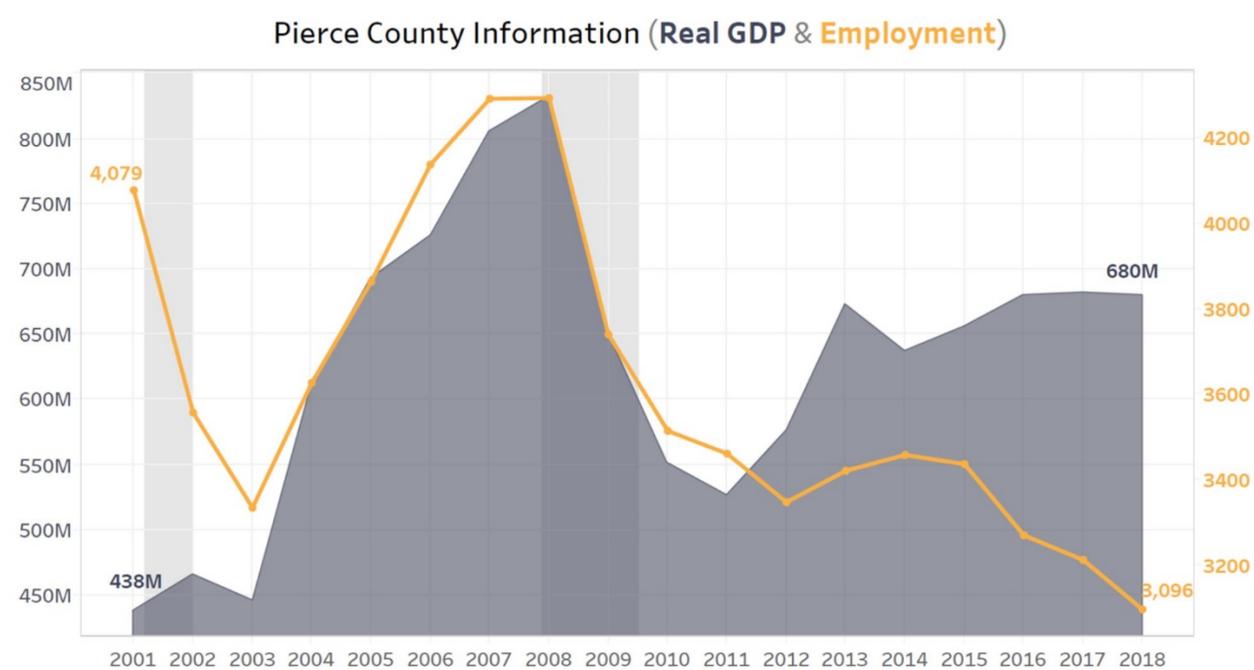
To understand the potential impact of automation, it's best to understand the many ways in which automation can impact an occupation and how the many tasks that make up a job are performed. While a robot arm might be the most iconic depiction of automation, the replacement of human labor - just as with bygone jobs like travel agents, switchboard operators, and bowling alley pinsetters - varies across industries, taking many forms. This type of automation is the most polemic and we can see many current examples of this shift in prominent occupations, e.g. Information and Record Clerks (11,029), Cashiers (7,600), Warehouse Workers (4,109), Team Assemblers (1,417), Meter Readers (58), etc. ([Bureau of Labor Statistics](#)).

In just as many ways, automation is being introduced to add value to occupations, improve safety, and expand how we think about our employment and the role of technology. Firefighters, for example, are now using drones to spot and assess fires earlier and leveraging IOT (internet-of-things) devices for safety monitoring in the line of work ([UW Tacoma](#)).

Robotic-assisted surgeries are now considered a common practice, yielding improved precision across a growing portfolio of procedures ([MultiCare](#)).

More ubiquitously, however, we see technology and computerization having an impact through the automation of certain tasks within occupations. This form of partial automation has the benefit of being ideally suited for routine intensive tasks, potentially freeing up workers to focus on the creative, social, and dynamic portions of their jobs.

Partial automation and expanded productivity, however, may still represent an indirect form of replacement. These little shifts have additive impacts across the workforce and, like all efficiency improvements, affect decisions about how businesses choose to grow. Take the Information sector: In Pierce County, we've seen a 27% drop in employment since 2001. But the real GDP (an inflation-adjusted proxy for production to estimate the value added per worker) has increased 36% over the same period. Similarly, manufacturing has seen a 20% drop in employment and a 10% increase in real GDP. This type of growth is occurring in several industries and is made possible through advances in technology. Efficiency and productivity have other impacts not captured by these measures: They can also lead to reductions in waste, improved performance, and increased quality of the goods and services produced. But the advances are rapidly shifting the distribution and needs for our labor force and represent a challenge for workforce development partners.



1 - Real GDP by Employments in Pierce County's Information Industries

The emergence of the “gig economy” may well reflect industries in transition.

