

Unemployment in the United States

—Economic Inequality in the Context of Industrial-technological Upgrading and Outsourcing in the United States Since the 1990s

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Abstract: There is significant concern that industrial-technological upgrading and outsourcing in the United States have led to increased economic inequality since the 1990s. In the fourth Industrial Revolution, computerization, automation, and artificial intelligence allowed American companies to preserve their technological core competencies and outsource non-core activities to foreign countries. This paper aims to provide the classical vocabulary on this topic, an analysis of the U.S.'s industrial-technological upgrading and outsourcing circumstances, and an explanation of their influence on the widening economic gap since the 1990s. This paper found that the three trends share a synchronous and reinforcing relationship, which can find support in Bruno Latour's actor-network theory. Businesses that engaged in outsourcing activities benefited financially. While low-skilled and high-skilled workers are both at risk of losing their jobs because of improved technology, the former is more vulnerable. Industrial-technological upgrading facilitates outsourcing, and outsourcing facilitates the former in return. They both contribute to a widening economic gap. This paper was written when many questions arose on the subject. It connects industrial-technological upgrading with outsourcing, which previous research failed to do.

Keywords: industrial-technological upgrading, technological unemployment, automation, outsourcing, economic inequality

1. Introduction

Since the 1990s, the economic gap between the rich and the poor has widened. Despite the interference of wars, financial crises, and other uncertainties, the overall trend is intensifying. According to the Federal Reserve's distribution of household wealth statistics, in the first quarter of 1990, the top 10% of households in the U.S. controlled 59.8% of the national wealth, while the rest owned 40.2% [1]. The problem is getting more severe as time progresses. In the first quarter of 2023, the top 10% will own 69%, while the rest will own 31% [1]. Similarly, the Gini coefficient increases from 0.43 in 1990 to 0.49 in 2021 [2]. Thus, it is reassuring to say that the United States is experiencing a widening economic disparity between the rich and the poor.

Simultaneously, since 1990, the U.S. has witnessed rapid technological progress. Mechanization and artificial intelligence have won more material resources for the U.S. at the expense of more and more ordinary workers who are forced to leave their jobs. The author found that there is a synchronous and mutually reinforcing relationship between the increasing trends of the United States' economic inequality, industrial-technological upgrading, and outsourcing. This statement can be most obviously drawn from a 2019 Pew Research Center survey [3]. According to the survey, 45% of the surveyed U.S. adults said that "the outsourcing of jobs to other countries" contributes a great deal to their country's economic inequality. As the surveyors could not agree on a major contributor to economic inequality, outsourcing, along with the tax system, peaked among all the options.

This paper seeks to answer why most Americans view outsourcing as harmful and a contributor to their country's economic inequality. Section 2 explores the U.S.'s industrial-technological upgrading history, motives, current situation, and impact on technological unemployment since the 1990s. Section 3 analyzes the U.S.'s outsourcing history, motives, and impact on economic inequality since the 1990s. Section 4 is dedicated to illustrating the synchronous and reinforcing relationship between economic inequality, industrial-technological upgrading progress, and outsourcing in the United States since the 1990s.

This paper links industrial-technological upgrading with outsourcing and the widening wealth gap in the U.S. and studies the relationship between the three. It can help policymakers and researchers clearly analyze the causes of the growing economic inequality in the U.S. since the 1990s. Future research can be done to advocate for this issue.

2. The Antecedents and Consequences of Industrial-technological Upgrading

Industrial-technological upgrading can be defined as "the transformation of the traditional industries by the Internet of Things, Data, and Services" [4]. It can lead to both outsourcing and technological unemployment. In the Oxford Dictionary, technological unemployment is defined as unemployment caused by technological advancement. This applies to workers whose skills are made redundant under the changes in manufacturing procedures, mainly referring to the substitution of their services by machines [5].

Industrial-technological upgrading is driven by capital. Companies desire to utilize developed technology to reduce production costs. Therefore, industrial-technological upgrading will promote technological unemployment and industrial outsourcing. However, the impact of industrial-technological upgrading on technological unemployment remains debatable. This section uses evidence to describe the antecedents and consequences of industrial-technological upgrading.

