MINNESOTA ECONOMIC

TRENDS

AUTOMATION ON THE RISE

THE KEY IS TO STAY RELEVANT

DECEMBER 2018

EMPLOYMENT AND ECONOMIC DEVELOPMENT

Automation's Impact

With near-record low unemployment rates, 2.8 percent in October, and a slow-growing labor force, Luke Greiner examines the role of automation in maintaining Minnesota's global position using the Information Technology & Innovation Foundation's index of at risk occupations.

The theme of job-destroying technologies bringing ruin to laborers, as a purported exchange between Queen Elizabeth I and William Lee, the inventor of the knitting machine, indicates, has always been with us. Based on Luke's analysis, Minnesota has a smaller relative concentration of occupations that are most at-risk to be impacted by automation compared to the nation.

No matter how automation continues to change the face of work for Minnesotans, lifelong learning is the key to staying relevant in the workplace.

Signs of Minnesota's tight job market continue to pile on. In addition to the headline unemployment rate (official or U-3), Dave Senf looks at other measures of labor underutilization – known as U-4, U-5, and U-6 – to determine whether part-time workers can move from the ranks of underemployed into full-time jobs. All these measures of Minnesota unemployment spiked during the Great Recession, and now they're the lowest on record. Look for this to become the new normal.

Sanjukta Chaudhuri writes that gender and race/ethnicity-based earnings gaps persist even after accounting for field of study and choice of occupation.

Finally, it's the end of an era for the Dayton administration. Steve Hine, Research Director, assesses Minnesota's employment conditions over the past eight years and compares them to previous administrations. It's a good reminder that administrations, no matter what political party, have limited influence over cyclical economic trends. Read his wrap-up to find out what the economies under the Perpich, Carlson and Dayton administrations have in common. Let's just say he likes what he sees.

Carol Walsh

Carol Walsh
Editor

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Luke Greiner

The Impact of Automation on Minnesota's Labor Market

Minnesota has a smaller concentration of occupations most at risk compared to the U.S. – and that's good news. But workers still need to keep up.

With near-record low unemployment rates and a labor force growing much slower than in the past, could automation be the boost Minnesota needs to maintain its global economic position?

At odds with that view and our current labor force situation, is the notion that new technologies will destroy so many jobs that our labor market will be systematically dismantled by robots. Many discussions about the future of work result in conclusions that are not only far-fetched, but unhelpful.

This article leverages the Information Technology & Innovation Foundation[1] (ITIF) analysis of occupations and its index of how 'at risk' each occupation is of being impacted by automation. With an increasing amount of research on this topic, analyses range from hardly concerning to widespread unemployment.[2] The ITIF analysis is a plausible, middle-of-the-road assessment of how technology will impact different occupations.

The ITIF analysis relies on Bureau of Labor Statistics employment projections in conjunction with its own analysis

[1]Accessed on 11/1/18: www.itif.org/about?_ga=2.33800673.192508287.1541090489-1674041133.1538508155

[2]Oxford study predicting 47% of jobs can be destroyed in the next 20 years, www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

[3]Unfortunately, Technology Will Not Eliminate Many Jobs, accessed 11/1/18, https://itif.org/publications/2017/08/07/unfortunately-technology-will-not-eliminate-many-jobs

of 840 occupations, and assigns a risk level to each on a scale of 1 to 5.[3] Merging the ITIF occupational risk indicator with other data produced by DEED, including employment, wages, educational requirements, and employment projections, provides a reasonable perspective on how technology will impact Minnesota's labor market.

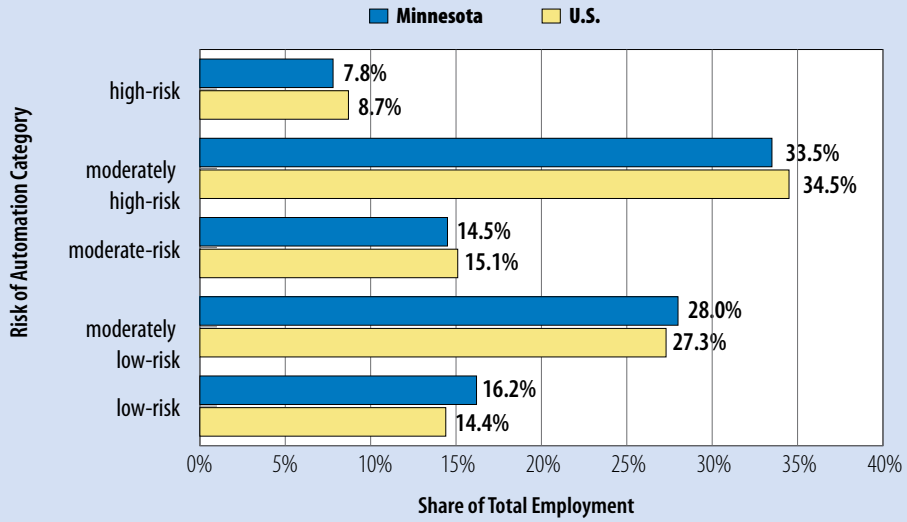
Fears of technology's impact on work and jobs can be traced back at least to the 16th century when Queen Elizabeth I denied William Lee a patent on his knitting machine: "Thou aimest high, Master Lee. Consider thou what the invention could do to my poor subjects. It would assuredly bring to them ruin by depriving them of employment, thus making them beggars."[4]

What Are the Possibilities?

The ITIF's risk index covers virtually every occupation recognized by official employment data. Using this index, Minnesota has a smaller relative concentration of occupations most at risk to be impacted by automation compared to the nation. Using the most recent employment data, 7.8 percent of jobs in Minnesota have a high risk of being automated, more than a full percentage point less than the U.S. share. The moderately high-risk category contains the largest share of jobs in Minnesota (33.5 percent of employment), followed by moderately low-risk (28 percent of employment). Worth noting is that there are more than twice as many jobs in occupations with the lowest risk of automation compared to the highest-risk category. Only 44 occupations fall into the high-risk category, according to ITIF, but combined they total 213,290 jobs (Figure 1).

Even for occupations identified as high-risk or moderately high-risk, it is unlikely that employment in entire occupations will be eliminated; instead, many of these occupations will be augmented by technology to increase productivity.

Figure 1. Share of Employment by Risk of Automation



Source: DEED OES and ITIF Risk Categories

[4] Why Nations Fail, Chapter 7, pg. 182 http://norayr.am/collections/books/Why-Nations-Fail-Daron-Acemoglu.pdf

Pride Solutions in Hutchinson took on a project to automate their CNC with a collaborative robot. This machine operator learned to program the Universal Robot during the project. Credit: Pride Solutions, Hutchinson, MN

Are Robots Coming for My Job?

