The Effects of Automation on Employment and Government Policy in the United States

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Throughout recent times, mankind has strived to produce more with less effort. From the most basic lever to the most complex supercomputer, the field of automation functions on the basic premise that future technology will reduce the work needed in modern society. Food, medicine, housing, and all manners of life improve with the rise of automated processes and machines; however, as technology advances, a concerning pattern of abandoning workers in related industries has taken the job market by storm (Tekla, 2023). This pattern rears its head in every generation, from the invention of the steam engine to the discovery of electricity. Even in just the United States, jobs in almost every industry fall victim to these outcompeting mechanical muscles, as will be shown in one of the United States' biggest employment sectors: the manufacturing industry. Employment concerns continue to grow as each generation brings about new innovations that seek to improve our quality of lives, but all too often the products and production techniques designed to ease our burdens only exacerbate the issues of falling wages, unemployment, and the struggle of supporting ourselves or our families in a world where human labor is no longer the main driver of our economic prosperity. All people from the simple working day laborer to highly trained and educated college graduates should understand the dangers of how an unregulated, automated workforce would impact their ability to provide the most basic standards of living for themselves and their loved ones in the near future.

Over the decades, labor unions and workers have banded together to protest new waves of automation that decimate the jobs and industries they desperately rely on, but developers and production owners laud the efficiency and reliability of mechanical production methods over the antiquated techniques of human design. Already, calls for the government to limit or outright ban technology that would replace human jobs target the development of groundbreaking features

such as generative artificial intelligence, completely departing from the original intention of automation improving the quality of life for the citizens and communities using it (Bughin et al., 2018). Given the massive benefits of increased production and safer working conditions that often accompany automation, an ethical dilemma emerges as those being replaced vehemently resist technological advancements while those eager for new innovations push harder for development, regardless of the potential dangers to workers' employment opportunities. As more data and research highlights automation's impact on the global economy, I will conduct an investigation using historical research and personal case studies to answer the following question: How does automation truly affect employment in the United States, and are government policies necessary to respond to an approaching automation-dominated future?

Background and Context

Fundamentally, automation is a method of executing a variety of tasks in such a way that minimizes the necessity of human input or interaction. Despite the imagery of big, complex machinery many assume, automation takes many forms such as very complex machines and code down to the most basic water wheel rotating a grain mill. When describing the sociotechnical situation, it is important to emphasize the original purpose of automation. The reduction of human effort required to produce food, shelter, and other necessities served two purposes. A producer's primary concern regarding automation is reducing the maximum amount of production costs and liability while also increasing the speed and efficiency of its production techniques. On the other hand, a consumer's concern lies more in the affordability and quality of the products they are consuming in their everyday lives. Automation manages to thread the needle by being beneficial for both groups since a decrease in production costs and liability

should logically be followed by a reduction in prices and injuries for the consumer as dictated by the constant market forces of supply and demand (Tekla, 2023). However, as standards of living continued to rise, life expectancy and the general population soon followed as more children lived long enough to become adults and birth their own offspring. This demand for more materials to support a greater population sparked the need for autonomous methods of production, which stabilized population growth and allowed society to prosper (Nargund, 2009). While this precarious balance of automation and human prosperity held true for some time, the modern methods of automation have made resource procurement and production so far departed from human interaction that many are no longer necessary for the production of materials needed for people to thrive. Despite its longstanding history of improving quality of life, the recent rate of automation has expanded to the point where a large portion of the general population must contend with incredible competition from their fellow workers and mass unemployment at the hands of their mechanical competition (Wajcman, 2017).

To illustrate the scale of this issue, the McKinsey Global Institute released a report displaying the predicted use of automation in various industries for the near future. One particularly concerning conclusion predicted that almost half of all industries including healthcare, retail, and manufacturing have the potential to be at least partially automated by 2030. As each wave of automation sweeps through the job market, positions that require less training or education find themselves obsolete while fewer new jobs in emerging fields replace their once vital roles with machines. While demand for work in the fields of engineering, maintenance, and operating could increase, meaning more jobs and demand for labor, even then there will be massive ripples that impact the jobs, skill sets, and corporations that populate the labor market. Often, new jobs require higher levels of education unattainable by most people.

This increase in education standards has already led to a widening of the gap between the wealthy and the poor, further exacerbating the cost of living crisis started by falling employment opportunities and the friction between socioeconomic classes in society (Bughin, 2018).