Automation and computerization can also play a disruptive role without any immediate replacement. While more of a primer to automation than actual replacement, the computerization of several industries has led to significant swings that challenge the

traditional relationship between employees to employers. We see risks in the digital outsourcing of customer service support jobs (5,034) and shifts from taxi drivers (546) to rideshare services. The emergence of the “gig economy” may well reflect industries in transition. Freelancers, for example, appreciate the flexibility that comes with selecting employment opportunities, but often face unreliable demand, and lack traditional benefits like healthcare and retirement. The same technological advancements that allow independent work may also be undercutting their competitive “human” advantage. Data gathered by rideshare operators is used by companies in furtherance of improving autonomous driving while vendors on Amazon often face competition from the platform itself if they prove to be successful ([WSJ](#), [Forbes](#), [CNBC](#)). Additionally, some workers who benefit from the gig economy may be doing so at the expense of an increasingly displaced labor force, either directly (via competition in the cases of ridesharing platforms) or indirectly (through use of self-service management tools like AI-driven digital marketing, web design, IT, accounting, etc.).

One of the reasons there is so much fear and excitement surrounding this topic is because there is so much misinformation. Many figures in circulation, through repetition in increasingly legitimate sources of information, have become *de facto* evidence. One favorite stat holds that “65% of children entering primary school today will ultimately hold jobs that don’t yet exist.” [Here is an abridged history](#) of this figure. Our goal with this report is to highlight some of the potential opportunities and risks we see ahead, and most importantly, the need for a collaborative and informed response to a rapidly evolving workforce.

Analysis

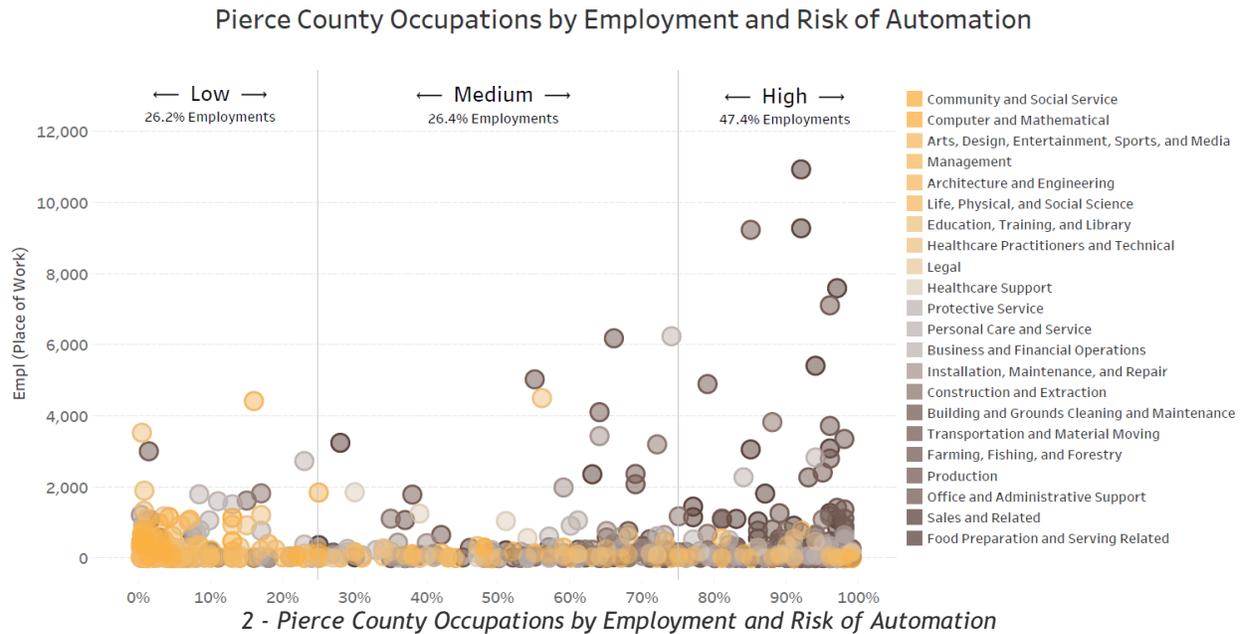
To understand how automation might impact jobs in our region, we rely on estimates of susceptibility produced by Frey and Osborne in their groundbreaking publication, *The Future of Employment* (2017). Their analysis of detailed U.S. occupations, modeled on BLS data and O*NET occupation characteristics, produced probability estimates for more than 700 occupations. These estimates were created without a timeframe, though the authors speculate that much of the advances would be possible within the next two decades. The authors made no attempt to estimate the number of jobs that will actually be automated.

Our analysis is based on a pairing of their probabilities with occupation distributions and characteristics for Pierce County, however, Frey and Osborne do not provide estimates for all jobs. Matched estimates cover about 86% of occupations in Pierce County, representing 90% of all employments. Furthermore, it is not our intent to defend or promote Frey and Osborne’s analysis. Their work presents the most robust and comprehensive attempt to estimate the probability of automation and computerization to date.