Table 1 looks at occupations with at least 1,000 jobs in the highest-risk category. Twenty-six occupations meet these criteria, with a combined employment of more than 207,000 jobs across Minnesota. These occupations account for 97 percent of employment categorized as high risk. The two largest occupations, cashiers and customer service representatives, account for 60 percent of the jobs identified as high risk to be automated. It's highly unlikely that every cashier or customer service representative job can, or will, be automated. There is already a high level of automation in these occupations, as a visit to your local big box store or a call to your cell phone service provider will confirm.

As illustrated in Figure 1, Minnesota has fewer jobs at high risk of being automated. The location quotient (LQ) column (Table 1) describes Minnesota's concentration of employment relative to the U.S. An LQ value over one means employment in that occupation is more concentrated in Minnesota, while an LQ value of less than one indicates less concentration in Minnesota. The most overrepresented occupations at high risk for automation in Minnesota are brokerage clerks; credit analysts; and reservation, ticket, and travel agents. Other occupations with an LQ greater than one are in boldface.

The following link shows the estimated risk of automation for all occupations in Minnesota based on the ITIF analysis (https://public.tableau.com/profile/magda.olson#!/vizhome/Greiner_Automation/Story1).

Just over 11,400 jobs in four occupations have a median hourly wage of $25 per hour or more. In contrast, there are nine occupations with median wages less than $15 per hour with combined employment over 97,000 in the high-risk category. The vast majority of occupations with the highest risk of being impacted by automation typically require a high school diploma/GED or less for entry into the occupation.

According to the ITIF's risk index, 96 percent of the jobs in occupations considered high-risk for automation have low educational requirements – a high school diploma or less. This group represents 7.5 percent of all jobs in Minnesota. Only 0.2 percent of jobs deemed high risk require a vocational degree, and 0.1 percent of jobs require a bachelor's degree. No occupations requiring a graduate degree were categorized as high risk.

However, higher education requirements do not necessarily

Table 1. Minnesota Occupations With Highest Risk of Automation and Employment Over 1,000

SOC Code	Occupational Title	Location Quotient	Employment	Median Wage	Minimum Education Typically Required
0	Total, All Occupations	1.0	2,838,270	$20.07	
412011	Cashiers	0.9	66,230	$10.78	High School or Less
434051	Customer Service Representatives	1.0	57,240	$18.11	High School or Less
537051	Industrial Truck and Tractor Operators	0.8	8,630	$19.25	High School or Less
433071	Tellers	0.8	8,280	$13.45	High School or Less
359021	Dishwashers	0.7	6,940	$10.91	High School or Less
433021	Billing and Posting Clerks and Machine Operators	0.7	6,660	$19.59	High School or Less
434181	**Reservation, Transportation Ticket Agents, Travel Clerks**	**1.9**	**5,470**	**$25.75**	**High School or Less**
513022	**Meat, Poultry, and Fish Cutters and Trimmers**	**1.3**	**4,100**	**$14.25**	**High School or Less**
292071	Medical Records and Health Information Technicians	1.0	4,010	$22.69	Vocational Training
533041	Taxi Drivers and Chauffeurs	0.8	3,210	$13.27	High School or Less
434031	**Court, Municipal, and License Clerks**	**1.2**	**3,140**	**$21.47**	**High School or Less**
132041	**Credit Analysts**	**2.1**	**3,060**	**$36.35**	**Bachelor's Degree**
439021	Data Entry Keyers	0.8	3,020	$16.41	High School or Less
433051	Payroll and Timekeeping Clerks	1.0	2,920	$23.05	High School or Less
434011	**Brokerage Clerks**	**2.4**	**2,820**	**$23.12**	**High School or Less**
393031	**Ushers, Lobby Attendants, and Ticket Takers**	**1.1**	**2,820**	**$11.05**	**High School or Less**
519121	**Coating, Painting, and Spraying Machine Operators**	**1.5**	**2,660**	**$19.26**	**High School or Less**
536031	**Service Station Attendants**	**1.1**	**2,520**	**$12.53**	**High School or Less**
493021	Automotive Body and Related Repairers	0.8	2,310	$21.52	High School or Less
434199	Information and Record Clerks, All Other	0.7	2,260	$21.07	High School or Less
536021	Parking Lot Attendants	0.8	2,200	$11.52	High School or Less
434071	File Clerks	0.7	1,540	$15.78	High School or Less
273091	**Interpreters and Translators**	**1.4**	**1,470**	**$25.30**	**High School or Less**
232093	**Title Examiners, Abstractors, and Searchers**	**1.3**	**1,410**	**$26.95**	**High School or Less**
319094	Medical Transcriptionists	0.9	1,050	$21.25	Vocational Training
435021	Couriers and Messengers	0.7	1,050	$13.22	High School or Less

Source: DEED OES, Educational Requirements and ITIF Risk Categories

mean low risk of automation, with the correlation between education and risk somewhat weak. In the lowest risk category there is actually more employment in occupations that can be attained with a high school diploma or less than those requiring a graduate degree. In the moderately low-risk category, occupations that require a high school diploma or less account for 12.7 percent of all jobs in the state, almost double the number of jobs in the same risk category that require a bachelor's degree (Figure 2).

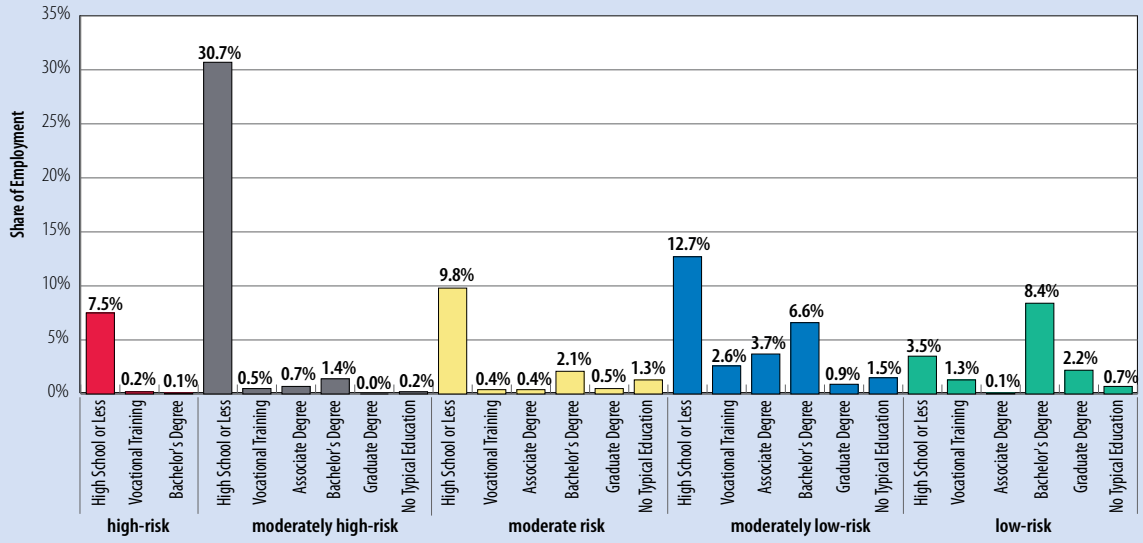
To be sure, more than twice as many occupations in the low-risk category require a graduate degree compared to a high school diploma or less, but employment in occupations requiring just a high school diploma is 60 percent greater than those requiring a graduate degree.

