

The Impact of Artificial Intelligence on the Labor Market

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Abstract

The rapid transformation of artificial intelligence (AI) has drastically improved the modern world, from homes to businesses. It has popularized immensely over the last few years, bringing quick, efficient solutions directly to the fingertips of its users. However, it has also raised concerns. This growth prompts both curiosity and concern about how AI affects the labor market and what should occur to account for the job displacement it might cause, which aligns with the research question this paper is intended to address. After 17 sources were selected largely through thematic categorization, many findings emerged. One reveals that the effect depends on the type of labor in question. Substitutable labor, where AI replaces humans, is generally more computable than complementary labor, where AI works with humans. When humans are pushed out of tasks involving substitutable labor, new opportunities surface that can be fulfilled. Additionally, complementary labor can integrate humans and AI to reach maximal success, and the more computable a country's tasks are, the higher risk there is of job displacement due to AI. This paper has examined and analyzed these findings regarding AI's effect on the labor market, discussing relevant labor types, occupational impact, and significance. In addition, it has discussed plausible solutions such as upskilling and reskilling to adjust to a rapidly changing job environment, complemented by corporate and governmental policies aimed at mitigating job displacement and other negative effects of AI. These are crucial in forming a more stable and manageable labor market in the future.

Keywords: Artificial Intelligence (AI), Labor, Computability, Digitalization, Policy

1. Introduction

1.1 Background and Importance

In recent years, AI has advanced rapidly (Copeland, 2022). It has demonstrated its utility in various forms, from extensive language models to image generators. It accelerates task processes, enhances accessibility to information, and is integral to learning. The onset of the COVID-19 pandemic in 2020 propelled people towards online sources more than ever, accelerating technological advancements (Brem et al., 2021).

These advancements progressed rapidly, resulting in widespread AI integration with human activities. However, AI also raises significant concerns regarding the replacement of human jobs and lack of original work (Lucchi, 2023). As humans progress into a future marked by exponential technological advancements, these possibilities raise a pivotal question: How does artificial intelligence impact the labor market, and what measures should be taken to mitigate job displacement?

While AI has displaced many jobs, it has also facilitated new ones. AI can be effectively integrated into the workplace through proper use and policies targeted to mitigate negative effects. Therefore, it is crucial to comprehend the specific instances of AI's application in the labor force and the essential response to alleviate job displacement. This review aimed to identify AI's influence on the labor market and the measures that must be taken.

1.2 Literature Overview

The shift towards online sources is mainly credited to the COVID-19 pandemic, considered by Brem et al. (2021) and Lucchi (2023). Over the years, these sources have resulted in widespread use of AI, leading to various task classifications and economic impacts based on these classifications, discussed by Acemoglu and Restrepo (2019), Carbonero et al. (2023), Tiku (2023), Karabarbounis et al. (2013), Sipser (2012), and Webb (2020). Its use has also led to conclusions about its efficiency and resulting role in the workplace, considered by Acemoglu and Restrepo (2018), Brynjolfsson et al. (2023), and Oschinski (2023). From these roles and effects in the workplace, workforce adaptation through policy has been emphasized, as described by Pizzinelli et al. (2023), Zahidi et al. (2020), Autor et al. (2019), de Laat (2021), and Zeng et al. (2024). From these pieces of literature, it can be understood how AI affects the labor market and what should take place to alleviate the resulting displacement in the workplace.

The rest of the paper dove into exploring this idea. Section 3 discussed the findings based on the methodology covered in Section 2. This involved AI's occupational impact and ambiguity, focusing on types of labor and resulting task classification and its effect on occupations, computability, and the future. It also described a case study of Lao PDR and Vietnam, centering on the effect of socioeconomic and regional variations on AI adoption in labor. Section 4 discussed these results, considering the purpose of policy as a response to AI, expanding on its focus, and specific actions. Section 5 concluded the paper, summarizing findings and key takeaways.