Distribution of Occupations

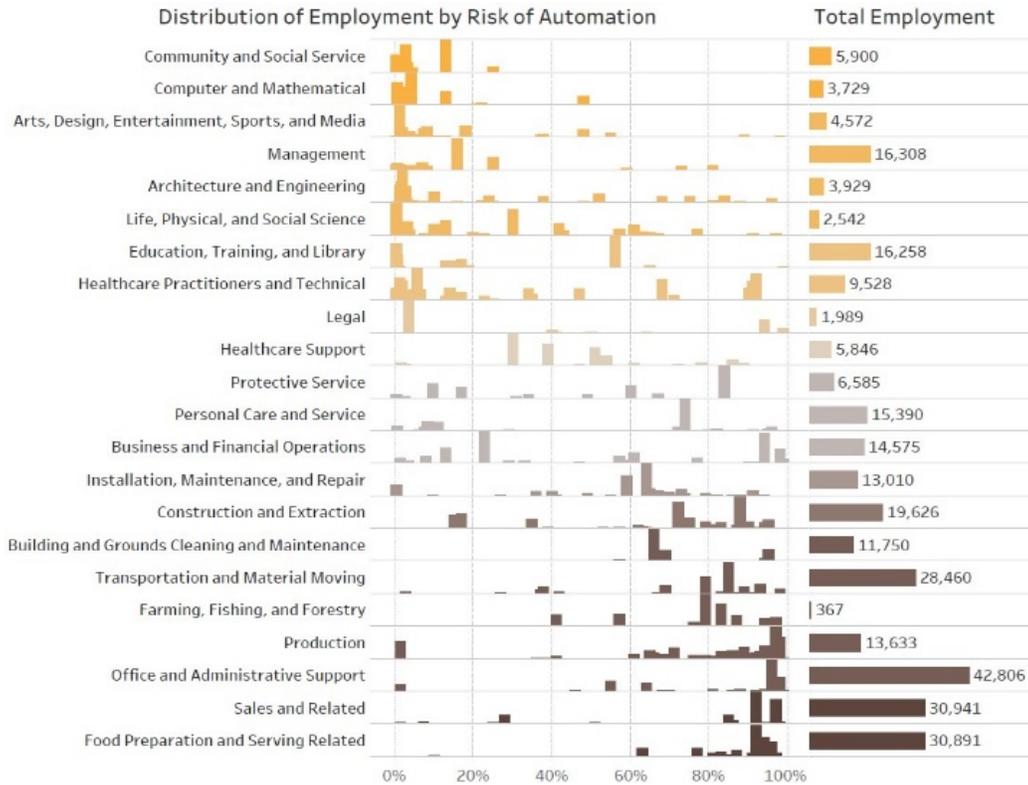
Below we can see the Pierce County jobs by their susceptibility to automation and computerization and clustered by major occupation group. The distribution below is very much in line with observations of the hollowing out of middle risk and middle-income jobs. In

Pierce County we see that 47% of occupations are estimated to be at a high risk of automation (141,682 occupations over 75%).



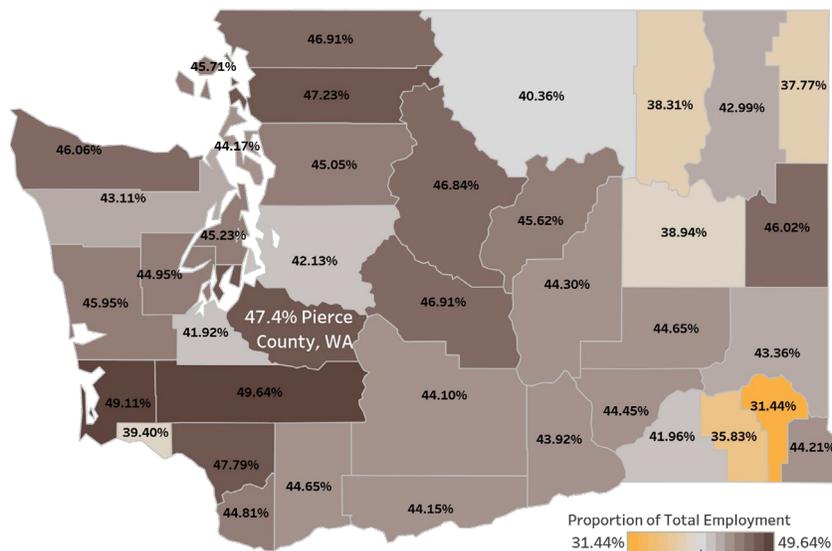
If we disaggregate the distribution of jobs by each major occupation group (below), we begin to see trends within occupation groups and large differences between groups. Within each occupation group, we generally see clusters where related jobs are more concentrated along the x-axis (susceptibility to automation). However, there are several groups with broad distributions of occupations - e.g. Healthcare Practitioners and Technical, Legal, Protective Services, and Business & Financial Operations. Those groups highlight opportunities (and possibly specific occupations or potential career paths) to transfer and upskill labor in response to changing needs.