Even occupations in the low-risk category are likely to see technological advances that increase productivity. For instance, there are a large number of teaching occupations in the low-risk category. While the teaching occupation is unlikely to disappear, technology is increasing the capacity and decreasing costs as seen with massive open online courses, or MOOCs (Figure 2).

Planning for the Future

DEED's most recent employment projections (2016-2026) project an overall employment growth rate of 5.8 percent in Minnesota. Employment growth for each risk category is highly correlated to long-term occupational growth rates in Minnesota, with the fastest growth (13.6 percent) occurring for occupations in the low-risk category; high-risk occupations have the slowest growth of less than 1 percent. This is not merely a coincidence. DEED's employment projections utilize the BLS projection methodology that includes technological

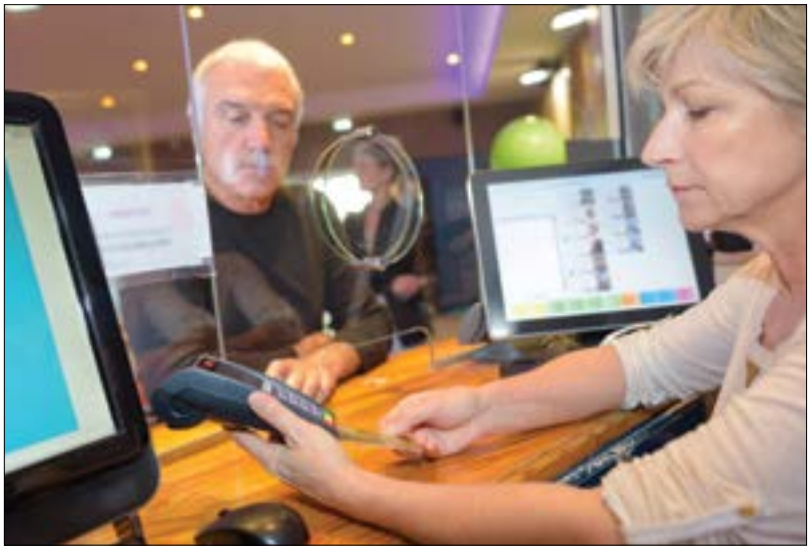
Figure 2. Minnesota's Share of Employment by Risk of Automation and Educational Requirement



Source: DEED OES, Educational Requirements and ITIF Risk Categories

innovation, changes in business practices or production methods, replacement of one product or service by another, organizational restructuring of work, offshoring and domestic outsourcing, and many others (Figure 3).

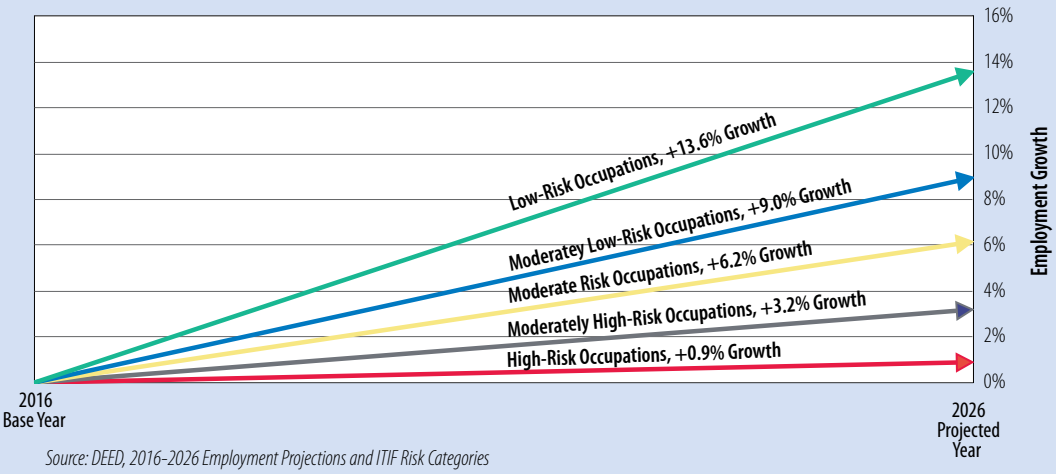
Although employment growth in Minnesota is projected to be almost 6 percent, between 2015 and 2025, labor force growth is projected to be an anemic 1.9 percent. To put that in perspective, the labor force grew by 5.4 percent in the 10-year period ending in 2017. Considering labor force constraints, Minnesota is more likely to benefit from automation now than ever before. Aligning workforce and educational programs with



current occupational demand and projected employment growth is one strategy to help keep Minnesota growing.

Regardless of future technological changes, if the ITIF index is any indicator, the importance of lifelong learning is, and will continue to be, essential to remaining relevant and valuable in the workforce.

Figure 3. Projected Employment Growth by Risk Category, 2016-2026



Source: DEED, 2016-2026 Employment Projections and ITIF Risk Categories

Sanjukta Chaudhuri

College Major, Occupational Pathways, and Labor Force Outcomes by Gender and Race/Ethnicity

Gender and race/ethnicity-based earnings gaps exist even after accounting for field of study and choice of occupation.

Obtaining a post-secondary degree tends to lead to better labor market outcomes, including higher income. In Minnesota, median earnings of high school graduates working full-time are $36,000. This increases to $45,000 for associate degree holders, $58,000 for bachelor's degree holders, and $72,000 for those with five or more years of college. Clearly, on average, post-secondary education increases earnings.