2. Methods

To initially identify sources for this literature review, Google Scholar was consulted under the following search terms: *Artificial Intelligence*, *Artificial Intelligence and Labor*, *Automation*, *Labor Market*. Most sources came directly from these searches, along with more specific and focused searches regarding the same topics. Chosen sources had to be original and relevant in some aspect to AI, the labor market, or both. Sources after 2018 were prioritized. However, if a source described a more general pattern or concept that remains applicable today, it could still be picked if it was published before 2018.

Sources were picked largely based on thematic categorization and were grouped together based on content. While they were not picked with the intent of comparative analysis, if possible, they were used to complement each other, dispute each other, and fill in any gaps that arose. Although credibility was a large factor in source selection, the existence of a peer-review was not considered.

3. Results

3.1 Types of Labor

Over the years, the human labor share has declined in the United States (Karabarbounis et al., 2013). This is primarily due to the amount of substitutable labor required for tasks, which calls for substituting human workers with AI technology (Webb, 2020). This is often done to raise productivity and reduce costs associated with resources and inputs, leading to workers earning lower wages and sometimes being entirely displaced from their jobs (Acemoglu & Restrepo, 2019).

However, many tasks call for complementary labor, which necessitates collaboration between humans and machines to maximize each's potential and increase efficiency. A country that is already focusing on working towards this type of mutual relationship is Japan, where collaborative systems and ethical guidelines are being utilized to smoothly integrate AI into the labor market (Tiku, 2023).

3.2 AI Functionality

AI models function by detecting patterns and making judgments. They do not rely on specific instructions to perform certain tasks. These models can formulate their output based on existing examples, allowing them to adopt

relevant skills and techniques. AI effectively uses this “tacit knowledge” within many occupations (Brynjolfsson et al., 2023).

3.3 Computability

Currently, “large-language models,” the most notable being ChatGPT, use tacit knowledge. In a 2023 study by Oschinski (2023), ChatGPT was told to perform different tasks and given a rating for each. Much of this study depended on computability, which refers to how effectively a task can be completed according to logical steps and methods. According to computability theory, problems are classified as solvable or unsolvable, particularly by a computer or machine (Sipser, 2012). The study’s results showed that the mean ranking was highest for ‘Working with Computers,’ ‘Information Skills,’ and ‘Management Skills,’ but lowest for less computable and less solvable skills, including ‘Handling and moving,’ ‘Tending plants and crops,’ and ‘Assisting and Caring.’ (Oschinski, 2023). Unlike the highest ranked tasks, which are more computable, the lowest ranked tasks call for increased human oversight. ChatGPT is less effective in executing less computable tasks because it is not equipped with the same feel, touch, or emotion as humans. However, AI can easily manage and work with data because it lacks the need for physical touch, allowing for speed and ease of organization. This type of data can be classified under topics such as natural language processing (Acemoglu & Restrepo, 2018).

3.4 Case Study in Vietnam and Lao PDR

The distribution of computable and non-computable tasks is crucial in determining the possibility of displacement. A recent analysis examined the adoption of AI in Vietnam and Lao People’s Democratic Republic (PDR), highlighting their differences (Carbonero et al., 2023). This study revealed that Vietnam has a higher proportion of computable tasks such as sales and textile machine operations than Lao PDR, which is mainly engaged in subsistence farming, an activity only partially replaceable by AI.

Lao PDR has a 40% share of occupations involving agricultural, forestry, and fishing skills. Compared to Lao PDR, urban Vietnam only holds a 4% share in these occupations (Table 1). Combined with Rural Vietnam, it still only holds a 10.3% share (Table 2). These skills are found within less computable tasks, meaning occupations in this area are less subject to replacement by AI. Conversely, when considering more computable occupations (plant & machine operators & assemblers, services and sales workers), urban Vietnam surpasses Lao PDR, with a 41% share in contrast to Lao PDR’s modest 14% share (Table 1). It still has the upper hand when grouped with Rural Vietnam, with a 25.8% share (Table 2). These numbers reflect Lao PDR’s emphasis on a less automated approach, as its higher percentages in non-computable tasks and lower percentages in computable tasks contrast with those of Vietnam, which uses a more automated approach.