In the visual below, we can also see total employments for each major occupation group. While there is generally a higher risk of susceptibility among larger employment groups, this association is not significant and is driven almost entirely by just a handful of occupations with high risk and high employment counts.



3 - Distribution of Employments by Occupation Group and Risk of Automation

Using the same methodology, we estimated the proportion of employments with at least a 75% susceptibility of automation for each county within the state. Eastern Washington appears to be somewhat more insulated from the effects based on the relative distributions of employment. In the Puget Sound region, Pierce County stands out as one of the most susceptible counties, especially in contrast to King and Thurston counties (47.4% vs 42%).

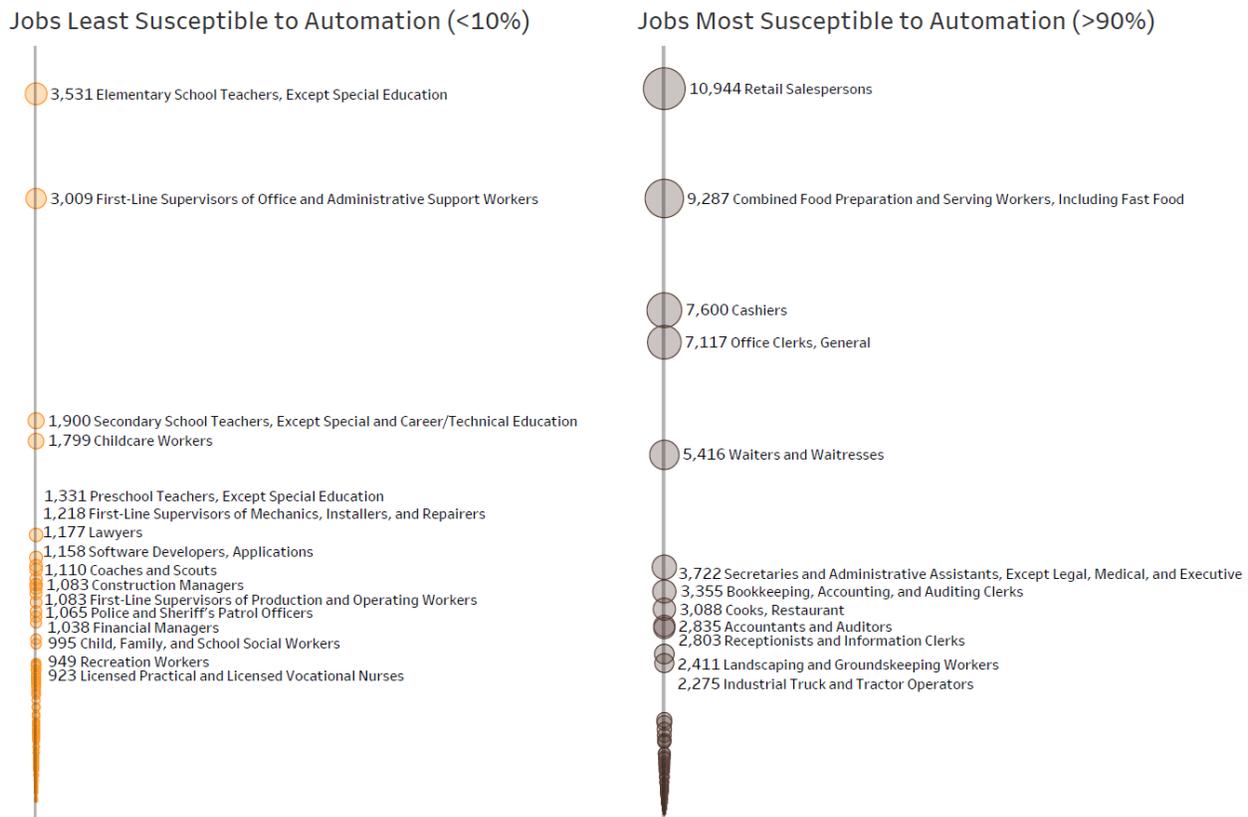


4 - Proportion of Employments with >75% Risk of Automation in the Future

Looking at occupation groups, this difference is in large part due to a higher concentration of Aerospace and Software jobs in King County, and a spread of higher-than-expected concentrations in conservation and environmental scientists and social workers in Thurston County.

Pierce County, in contrast, has fewer prominent* occupations with low risk scores. In other words, many of the occupations that are most prominent in Pierce County are at a higher risk of automation, especially when compared to occupations in Thurston and King County.

By occupation, we can see that several of the jobs most susceptible to automation (>90%) have a high overall share of employments. Four of Pierce County's top six occupations fall in this group: Retail Salespersons (10,944); Combined Food Prep & Serving Workers Including Fast food (9,287); Cashiers (7,600); and Office Clerks, General (7,117).