It is not just the degree that matters, however. Field of study is an important factor determining eventual labor market outcomes. According to the American Community Survey, undergraduate degree holders who majored in computer science earn a median salary of $86,000, while graduates of nursing programs earn $73,000, and graduates of early childhood education programs earn $41,000 annually.

Moreover, some programs of study, like nursing, train for very specific occupations while others are not so closely aligned to specific occupations. For example, economics majors find themselves in a variety of occupations, including management, finance, marketing and sales, management analysts, and computer and information research scientists. In this major as well as many others, both occupational choice and educational choice make a difference to lifelong earnings.

In addition to degree level, field of study, and occupation, other factors are associated with earnings. These include gender, race, ethnicity, and immigration status. This article uses ACS one-year microdata from 2012 to 2016 to examine the association between field of study at the bachelor's level and occupation and earnings by gender and race/ethnicity in Minnesota.

Choice of Field of Study

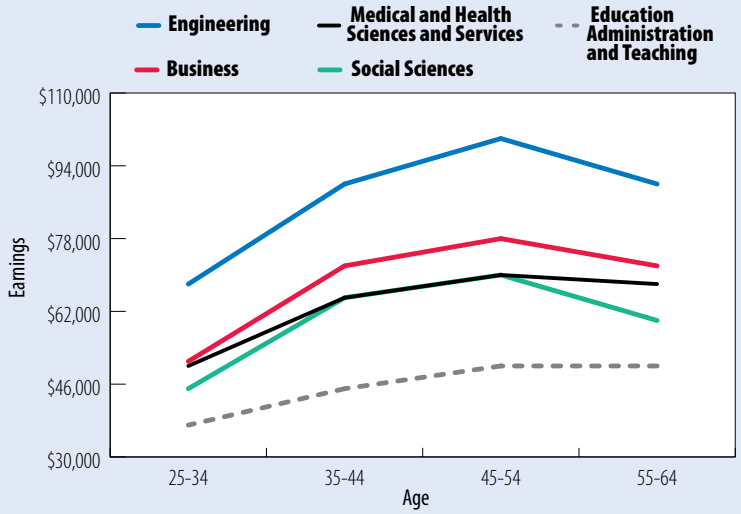
At the bachelor's degree level, almost a quarter (24.2 percent) of Minnesotans graduated with a business major as their first field of study, making this the most popular general field of study. Business is followed by education administration and teaching (13.2 percent); medical and health sciences and services (7.4 percent); social sciences (6.4 percent), and engineering (6.3 percent). Together, the top five general fields of study explain 57.5 percent of bachelor's degree holders' field of study. At the detailed level, 26 percent of bachelor's degree holders fall into five detailed fields of study: business management and administration (7.3 percent), elementary education (5.2

percent), general business (4.8 percent), nursing (4.7 percent), and accounting (4.3 percent).

There are similarities and differences in field of study by gender. While business, social science, and education administration and teaching are integrated and popular among both men and women, some fields of study are segregated. For example, men tend to favor engineering and computer and information sciences; women favor medical and health sciences and services, and communications. By detailed field of study, accounting and business management and administration both fall into the top five for both men and women. However, men are more likely to choose general business, computer science, and finance, while women are more likely to choose elementary education, nursing, and psychology.

Overall, the choices of fields of study are quite similar between whites and minorities. Both whites and minorities choose business, medical and health sciences and services, social sciences, and engineering. While whites favor education administration and teaching, minorities favor computer and information sciences. At the detailed level, both whites and minorities opt for business management and administration, general business, nursing, and accounting. Whites are more likely to choose elementary education; minorities are more likely to choose computer science.

Figure 1. Age-Earnings Profiles, 25-64 Year-Olds, by Most Popular General Fields of Study, Minnesota, 2012-2016



Source: American Community Survey, one-year sample, 2012 to 2016

Earnings by Field of Study

Predictably, earnings vary by field of study. Figure 1 shows that among the five most popular majors, engineering graduates, ages 25 to 64, earn $84,000 at the median. This is followed by computer and information sciences majors at $80,000, business majors at $65,000, medical and health sciences and services at $62,000, and education administration and teaching majors at $42,000.

These earnings gaps by college major remain stable as workers age. Figure 1 shows the age-earnings profile for four age categories by the five most popular general fields of study. The profiles clearly show that engineering majors are at the top throughout their careers, followed by business, medical and health sciences and services, social sciences, and education administration and teaching majors.

By detailed field of study, accounting and general business majors come out on top with annual median earnings of $70,000 each, followed by

nursing at $65,000, business management and administration at $60,000 and elementary education at $40,000. The earnings profiles by age show the same pattern.

Earnings Gaps by Gender and Race/ Ethnicity Within Field of Study

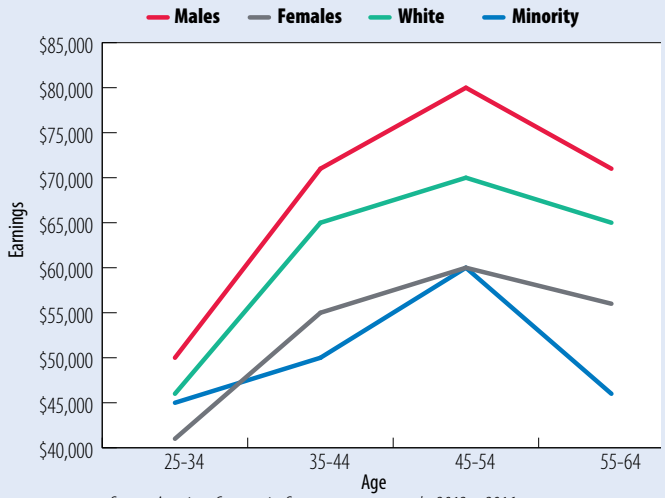
Median annual earnings are stratified not just by field of study, but also by gender and race/ethnicity. Among bachelor's degree holders only, median earnings are stratified such that males earn more than females, and whites earn more than minorities (Figure 2).

When examined by general field of study, men earn more than women even when they graduate with the same field of study as their college major. Among business, social sciences, and education administration and teaching majors, barring a few exceptions, men invariably earn more than women at the median and also over the age-earnings profile. Even in majors that are more popular among women, such as communications and medical and health sciences and services, men earn more than women. Finally, for majors that are more popular among men, such as engineering and computer and information sciences, men still earn more than women.

Among detailed field of study, men earn more than women at the median with the exception of nursing. The age earnings profiles are also fairly consistent, with women earning less across the four age cohorts examined. Women almost always earn less than men with the same college major.