Due to the concerns of unemployment and automation, adaptation of work to a more technological environment is expected to slow down proportionally. Critics of technology like AI-generated art have caused companies like Hasbro to revert back to human artists in the face of pushback to mass layoffs. Other social factors such as the political leanings of the youth towards more liberal policies have also seen the restriction of certain automation in the fields of art, music, and writing (Manyika, 2017). Furthermore, some critics have even suggested the concept of a government policy called Universal Basic Income, which includes a monthly allowance to certain people that ensures citizens receive a minimum quality of life and relieves many of the financial burdens that accompany mass adoption of automation and the accompanying reduction of jobs. This solution to the automation crisis would require extreme government intervention as the time, funds, and manpower needed to raise, distribute, and judicate the funds of such an ambitious policy far exceed any microeconomic implementation (Au-Yong-Oliveira et al., 2019). Both of the above methods seek to push back against the rising cost of living, falling employment, stagnating wages, and drastic income inequality that now plagues the United States. According to a research study from the Boston University School of Law, the gap between the 90th and 50th percentile of American citizens has vastly expanded with global shifts associated with computers and technology accounting for about 45% of the newly widened gap. If drastic measures are not taken, nearly half of all Americans may be at risk of falling below the poverty line and suffering at the hands of their unrelenting mechanical competition (Bessen, 2015).

Changes to education, developing industries, and other labor market enhancements may be necessary if we are to avoid catastrophic collapse of the United States' workforce. As productivity increases, consumer demand often keeps pace as everyone's standard of living increases, which creates more demand for workers and machines alike. The same does not hold true for many industries that instead rely on producing the maximum revenue while minimizing the cost of production, one of the biggest costs being human workers (Manyika, 2017). For example, according to a book in the World Conference on Information Systems and Technologies, the agricultural industry has seen a massive decrease in occupation due to heavy farm equipment like tractors and mass trench-diggers decimating the need for hardworking human farmhands. Meanwhile, emerging fields like information technology and customer service have increased rapidly as corporations expand into the online service industry. A pattern emerges as these technological advancements destroy the jobs of established fields while the new areas of employment being created often require more education and training than previous generations. These jobs often pay more than the positions they destroyed, but meeting the basic qualifications necessary to perform the job can take years of training and education, making employment that much more arduous to obtain (Autor, 2015).

Methods

In order to collect the data needed for analyzing the effects of automation on employment, I will track and monitor the employment rate of the United States across multiple decades and cross-reference them with major events and the rise of automation after World War 2. By comparing the employment rate of United States citizens with innovation, I will determine what creates mass shockwaves throughout the national markets, further impacting corporations'

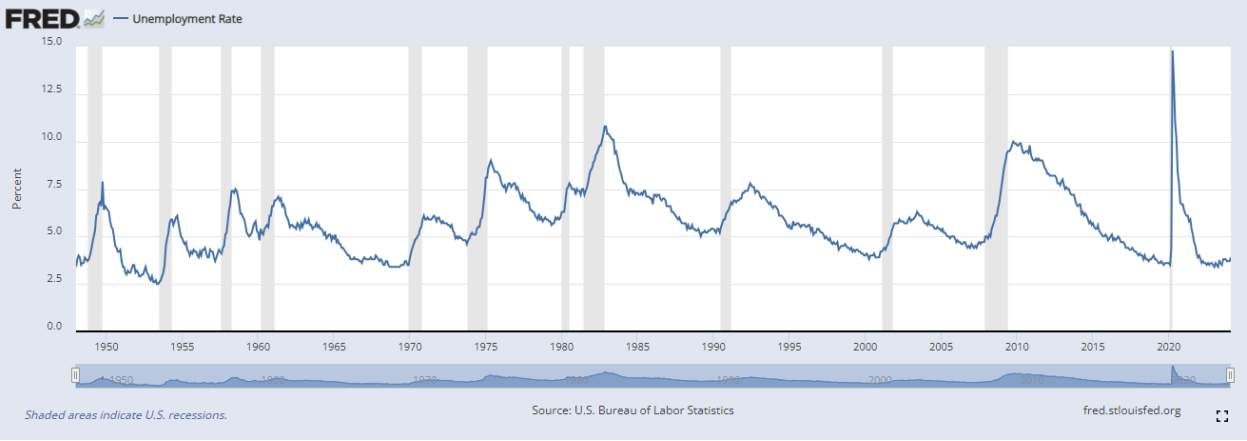
abilities to maintain and hire new workers in multiple different industries. In addition, to gain a more personal understanding of how automation may be impacting the need for human workers, I will analyze the data collected by an automated spotlight security system that utilizes motion tracking software and predictive analytics to monitor an area of interest for intruders. Specifically, data points such as target accuracy, uptime, reaction speed, and longevity will form a case study comparing how human and automated security methods perform in a simulated scenario. This project highlights the nature of automation as both a helpful and harmful power in the world. On one hand, the automated spotlight's motion tracking, thermal vision, and mechanical nature leads to a significant reduction in overhead cost, salary, liability, danger, and unpredictability. An automated machine does not require food, drink, sleep, pay, or any other element that might distract a night guard from the task of protecting an objective. On the other hand, this machine may not completely eliminate the need for an onsite security guard due to falling victim to vulnerabilities such as power outages, thermal cloaking, or physical apprehension of suspects. On a social level, the automated system could potentially be extrapolated to multiple areas that would otherwise be monitored and patrolled by human laborers across a wide sector of industries, leading to changes in the employability and valued skills of humans in the labor market. By analyzing the historical and technical aspects of automation, my research will not only shed greater light on the specific job market of security and protection but also grant a microeconomic angle of how automation affects specific jobs instead of the employment rate as a whole.