Significant industrial-technological upgrading has occurred during the 2010s decade: mobile upgraded from 3G to 4G networks, social media users skyrocketed, genomics and precision medicine trended in biomedical research, artificial intelligence and big data took off, and data storage moved to the cloud. One can observe that these fast-growing industries, such as information technology and healthcare, are all parts of the service sector, the most invested, advanced, and productive industrial sector of the United States [6].

During an interview for the Editorial Board of Anthropology and Materialism In the Journal of Social Research [7], American Philosopher Andrew Feenberg stated that in the past centuries, capitalism has greatly influenced the trajectory of technological advancement, and its influence is still shaping the technology now. He described the evolution of the Internet from a highly decentralized system based on a unique open protocol to what it is now in the domination of large companies. To maximize profits, a few large corporations monopolized the industry. "One can imagine a very different Internet based on the undisturbed evolution under public control of a

largely peer-to-peer system," said Feenberg. Industrial-technological upgrading is not a spontaneous process; it is driven by capital.

As established earlier, industrial-technological upgrading is one culprit in technological unemployment. How the transformation of traditional industries such as textiles by mechanization and artificial intelligence would exclude human labor is not a new topic. Dating back to the First Industrial Revolution (1811–1816), a group of English textile workers known as the Luddites were concerned about losing their jobs to weaving machinery. They protested the first mass technological unemployment by destroying the machines that would replace them [8]. When unemployment rose sharply during the Great Depression, the blame was once again placed on machines. Commissioner of the U.S. Bureau of Labor Statistics Ewan Clague stated that the displacement effect would outweigh the productivity effect and that machine-related unemployment would be significant [9]. Given much historical evidence, such as the First Industrial Revolution mentioned above, a consensus is reached that there is a cause-and-effect relationship between industrial-technological upgrading and technological unemployment. The question remains as to how much the former influences the latter.

In the 21st century, mankind is experiencing an unprecedented level of industrial-technological upgrading. In 2016, the founder of the World Economic Forum, Klaus Schwab, prophesied the advent of a Fourth Industrial Revolution. The Fourth Industrial Revolution is a fusion of advances in smart technology, artificial intelligence, robotics, and algorithms. It will bring about greater digitalization and automation. As opposed to weaving machinery that required human assistance, we now have artificial intelligence that can imitate human behavior and function independently. The number of tasks that machines could perform without human interaction increased drastically. Many studies have investigated the extent of the impact of industrial upgrading on unemployment in this new era. The varying conclusions could be classified into two opposing views. One opinion finds the impact to be temporary or even non-existent; the other continues. This paper will elaborate on these two differing opinions.

The first opinion concludes that technological unemployment has a temporary and even nonexistent effect on unemployment. In 2013, Feldmann conducted an empirical analysis of the effects of industrial upgrading on unemployment using annual data for 21 industrialized nations from the years 1985 to 2009. His findings show that an increase in technological change over a three-year period significantly increases unemployment, but there is no long-term effect. Nevertheless, it supports the idea that faster industrial upgrading may increase unemployment, at least during a transition period [10]. In 2019, Kapeliushnikov provided theoretical, empirical, and historical evidence that "the phenomenon of technological unemployment is a phantom". He reasoned that since the pace of industrial upgrading in the upcoming decades will not be very rapid by historical standards, a spike in technological unemployment, even in the short term, seems highly unlikely [11]. His results reversely echo that faster industrial upgrading leads to increased technological unemployment.

The second opinion discovers that the impact is continuous, so the labor force should start preparing for the possibility that robots will replace their jobs. Note that temporary and continuous are time indicators only. The impact can be both minimal and continuous. In their 2014 book, *Race Against the Machines*, Erik Brynjolfsso, and Andrew McAfee foreshadowed the upcoming Fourth Industrial Revolution and how machines would lead to persistent mass technological unemployment [12]. They both expressed their concerns about industrial-technological upgrading. Based on the research of Frey and Osborne in 2013, 47% of the 702 investigated jobs in the U.S. were predicted to face a high probability of a declining employment rate as a result of computerization within the coming 10-25 years [13]. In 2018, Krousie ran a two-stage least squares regression that links industrial upgrading to unemployment. Even though it is small, she found a positive relationship

between industrial upgrading and unemployment from 2002 to 2013. She further hypothesized that the displacement effect will expand as artificial intelligence develops [8].