In terms of race, whites usually earn more than minorities, with a few exceptions (Figure 3). At the high end, in accounting and general business majors, the median annual earnings gap between whites and minorities is $30,000. At the low end, in nursing, the earnings gap between whites and minorities is $6,000. This pattern holds by age.

Figure 2. Median Earnings Profile by Age for Bachelor's Degree Holders, Minnesota, 2012 to 2016



Source: American Community Survey, one-year sample, 2012 to 2016

Earnings Gaps by Field of Study and Occupation

Given that gender and race/ ethnicity-based earnings gaps persist even when individuals graduate with the same fields of study, it is important to examine to what extent patterns of occupational choices might drive these earnings gaps. Do men and women or whites and minorities make very different occupational choices? Although a conclusive argument cannot be presented, a few case studies can help us approach an analysis.

Accountant and Auditor: Accounting is a popular major among men and women and whites and minorities, and a large proportion become accountants and auditors. Accounting majors (37.8 percent of males, 47.7 percent of females, 44.1 of whites, and 21.1 percent of minorities) choose this occupation making it the top occupational choice for accounting majors. However, men in this occupation earn $80,000 at the median, while women earn $65,000. Similarly, whites working in this occupation earn $72,000 while minorities earn only $42,000.

Software Developer, Applications and Systems Software: Computer science is a field of study particularly

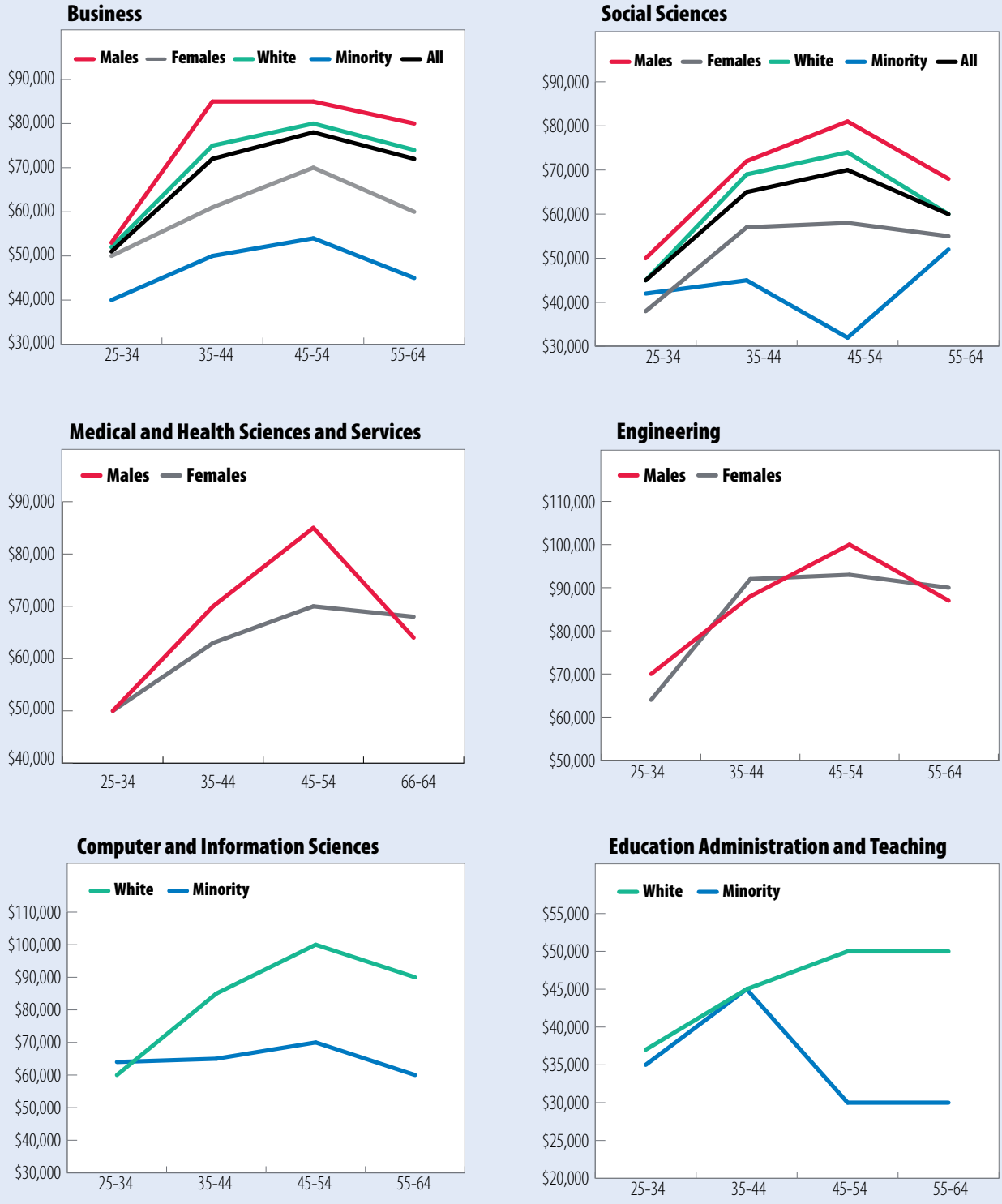
Notes on the Data Used for this Analysis

This article uses weighted ACS one-year microdata from 2012 to 2016 for Minnesota. So while all respondents reported Minnesota as their residence during the year of the survey, they did not necessarily attain their degree in Minnesota. Only those with a bachelor's degree as their highest educational attainment, and those with a full-time job (defined as working at least forty hours a week) are included in the analysis.

Due to the sample size, the number of minority respondents is small. Therefore, this analysis combines all minority categories (non-white Hispanic origin, American Indian or Alaska Native, Asian, Black or African American, Pacific Islander) into one category, called minority. This is done purely for statistical reasons. It is acknowledged that this grouping together of ethnicities overlooks the wide range of barriers, opportunities and cultural experiences. Elsewhere in *Minnesota Economic Trends*, more fine-tuned categories have been addressed.

Finally, throughout the article, the term 'field of study' refers to college major. A general field of study is an umbrella college major (social science), whereas a detailed field of study is a specific sub-category within an umbrella major (economics within social science).

Figure 3. Median Earnings Profile by Age, Comparison by Gender, Race/Ethnicity, Minnesota, 2012-2016



Source: American Community Survey, one-year sample, 2012-2016

popular among minorities. Both whites and minorities who majored in computer science are likely to become software developers, applications and systems software. Specifically, 25.1 percent of white and 33.4 percent of minority computer science majors are found in this occupation. Median earnings for computer science majors are $95,000 for whites and $80,000 for minorities.