Table 1. The occupational structure in Lao People’s Democratic Republic and Urban Vietnam is represented. Employee amount and share percentage are shown for each. Adapted from Carbonero et al. (2023).

Occupations ISCO 1-digit	Lao PDR		Viet Nam (Urban Areas)	
	Employees	Share	Employees	Share
Armed Forces	53,366	3%	92,632	1%
Managers	189,436	11%	336,762	2%
Professionals	138,341	8%	2,582,741	15%
Technicians and associate professionals	46,110	3%	865,973	5%
Clerical support workers	33,574	2%	589,804	3%
Services and sales workers	180,285	10%	4,695,661	28%
Skilled agricultural, forestry, and fishers	696,720	40%	701,367	4%
Craft and related trades workers	198,077	11%	2,296,696	14%
Plant & machine operators & assemblers	77,375	4%	2,156,798	13%
Elementary occupations	135,366	8%	2,603,557	15%
Total	1,748,650	100%	16,921,990	100%

3.5 Digitalization

The data presented above lead to positive and negative conclusions, emphasizing two types of digitalization: transformative and destructive. Transformative digitalization (represented by sdmSML) describes the emergence of transformative occupations and increased productivity, while destructive digitalization (represented by mSML) indicates the potential risk of worker displacement. Figures 1 and 2 below display Lao PDR and Vietnam's transformative and destructive digitalization levels, reflecting each country's occupation types and concentrations listed in the tables above.

Table 2. The occupational structure in Rural and Urban Vietnam is shown. The combined employee amount, share percentage, and female share percentage are indicated. Adapted from Carbonero et al. (2023).

Occupations ISCO 1-digit	Employees	Share
Armed forces	126,201	0.2%
Managers	554,950	1.0%
Professionals	3,658,961	6.9%
Technicians and associate professionals	1,639,040	3.1%
Clerical support workers	991,888	1.9%
Service and sales workers	8,861,432	16.6%
Skilled agricultural, forestry and fishers	5,470,903	10.3%
Craft and related trades workers	6,826,970	12.8%
Plant & machine operators & assemblers	4,921,601	9.2%
Elementary occupations	20,247,997	38.0%
Total	53,299,943	100%

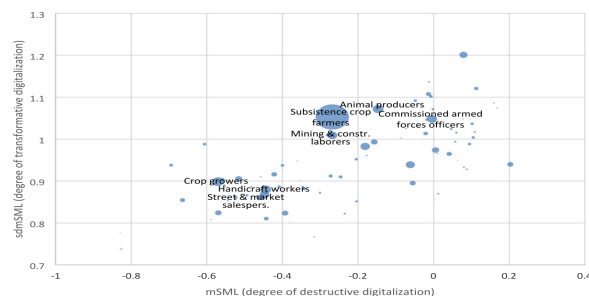


Figure 1: Transformative and destructive digitalization in Lao People's Democratic Republic is displayed.

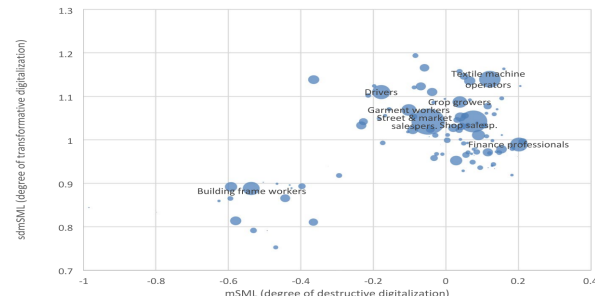


Figure 2: Transformative and destructive digitalization in Vietnam is displayed.

Note: Bubbles are labeled with certain occupations, and their sizes indicate the level of employment in an occupation area (Carbonero et al., 2023).