In summary, it seems that unemployment due to industrial-technological upgrading is inevitable. Especially during and after the Fourth Industrial Revolution, the abundance of mechanization and artificial intelligence allowed companies to reduce their demands for routine and repetitive human labor to increase profits. Industrial-technological upgrading has led many Americans to worry about job security. In fact, they are not wrong. Automation is predicted to displace 20 million manufacturing jobs by 2030 [14]. In Section 4, the author will discuss how industrial-technological upgrading can also facilitate outsourcing.

3. The Antecedents and Consequences of Outsourcing

Outsourcing is the act of obtaining a semi-finished or finished product or service from an outside company while these activities are traditionally performed inside the company. There is frequent confusion between "outsourcing", "offshoring", and "offshore outsourcing" [15]. Offshoring happens when a company is relocated to another country other than its home country. Offshore outsourcing happens when a company recruits a third-party supplier to conduct operations in an outside country. Since certain types of outsourcing can happen in the same country, outsourcing cannot be equated with offshore outsourcing. However, people usually do not distinguish between them in the general context. This paper mainly focuses on offshore outsourcing contributed by industrial-technological upgrading, but for simplicity's sake, it will be generalized as outsourcing.

Enterprises that outsource can minimize production costs to maximize their profits; they benefit from outsourcing economically and strategically. Both high-skilled and low-skilled workers face the risk of technological unemployment, yet high-skilled workers in certain industries are better poised to succeed [16]. Thus, outsourcing increases inequality between high-and low-income groups.

Companies that engage in outsourcing activities benefit economically and strategically. These enterprises are called buyers. Outsourcing can save companies money by choosing a vendor that provides the service to perform the outsourced function more efficiently than the buyer could [15]. Economizing their scarce financial and managerial resources, outsourcing allows companies to focus on their core competencies [17]. Such core competencies are the foundation of competitive advantage and represent the collective learning of firms on how to coordinate diverse production skills and integrate multiple technical and managerial competencies to enable individual firms to quickly adapt to changing opportunities [18].

In turn, these benefits encourage them to further promote the industrial upgrading of outsourcing. The author will discuss this further in Section 4.

Most Americans believe that outsourcing has contributed to their country's unemployment rate, at least to some extent. In 2009, Lacity studied the public's opinion of outsourcing and offshoring as reflected in political cartoons. She analyzed the content of 130 U.S. and Western political cartoons that depict offshoring and outsourcing. She found that job loss is the most common storyline, representing 39 percent of the cartoons [19]. Increases in unemployment can worsen the relative position of the low-income group [20].

According to Morrison and Siegel's 2001 study, outsourcing is labor-saving for all labor categories continuously, and its effects seem to be stronger for less educated workers [21]. The two researchers utilized a dynamic cost function framework and measures of workforce composition and investment in technology to examine the effects of trade, technology, and outsourcing on changes in labor demand. Low-skilled labor requires people with a high school diploma or less to execute routine and/or non-cognitive tasks. High-skilled labor includes positions that require college graduates to conduct analytical and cognitive tasks. They receive higher pay [22]. Generally, high-skilled labor receives more pay than low-skilled labor.

Lower salaries and higher unemployment result from a decrease in demand for low-skilled workers [23], and limited job replacement caused by the outsourcing of labor and manufacturing occupations also leads to economic losses of individuals, families, and communities [24]. According to the Department of Labor, more than 1/3 of employees who are displaced stay jobless, and a majority of those who do find jobs face significant pay cuts [25]. The Census Bureau reported that in the U.S., 21.8% of income in 2014 went to the top 5% of households, while 27.1% to the bottom 60% [26]. Therefore, income inequality caused by outsourcing is a direct contributor to overall economic inequality.

4. A Synchronous and Reinforcing Relationship

There is a synchronous and reinforcing relationship between industrial-technological upgrading, outsourcing, and the economic gap in the United States. Industrial-technological upgrading can encourage outsourcing, while outsourcing can boost a firm's industrial upgrading. They have the same internal drive and can widen the economic gap in the U.S.