Registered Nurse: The nursing major is popular among women and minorities. Predictably, the most popular occupation for nursing majors across the board is registered nursing. Yet, the earnings gap persists. The median wage for men who are registered nurses is $73,000 compared to women at $70,000; white registered nurses earn $70,000 compared to minority registered nurses at $60,000. This finding is supported by past research published in *Minnesota Economic Trends* which concluded that the earnings gap between white and minority nurses arises from that fact that white nurses are more likely to work in hospitals while minority nurses are more likely to work in nursing homes.

This article finds evidence of gender and race/ethnicity-based earnings gaps in Minnesota, even after accounting for field of study at the bachelor's degree level and eventual occupational choice. To summarize findings, median earnings and earnings over time are stratified by gender, where males earn more than females at all ages, across fields of study and occupation. Similarly, whites earn more than minorities by field of study and occupational choice.

Dave Senf

More Signs of A Tightening Job Market

Low levels of discouraged and involuntary part-time workers may signal Minnesota's new normal.

Signs of Minnesota's tight job market continue to pile up. The number of unemployed fell below 90,000 in August for the first time since 2000, while the unemployment rate dipped below 3 percent for the first time since 1999.[1] The unemployed workers-to-job openings ratio fell to its lowest reading ever (0.6) during the second quarter in 2018. The ratio will likely decline further when the fourth quarter Job Vacancy Survey results are published as labor demand remains solid while the number of unemployed shrinks.[2] The number of initial claims for unemployment benefits to total wage and salary employment, a proxy for the rate of layoffs, dipped below 50 initial claims per 10,000 employed for the first time in 48 years in August.[3]

Is there any slack in the Minnesota labor market that can be tapped to keep job growth hovering around 1.3 percent, as it has over the last three years? Aren't there lots of potential jobholders who dropped out of the labor force, discouraged by unsuccessful job searches after the recession? Can part-time workers move from the ranks of underemployed into full-time jobs? Fortunately, several broader measures of unemployment address these questions.

The monthly job report highlights the official (U-3) or headline unemployment rate, which is the number of unemployed workers divided by employed and unemployed workers. (Employed and unemployed workers comprise the total labor force.) To be counted as unemployed, a person has to be available to take a job and to have actively sought work in the past four weeks. Other measures of unemployment, or labor underutilization, are called the U-4, U-5, and U-6 unemployment rates.[4]

The U-4 rate adds discouraged workers. Discouraged workers are defined as persons not in the labor force but who want work and are available to work. These workers have looked for work over the last 12 months but not over the last four weeks because they believe there are no jobs available. U-5, in addition to unemployed and discouraged workers, includes marginally attached workers; these are discouraged workers who have not looked for jobs in the last four weeks, for any reason. The U-6 rate adds employed workers who want to work full time (35 hours per week or more), but due to economic reasons worked only part time (34 hours or less per week). These workers are referred to as involuntary part-time workers – they want to work full time but can't find a full-time job or their hours have been cut back.

All these measures of Minnesota unemployment, after inching down in 2005 and 2006,

[1]Minnesota Local Area Unemployment Statistics (LAUS) – mn.gov/deed/data/data-tools/laus/

[2]Minnesota Job Vacancy Survey (JVS) – mn.gov/deed/data/data-tools/job-vacancy/

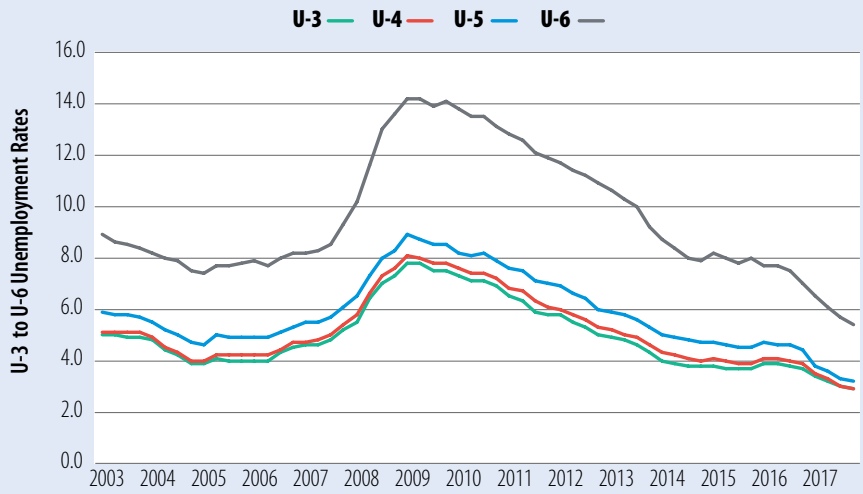
[3]Minnesota Initial Claims for Unemployment Benefits – mn.gov/deed/data/current-econ-highlights/ui-statistics.jsp

[4]Minnesota's alternative unemployment rates are four-quarter moving averages updated every quarter by the Bureau of Labor Statistics (BLS). The latest rates are posted at mn.gov/deed/data/current-econ-highlights/alternative-unemployment.jsp.

started to increase in 2007 and then spiked during the recession (Figure 1). Labor underutilization (as measured by alternative unemployment rates) peaked during the first half of 2009 before declining very slowly over the next nine years. The latest estimates, which are an average between the last quarter of 2017 and the first three quarters of 2018, are the lowest on record. The alternative unemployment rates have only been published at the state level since 2003. Future alternative rates are likely to continue to inch downward over the next six months as labor underutilization dives in the face of the state's tight labor market.

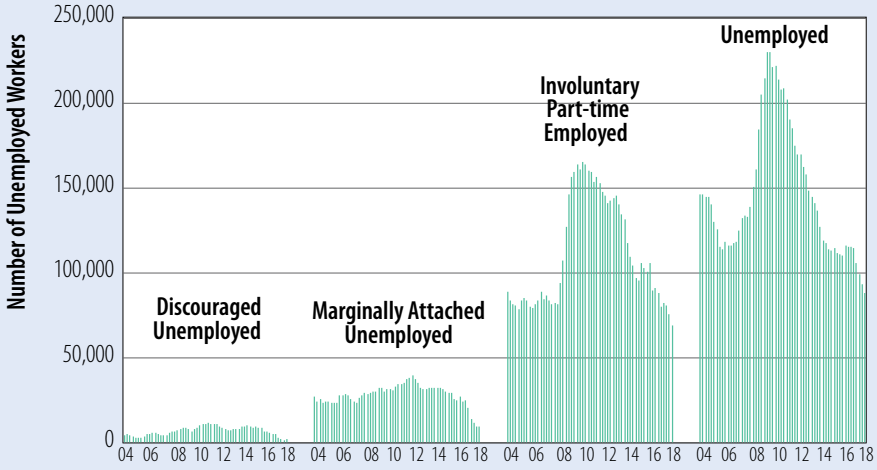
Almost all of the spike in the U-6 rate during the recession came from sharp increases in unemployed and involuntary part-time employed (IVPT) (Figure 2). Labor underutilization, as measured by the U-6 rate, rocketed from 7.8 percent in 2006 to 14.2 percent at the end of 2009. Unemployed workers spiked by 109,000, while IVPT increased by 79,000. The number of unemployed shot up 93 percent while IVPT employment rose 97 percent. During the recession Minnesota employers responded to declining business activity by cutting payroll numbers and reducing their employees' hours.