Results and Analysis

Based on my research, the United States' unemployment rate is affected by a wide variety of factors including war, inflation, labor rights, and more. The combination of these factors creates a cyclical pattern of employment as various world events such as economic policies, political conflicts, and technological advancement alter the markets, but the focus of this paper will revolve around automation in the post-war period of the United States. Over the course of my research, I have monitored the rise and fall of employment over a century of the United States' history and cross-referenced its patterns with major world events and innovations to form a conclusion of how automation affects the United States' employment rates. As shown in Chart 1, the Federal Reserve Economic Data website released a graph that displays the unemployment rate from the start of 1948 to the modern day in 2024 (U.S. Bureau of Labor Statistics, 2024).

Chart 1

Federal Reserve Economic Data Graph of Unemployment in the United States (U.S. Bureau of Labor Statistics, 2024)



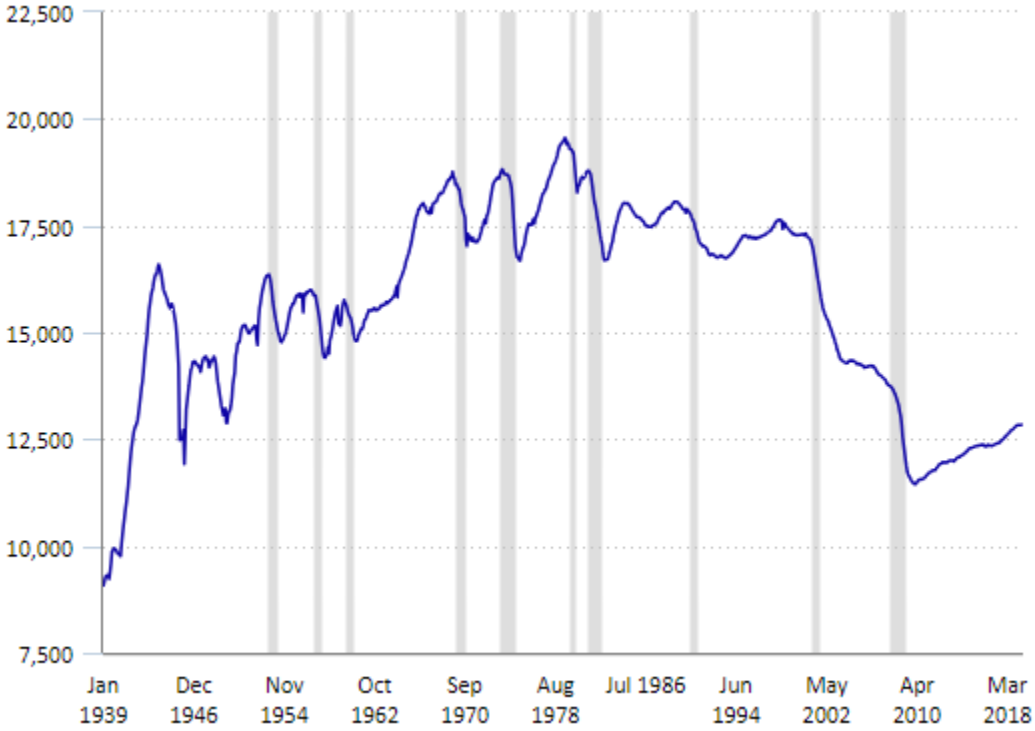
Note. The Federal Reserve Economic Data is an online database used for collecting various economic data types ranging from national, international, public, and private sectors. The Federal Reserve Economic Data is maintained by the Research Department of the Federal Reserve Bank

in order to provide the public with safe, reliable information about the financial state of their country.