5 - The Most and Least Susceptible Jobs in Pierce County

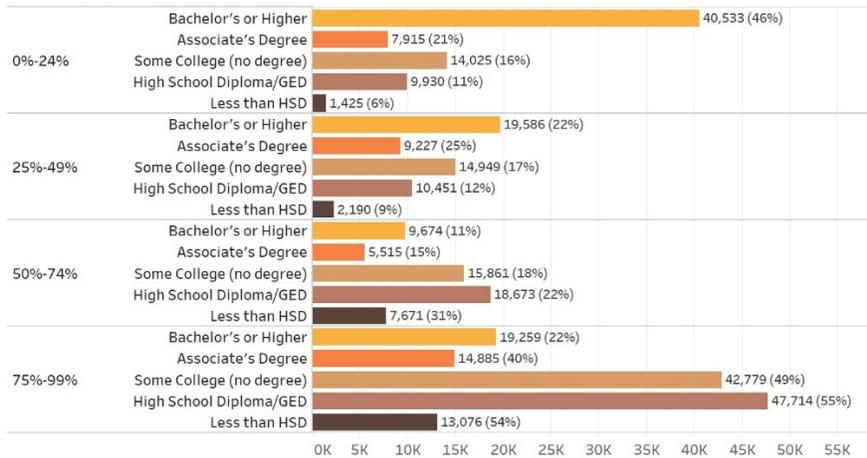
**Prominent occupations are those with a high location quotient, meaning they have a high proportion of all employments within an occupation for the region, relative to the U.S.*

Education

As one of the strongest determinants of employment and an important lever for workforce planning, education plays a significant role in this space. Pierce County is unique in its share of post-secondary institutions: With eight colleges and universities, the region is equipped with the infrastructure to train and upskill workers to meet almost any emerging labor need. This is especially important given that occupations held by residents with a bachelor's degree or higher are especially insulated from the risk of automation.

Conversely, over half of the occupations held by residents without a high school diploma are at high risk (13,076 occupations in the 75% to 99% range). Similarly, residents with a high school diploma or some college but no degree are much more likely to be in high-risk occupations.

Employment Distribution by Education Attainment and Risk of Automation



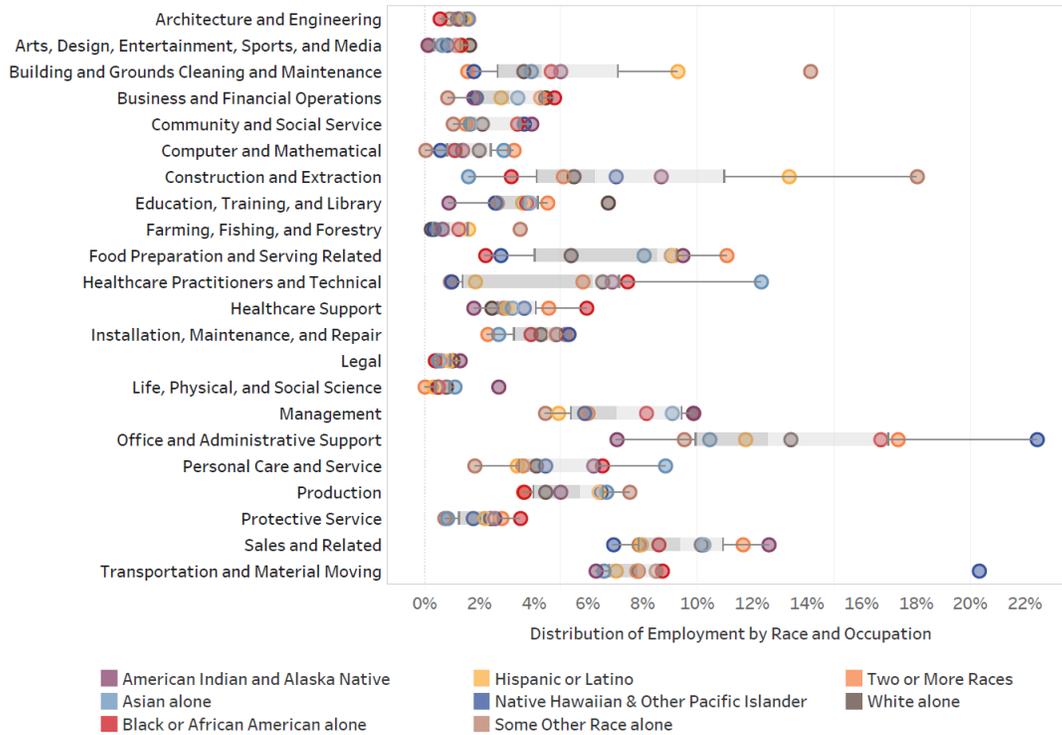
6 - Distribution of Employments by Education Attainment and Risk of Automation

More surprising is the lack of security seen among residents with a high school diploma or even some college. Combined, just 27% are at low risk of automation. And, while having a four-year degree has many advantages, it is not a guarantee of future demand: We see that 33% of all jobs held by workers with a four-year degree have at least a 50% chance of automation in the future.