Figure 1. Alternative Unemployment Rates in Minnesota, 2003-2018



Source: Bureau of Labor Statistics (BLS) available for Minnesota data only at mn.gov/deed/data/current-econ-highlights/alternative-unemployment.jsp and for all states at www.bls.gov/lau/stalt.htm

Figure 2. Discouraged, Marginally Attached, Involuntary Part-time Employed, and Unemployed Workers

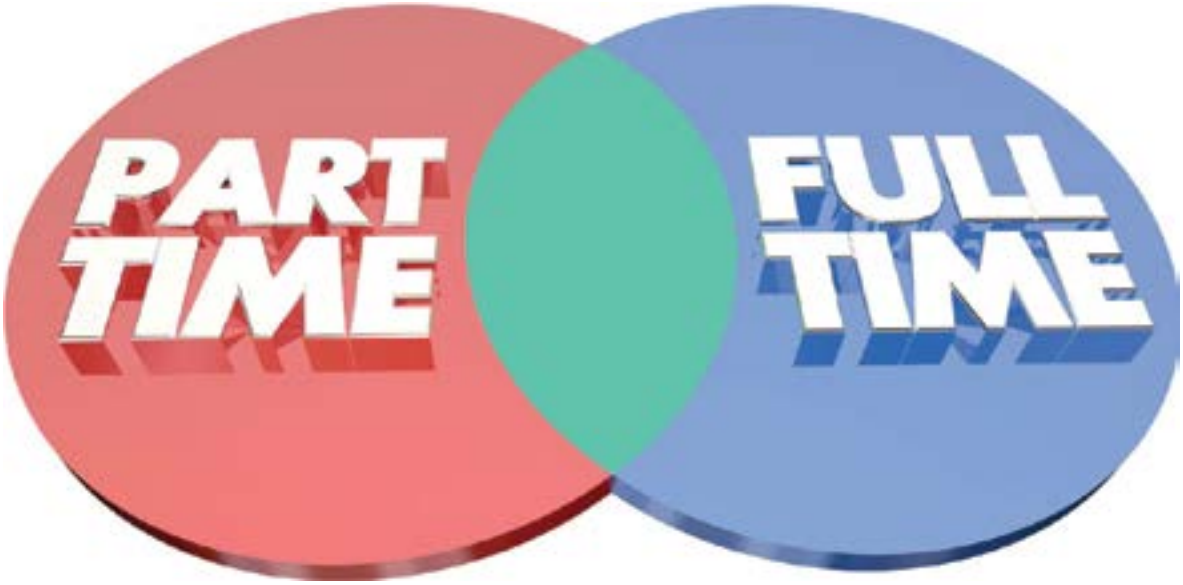


Source: Bureau of Labor Statistics (BLS) available at www.bls.gov/lau/stalt.htm

The rapid rise in IVPT employment occurred across the nation and generated widespread discussion on whether the increase in IVPT employment was cyclical in nature, caused by weak business conditions leading to lingering weakness in the labor market, or more structural, representing a more permanent use of part-time workers by businesses. A number of reasons supported a permanent increase in the use of involuntary part-time employees: The Affordable Care Act, employee scheduling software that lowered the cost of more part-time staffing, and a shift in employment to service industries, such as restaurants, that required only part-time workers.

As labor markets in Minnesota and across the nation gradually improved over the last nine years, labor market slack waned and IVPT employment returned to pre-recession levels in most states. The latest reading on IVPT employment in Minnesota (October 2017 to September 2018), pegged IVPT at 68,700 workers. That is down almost 20 percent from the average of 83,700 IVPT workers that occurred over the 2004-2007 pre-recession years. Before the recession 3.0 percent of employees in Minnesota wanted to work full-time but for economic reasons were employed only part time. That percent rose to 6.0 percent during the peak of the recession and currently stands at 2.3 percent.

The sharp jump in IVPT employment in Minnesota has proven to have been totally cyclical, as has the increase in discouraged and marginally attached workers in 2009 and 2010. Similar to IVPT employment, the most recent level of discouraged and marginally attached workers has dipped well below the pre-recession level. These are additional indicators of how tight Minnesota's labor market has become. Low levels of discouraged, marginally attached, and IVPT workers go hand-in-hand with low unemployment rates. We can expect this to be the new normal in Minnesota as long as the national economy remains in expansionary mode.[5]



[5]Alternative unemployment rate data from 2003 to 2018 for all states and the U.S. can be viewed graphically at: https://public.tableau.com/profile/magda.olson#!/vizhome/Alternative_UnempRate/AlternativeMeasuresofUnemployment?publish=yes.

How Do the Dayton Years Compare to Previous Administrations?

Wrap up: Mighty improvements in unemployment, but we're undergoing a long period of slowing labor force growth.

With change in the gubernatorial administration upon us, it's an opportune time to look back over the past eight years of the Dayton administration, assess our employment conditions, and see how these conditions compare to previous administrations. We do this not because we believe any elected state official deserves all the blame or all the credit for changing conditions well beyond their control. Quite the contrary. This comparison highlights the fact that governors of both parties have seen broader cyclical trends impact the state's economy. To ignore these impacts and attribute good or bad performance to the office holder overstates their influence over these trends at a state level.

Nonetheless, gubernatorial administrations are frequently used as time references in discussing the state of our economy, and it is useful to compare each to predecessor administrations. In a time when partisan preferences often override evidence in our personal gubernatorial assessments, it is especially valuable to provide an objective comparison for the record.

Availability of data constrains our analysis to a few recent gubernatorial administrations. Total non-farm employment is available back to 1950, but a dramatically changing economy over the past few decades, and corresponding changes in the classification system used to describe the components of our economy, most notably the adoption of the North American Industry Classification System (NAICS) in 2000, make a detailed assessment more challenging than is intended. Another limitation is due to state-level estimation of unemployment and other labor force indicators starting in 1976.