Industrial-technological upgrading contributes to increased outsourcing by allowing companies to use services based on leading technologies without "incurring the sunk costs of adopting these new technologies" [27]. In their study, firms that use more IT-intensive technologies had lower outsourcing prices for IT-based services. This creates a positive relationship between the IT level of the buyer and the percentage of IT-based services it outsources. Moreover, according to a 2019 small business survey conducted by Clutch, the most outsourced services by American businesses are accounting (37%), IT services (37%), and digital marketing (34%). Next in line are development (28%), human resources (24%), and customer support (24%) [28]. One can find that many domestic industries at risk of industrial outsourcing, such as information technology and customer service, fall under the service sector. Interestingly, the author mentioned in Section 2 that the service sector experiences the most industrial-technological upgrading in the U.S. Mobile upgrades from 3G to 4G to even 5G today have allowed smartphone manufacturers, social media, e-commerce, and streaming media to prosper, resulting in more jobs in the U.S. being outsourced. Advanced and efficient communication technology further enables companies to outsource their customer support.

Reversely, outsourcing can boost a firm's industrial upgrading, which further encourages it to outsource. When buyers possess developed technical and methodological skills, they will feel more comfortable with outsourcing services [19]. Rumelt argues that outsourcing speeds up when lead firms have access to certain isolating mechanisms that allow them to "appropriate the rents from externalized value chains" [29]. These mechanisms include formal property rights (patents, trademarks, and licenses); firm-specific technical knowledge; market-based firm-specific assets (marketing capabilities, distribution networks, corporate reputation, and brand names); and/or first-mover advantage [30].

This relationship between industrial-technical and outsourcing also finds support in Bruno Latour's actor-network theory. According to Latour, science and technology do not develop neutrally and independently; capital and policy are all "actors" in this network, which influence the direction of industrial-technological upgrading and are also affected by its state. An actor is something that takes action or is given an activity by another person. Scientific practices and their social contexts arise in the same process and do not have a causal relationship; they are reinforcing and synchronous.

Both Industrial-technological upgrading and outsourcing contribute to the widening gap between the rich and the poor in the U.S. In the 1990s, most American automakers were vertically integrated. They were impressed by Toyota's more technologically advanced production methods. Soon, these managers began to adopt outsourcing. Outsourcing allows them to utilize machines and

workers in a more flexible way, like Toyota. Simultaneously, workers are replaced by machines to minimize production costs and increase production efficiency. Hence, Detroit's once vibrant manufacturing district closed due to industrial-technological change and outsourcing. Car workers lost their jobs but lacked the qualifications to gain jobs in other areas. In 2009, Detroit's unemployment rate increased to 29% [31].

Industrial-technological upgrading and outsourcing have expanded the gap between the rich and the poor in the U.S. They allow technology companies to own more wealth and make low-income people more economically vulnerable. They are both means for capital to reduce costs and increase profit. In their 2021 research, Lima, Barbosa, dos Santos, and de Souza expressed their concerns over the control of the industrial upgrading agenda by a very small number of companies located in a small number of countries. For some, the fact that the expansion of human knowledge, in this case in the form of technological change, is left to profit-maximizing corporations is a problem in and of itself [32].

5. Conclusion

This paper explores the synchronous and reinforcing relationship between industrial-technological upgrading and outsourcing. It aims to explain their combined effects on the expanding economic inequality in the United States since the 1990s. This paper also attempts to answer the question of why the American public views outsourcing as harmful and the culprit of their country's economic inequality. After reviewing past literature, the author verified the positive relationship between industrial-technological upgrading and outsourcing. The author simultaneously found evidence to support the idea that technological unemployment and outsourcing add to economic inequality as they benefit high-tech companies but hurt low-skilled, low-income workers. In the future, wealth inequality contributed by industrial upgrading should be studied in more detail; there are certainly more factors than just outsourcing. It is also possible to study the extent of its impact. With this information in hand, policymakers and researchers can better prescribe the right remedy to alleviate the economic inequality problem in the United States.

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