As a strategy for upskilling a labor force and providing access to gainful employment, we need a much better understanding of the role of education and the career pathways that make such an investment worthwhile for future workers. The jobs created via automation and computerization will also continue to shape the demand for certain occupations and skills. It's important that education, employers, and workforce development partners work together to identify new labor needs as they emerge and support education and training pipelines for these opportunities.

Demographic

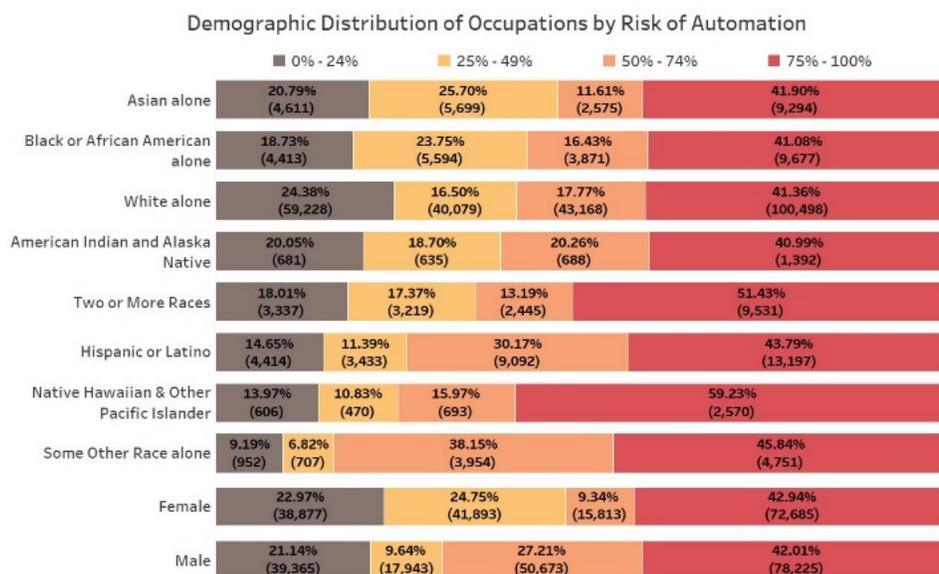
The susceptibility to automation is not an equally distributed risk. To better understand the degree of disproportionality, we first modeled the employment distribution by race and ethnicity. Using Public Use Microdata Samples from the 2017 American Community Survey, we are able to estimate a distribution of employments for each race across major occupation groups.



7 - Concentration of Employments by Race & Ethnicity and Occupation Groups

We found large variations in share of employments by race and occupation. Workers who identified as *Some Other Race Alone* represent 18% of all Construction and Extraction employments, nearly three times the median share of all groups. Similarly, we find examples of over- and under-representation in almost every broad occupation group.

To see if these occupation-level disparities translated to differences in susceptibility of automation, we aggregated the share of employment by demographic group and ranges of susceptibility.



8 - Distribution of Employments by Demographic Group and Risk of Automation

Native Hawaiian & Other Pacific Islander residents and those identifying as *Two or More Races* have the greatest concentration in high-risk occupations (59% and 51%, respectively). The variations we see here are the product of differences in representation within each occupation group. For example, because residents surveyed as *Some Other Race* or *Hispanic or Latino* had a significantly higher presence in Construction and Extraction occupations and because those occupations are associated with a higher level of susceptibility, their overall risk when aggregated is higher than other groups.

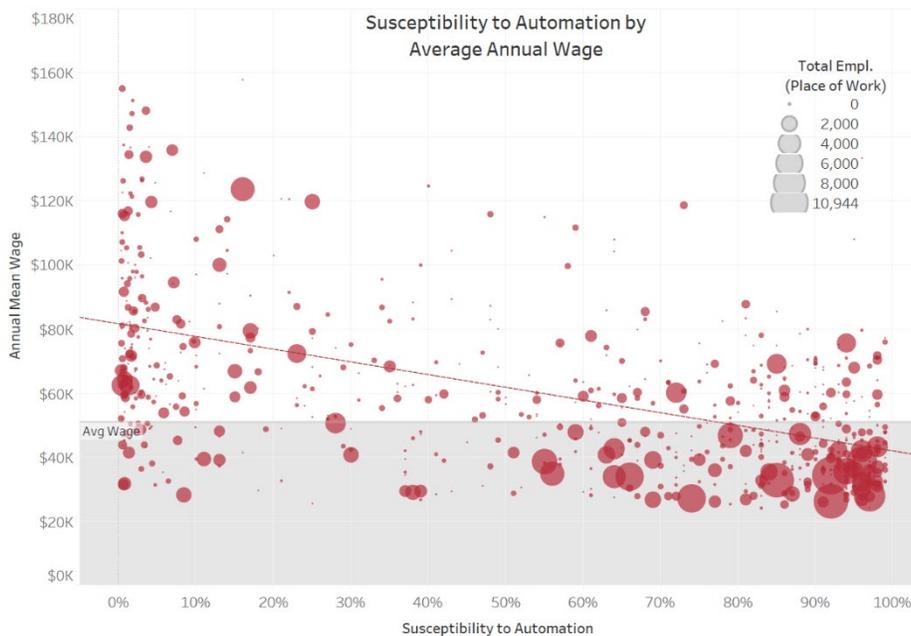
Similarly, *White Alone* workers have the highest concentration of low-risk employment due to over-representation in Management and Education, Training and Library occupations. Simply, there are significant differences in representation within occupation groups that translate to differences in the overall risk borne by each demographic group.