Many of the major spikes in unemployment can be attributed to specific events such as the housing market crash of 2008 or the global coronavirus pandemic in 2020, but the real concern lies in the types of jobs that are available to the general population. During World War 2, the manufacturing industry of the United States became incredibly streamlined as companies developed better automated manufacturing techniques to keep up with the demand for war materials like ammunition, tanks, and fighter jets. Other nations like Japan also contributed to the technology needed to produce more material for less effort after their surrender to the United States, which only further encouraged corporations to expand their reach into the sphere of automated production techniques (Boisset, 2018). From 1939 to 1979, a constant, cyclical employment pattern emerged in the manufacturing industry as soldiers returned home from World War 2 and consumer goods rose in popularity. This post-war time period represents the peak golden years of manufacturing when workers fresh out of high school could feasibly enter this labor field without post-secondary education and still earn a wage high enough to support themselves and their families. However, following the 1970's, another wave of automation in the areas of electronic switches and motors caused the amount of manufacturing jobs in both durable and non-durable goods to plummet nearly 40% as shown in the chart below from the U.S. Bureau of Labor Statistics (Harris, 2020). To make matters worse, this time period also saw the destruction of several other jobs that require little to no level of education such as switchboard operators that many workers without college education relied on (Price, 2019).

Chart 2

Employment in manufacturing, January 1939-June 2019, seasonally adjusted (Harris, 2020)



Note. The Bureau of Labor Statistics is an agency of the United States Department of Labor. It is the principal investigative agency in the broad field of labor economics and statistics and serves as part of the U.S. Federal Statistical System.

This type of unemployment did not spell disaster since many new industries such as education, health services, and computer science grew from the collapse of manufacturing, but a sinister side effect of this workforce transition revealed itself as the accessibility and training needed for displaced workers to perform these new jobs far exceeded what most individuals and even families could have predicted (Harris, 2020). Education, health services, and computer science all require forms of education or training in order to break into the lucrative jobs of the era. As manufacturing jobs continued to disappear over the next few decades, the future for the

majority of the workforce grew bleak as only 37.7% of Americans today graduate with a four-year college degree (Talbott, 2023). While this is an increase when compared to the number of college graduates of previous decades, the graduation rate cannot keep pace with the millions of manufacturing jobs lost over the last two decades, especially since manufacturing is just one suffering industry among several such as mining and textile *(Harris, 2020)*. The example above had a major impact on the job market during the 1980's, but the modern wave of automation such as generative artificial intelligence and coding bots are several magnitudes worse as these new technologies advance so rapidly and with far fewer resources that they now threaten jobs which take years of study and thousands of dollars for a human to perform.

In the modern age, a great example of generative artificial intelligence's disruptive impact on the modern job market is ChatGPT, an AI language model designed to understand and respond to prompts given to it by humans and machines alike. Among the thousands of companies utilizing its groundbreaking features, Coca Cola, the largest soft drink brand in the world, now uses Chat GPT as one of its default customer support features. Instead of hiring customer service representatives and spending money on their wages, benefits, sick days, insurance, and mistakes, Coca Cola has transitioned to using chat bots backed by generative artificial intelligence in order to handle basic questions and give customers personalized recommendations based on their preferences. Using the sheer quantity of data collected on their users via website cookies and voluntary questionnaires, the generative artificial intelligence can quickly outperform an entire team of customer support representatives for a fraction of the cost, leading to mass layoffs and rising unemployment in just a few years (Osama, 2023). Another modern example of disruption can be demonstrated by the automated spotlight security system described earlier. My system displayed promising results as the tracking software successfully

identified all living creatures in the designated area via thermal, heat-seeking trackers and illuminated them with far better accuracy and faster reaction times when compared to several human test subjects, especially in the dark where the camera's thermal vision far exceeds the human eye. The automated system's longevity also surpassed human capabilities without any need for sleep, food, entertainment, or shift changes. The only scenario in which human labor managed to surpass my system was from auditory cues and physical apprehension of culprits; however, in the main task of surveillance and monitoring, the automated system's advantages of never needing to eat, sleep, seek entertainment, or any other source of human error outcompeted human labor by a wide margin. When machines like my spotlight system can far exceed normal human capabilities, the demand for human labor may decrease, leading to fierce competition for the remaining jobs, greater requirements for education, and higher unemployment.

Conclusion

Automation as a whole emerges as an impressive force for both the public good and evil. The quality of life for a government's citizens hinges heavily on the economic prosperity of the nation, but automation flips the script by creating a system where goods and services are produced so cheaply and efficiently that an increasing number of individuals and families are priced out of the wages needed to meet their basic standards of living, let alone any indulgences. All citizens from lifelong farmers to college graduates must be prepared for a future in which their human labor cannot compete with the tireless nature of their mechanical competition. Government policy may be capable of salvaging the automation-dominated workforce through the implementation of an economic policy like Universal Basic Income, but only if quick and

decisive action is taken to limit automation or provide relief for displaced workers before too many of its citizens are irreversibly harmed due to lack of economic opportunities.

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