But comparing the behavior of such high-level aggregates as total non-farm employment and the unemployment rate still serves our purposes. We compare the behavior of total employment beginning with Elmer Andersen who took office in January 1961, and we can compare unemployment rates beginning with Rudy Perpich's first term when he replaced Wendell Anderson in December 1976.

Table 1 provides high-level indicators of employment and unemployment conditions across administrations. Average employment changes range from the 6,677 per month during Perpich's first abbreviated (two-year) administration to the 894 average loss during Al Quie's subsequent tenure. Those of us who remember those times 40 years ago recall that the driving force behind these disparate

outcomes was the fact that Quie had the misfortune to be in office during two national recessions during his one four-year term. Similarly, the only other administration to have shed jobs over its time in office was Pawlenty's, and here again this was in no small part due to the Great Recession coming midway through his second term.

Indeed, the timing of our national recessions has much to do with the relative performances of our gubernatorial administrations. Of the 11 listed, only three spanned a time when there were no recessions, including Rolvaag's one term, Perpich's short (two-year) first term, and now Governor Dayton's two terms. In addition, both Elmer Andersen and Arne Carlson took office during a recession, both of which ended within a short (two months and three months following inauguration, respectively) time after, and both administrations were recession-free from then on. Perpich's second eight-year term ended in recession, the relatively mild nine-month downturn that began in July 1990 and spilled over into Carlson's term. The remaining governors (LeVander, Anderson, Ventura, and Pawlenty) each served a term that included one recession.

To see how this timing matters, we note that the administrations with the five highest average monthly job gains, including Dayton's, are also those with the lowest share of months in recession, and the three slowest job growth administrations are those with relatively high shares in recession. An interesting illustration of this dependence of average job growth on the timing of recessions is a comparison between Perpich (2nd term) and Carlson. They shared a mild nine-month recession between them, six months for Rudy and three for Arne, but otherwise each served eight-year terms without another downturn. And as a result, their respective average monthly job gains differed by one job.

But as we consider Dayton's

Table 1. Employment Gains and Recessions by Gubernatorial Administration

Term Start	Governor	Average Monthly Employment Change	Average Monthly Employment Growth Rate	Share of Months in Recession
January 1961	E. Andersen	1,615	0.17%	8%
March 1963	Rolvaag	4,020	0.37%	0%
January 1967	LeVander	2,620	0.21%	25%
January 1971	W. Anderson	3,158	0.23%	24%
January 1977	Perpich (1st term)	6,677	0.42%	0%
January 1979	Quie	-894	-0.05%	50%
January 1983	Perpich (2nd term)	4,672	0.25%	6%
January 1991	Carlson	4,671	0.20%	3%
January 1999	Ventura	1,504	0.06%	19%
January 2003	Pawlenty	-104	-0.00%	19%
January 2011	Dayton	3,473	0.12%	0%

Source: DEED Current Employment Statistics, 1961 to 2018

record, the close correlation between being recession-free, or nearly so, and seeing high monthly job gains slips somewhat. Comparing Dayton's job growth rate to Perpich's and Carlson's, we see that Dayton's job growth is 1,200 per month lower than during both of those earlier administrations. Does this imply that we have been underperforming for some reason relative to these earlier administrations? Table 2 reveals this is not the case; rather, the reason we have seen job growth slip is that over the last two administrations, the rate at which our labor force has grown has fallen, as baby boomers began to hit retirement age. In fact, relative to the Perpich (second term)/Carlson era, labor force growth is lower during the Dayton years by 1,284 per month, just about enough to account for the shortfall in employment growth. In other words, despite being the only recent governor to hold office through a full recession-free two terms, his average employment growth lagged previous office holders simply because demographic trends reduced the number of warm bodies available to take jobs that might otherwise have been available.

This is further illustrated in Table 2. The average rate of unemployment during each gubernatorial term depends greatly on where the rate stood at the beginning of each term, or in other words what was happening to the rate in the prior term. For example, Ventura experienced the lowest average unemployment rate of the governors listed, but this is largely because it was so low by the time he took office following the long expansion of the 1990s. What is more revealing about the behavior of unemployment over the course of any administration is how it changed from beginning to end.

By this measure, Dayton's time in office looks slightly better than those of both Perpich and Carlson, with a 4.1 percentage point decline, from 6.9 percent to the current 2.8 percent (although we should note that the 2.1 point decline in Perpich's first term was accomplished in two years rather than eight). Not surprisingly, Quie and Pawlenty, two administrations in office during job declines, also saw the largest increases in the unemployment rate during their tenure. Ventura also held the post during an unemployment rate increase, but the 2.5 percent rate

Table 2. Labor Force Growth and Unemployment by Gubernatorial Administration

Term Start	Governor	Average Monthly Labor Force Growth	Average Unemployment Rate	Change in Unemployment Rate During Term
January 1977	Perpich (1st term)	4,968	4.6%	-2.1
January 1979	Quie	3,409	5.9%	+5.1
January 1983	Perpich (2nd term)	2,580	5.5%	-3.8
January 1991	Carlson	3,245	4.1%	-2.6
January 1999	Ventura	2,776	3.5%	+1.9
January 2003	Pawlenty	840	5.3%	+2.6
January 2011	Dayton	1,629	4.4%	-4.1

DEED Local Area Unemployment Statistics, 1977 to 2018

when he took office is our lowest on record and gave it essentially nowhere to go but up. So by virtue of the long expansion during his term, Dayton has seen the unemployment rate improve as much as, or more than, any of his recent predecessors. He leaves office with conditions, at least by these very top-level indicators, in much the same shape as Arne Carlson left them for Jesse Ventura.

Of course, a full evaluation and comparison of gubernatorial administrations is not our goal here. These data, being as limited as they are, don't provide for the kind of detailed analysis that may attribute credit or blame for changing conditions. In fact, we can see from these data that relative performance across administrations depends on factors such as whether the nation experiences a recession while in office, or on long-term demographic trends and an aging population. These are not factors under the influence or control of any party or administration.

Mark Dayton has had the good fortune to serve during a time free from national recession, a fortune not enjoyed by many of his predecessors; but he has also served during a period of slowing growth in our labor force. As a consequence, the last eight years have seen dramatic improvements in unemployment, with slower

but still impressive rates of job growth. Let the record show that during Mark Dayton's time in office, improvements in our economy align closely with those experienced under Perpich and Carlson, or in other words, pretty nicely. T

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