It's important that employers consider the potentially disparate impacts of automation by race, ethnicity and gender when making decisions that affect existing labor. It also re-enforces the need for full demographic representation within pipelines and programs to emerging occupations. While much has been gained in representation in STEM and high-demand programs, the state reports that under-representation remains a significant problem for women and students from low-income families ([WA STEM Report](#)).

Socioeconomic

Lastly, we considered the socio-economic differences, modeling the association between average annual wages and susceptibility. We found that wages for Pierce County occupations are very strongly associated with the occupation's susceptibility. We see this most strongly at the extremes: 88% of Pierce County workers in highly susceptible occupations (>90%) make less than the average annual wage, whereas 81% of Pierce County workers in jobs that are at low risk of automation (<10%) make *more* than the average annual wage.

Put another way, every 10% decrease in susceptibility is associated with an average gain of \$4,000 in annual wages.

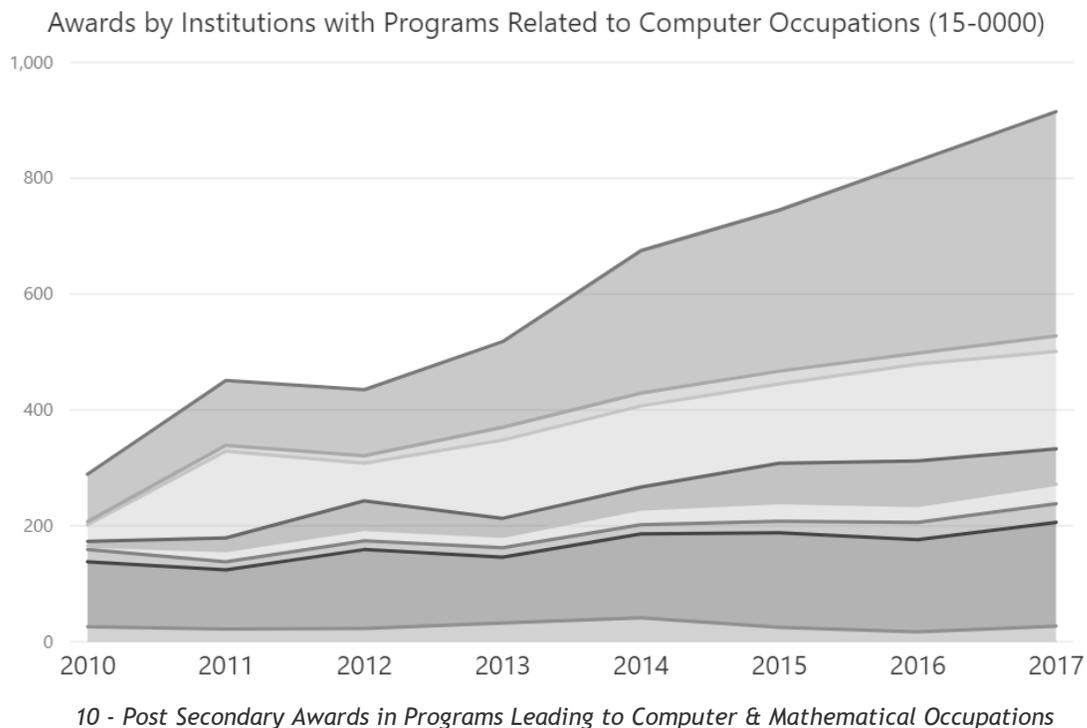


9 - Risk of Automation by Average Annual Wage

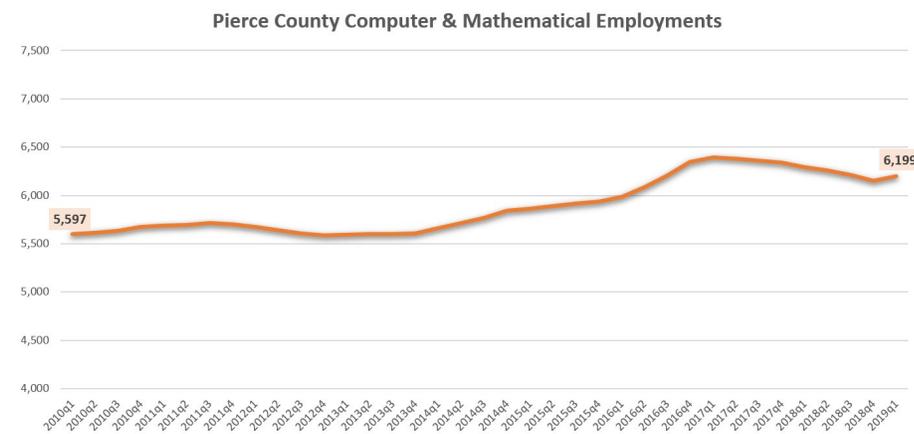
This confirms the unfortunate trend that low-paid workers are likely to be disproportionately affected by automation, but it also highlights an opportunity: Upskilling workers to more secure occupations is likely to also have the benefit of transitioning those workers to higher income jobs.

The Rub

Clover Park Technical College recently launched a two-year mechatronics degree and several certificates (a hybrid between computer, electrical and mechanical engineering programs) to meet emerging labor needs. Employer partnerships enable students to develop autonomous technical solutions to real-world challenges. Similarly, University of Washington-Tacoma's School of Engineering & Technology is rapidly expanding programs and partnerships in several sectors. Overall, postsecondary programs have dramatically shifted the number of awards in these related programs, a three-fold increase in the last seven years ([NCES](#), [Data](#)). The interest and response in higher education has been astounding.



In the same period the number of actual jobs in these fields has only inched forward compared to other regions. There is demand for these graduates - Seattle saw 47% growth over the same period, and nationally the sector expanded 22%.



11 - Pierce County Employments among Computer and Mathematical Occupations

The challenge confronting our region is not necessarily the lack of talent for the types of jobs associated with automation and computerization, nor do we have any apparent dearth of pipelines to these careers, nor do we lack models of education or employer partnerships. Our barrier is a lack of *demand* for these jobs regionally.

This example highlights one of the greatest challenges of automation for regions poorly positioned to leverage the returns: While new employments will emerge across multiple sectors - potentially as many or even more than those lost - there is no evidence that new jobs will be distributed to the same regions or among the same demographic groups displaced. Our region's ability to mitigate the impact of the transition while capturing and retaining emerging employments will be the primary determinant of our future workforce opportunities.

Potential Solutions and Opportunities:

Our analysis and position in workforce development drives many of the recommendations below, however, this is not a complete list nor is this a guide for implementing solutions. For these reasons, our first and strongest recommendation is to establish a regional task force to help guide workforce and economic development in response to shifts from automation, continue to monitor and explore this topic, and work with partners to make collective and impactful recommendations that lead to action and measurable change.

Out of this analysis we have identified several opportunities for employers, organized labor, educators, economic development stakeholders and workforce development partners to support Pierce County through a rapidly-changing economy.

Improved use of the existing labor force

In Pierce County, 31% of residents with a bachelor's degree or higher are considered underemployed and tens of thousands of workers commute to neighboring counties each day. Employers and economic development partners should prioritize efforts that utilize these labor pools to meet emerging skill gaps.

Promoting access to employment opportunities and digital upskilling resources

Encouraging high-speed broadband internet access throughout the county.

Employer-directed training

Increased employer engagement and participation in workforce training. Skill gaps are often the single greatest challenge for employers in Pierce County. Employers would benefit directly from taking a more active role in workforce education and training priorities, helping ensure that resources are directed where needed, with learning opportunities that better address the needs of the workforce.

Increased focus on emerging and high-demand occupations

Prioritize career pipelines and retraining/upskilling efforts to high-demand occupations with minimal automation risk.

Regularly re-evaluate existing pipelines and workforce development efforts to ensure that resources are aligned with projected labor needs.

Support a talent development pipeline and lifelong learning structure, from K-12 through retirement, for all workers and industries.

Train incumbent workers (reskilling existing labor is cheaper than hiring skill replacements).

Ensuring demographic representation in all education and pipeline programs

Full demographic representation within pathways to emerging occupations is critical to ensure that economic disruptions don't further disparately impact historically under-represented populations.

Encourage employers to invest in workers

Expand business tax credits to offset the cost of training activities for non-highly compensated employees.

Up Next:

This report is a point-in-time snapshot exploring some of the emerging trends and potential risks ahead. While information is far from complete and the future is murky at best, waiting for certainty would mean inaction and a retrospective reflection.

Pierce County leaders should be proactive and work collaboratively to understand the regional impacts as they emerge and make informed recommendations that support the economic future for all. We propose the establishment of a task force comprised of partners from education, organized labor, businesses, community-based organizations, economic and workforce development, and local elected officials.

This collaboration should be tasked with ongoing oversight of the regional impacts, risks, and opportunities of automation. It should also work to identify and implement solutions that capture emerging employment opportunities and mitigate labor loss and disparate outcomes.



Partnering in pursuit of greater economic vitality for all

References & Methodology

All analysis, data, and preparation steps are publicly available via [Github](#).

Data visualizations and extracts are available to view and download via [Tableau Public](#).