One large bubble for Lao PDR stands out relative to the others: subsistence crop farming. This means that the highest level of employment for Lao PDR is in subsistence crop farming, a less computable task. On the other hand, three large bubbles stand out relative to the others for Vietnam: street & market sales, shop sales, and textile machine operation. These are much more computable tasks that hold higher levels of employment. These ideas are consistent with the data presented in Tables 1 and 2, and such differences can be attributed to the specific conditions of each country. Additionally, Vietnam has already seen waves of mechanization in its labor market. This makes AI implementation much easier as opposed to Lao PDR, where the lower technological capabilities and state of human capital makes it difficult (Carbonero et al., 2023).

Beyond the differences between each other, both countries differ from regions such as the United States. It is stated that 60% of US occupations could use AI to automate 30% of their tasks, indicating even higher levels of computability (Tiku, 2023). If this was represented like the data for Lao PDR and Vietnam, it would be marked by higher percentages in the table and bigger bubbles in the graph for occupations such as sales and machine operation.

3.6 Policy Purpose & Focus

Policy is essential to mitigate the negative consequences of AI use across various occupations, and it can center around upskilling and reskilling the workforce. Upskilling increases a worker's efficiency within their current position while reskilling exposes workers to new skills that can be applied in many contexts (Zahidi et al., 2020). It aids in targeting substitutable labor more due to a higher possibility of income shocks from vulnerability. On the other hand, it has less of a positive effect on complementary occupations due to the idea that higher labor returns are probable (Pizzinelli et al., 2023).

3.7 Policy Action

Upskilling and reskilling must be facilitated. New and developed skills must be easily accessible as well as provided and paid for by institutions. An effective way to handle these requirements is through increased investment in online education. As of 2011, one-third of college students took one or more online courses during their college careers, three times the number of students who did so in the previous decade. As online education continues to grow in this manner, efficiency will be boosted, accessibility to digital resources will be broadened, and flexibility will increase. Learners can also pace themselves while targeting specific skills relevant to a changing workforce (Autor et al., 2019).

Another approach to help adjust to AI is rebalancing the tax code. For instance, the U.S. tax code focuses primarily on capital and not labor investment, incentivizing firms to focus on human and skill development. Such focus falls especially on lower-skilled workers, promoting the acquisition of widely applicable skills that workers can take into the future (Autor et al., 2019).

A key point within these possible actions is nudging innovation to benefit the nation. To illustrate this, the United States should assist the public and private sectors to ensure technology leads to increased productivity and complementary work alongside humans. Incentivization is crucial in making this happen; policy and regulation should lead firms and corporations to take action to adjust to AI's use in the workplace. (Autor et al., 2019).

When discussing policy, it is also reasonable to revisit the ideas of transformative and destructive digitalization. Companies and governments in all countries, regardless of the amount or type of digitalization based on the factors discussed prior, should have methods for managing them. These include having a governance council for responsible AI like Google, providing an AI ethics course like Telefónica, and more (de Laat, 2021).

Federal action is also being used to address AI in labor. In 2023, the US issued the Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence. It asserts that AI should not be applied in a way that undermines rights, lowers competition in the market, disrupts or harms the labor force, or anything else harmful in the labor market (Zeng et al., 2024).

4. Discussion

4.1 Differences in Labor

Due to a heavy emphasis on collaboration and integration, complementary labor reduces the risk of total displacement of human workers. Within substitutable labor, humans struggle to identify areas where a mutualistic relationship can exist with AI. Given these ideas, complementary labor may emerge as a focal point for human employment.

A shift towards complementarity will necessitate adjustment. The labor market is constantly changing, and this will likely continue for the years to come. For instance, non-substitutable labor may become substitutable over time, as tasks which fall under these types of labor may be redefined over time. It is therefore a necessity for humans to adapt to the changing nature of tasks and acquire new skills by actively seeking out new opportunities, one of which may be employing connection and emotion to identify AI's successes and take them a step further. AI may help increase the success or profit a product could potentially yield, but humans are the ones who sell it. Capitalizing on this idea can allow humans to earn and retain significant roles in the labor market.

4.2 Occupational Effect

While AI significantly diminishes jobs within substitutable labor, it facilitates new ones. Given this dynamic, positive effects can only be achieved through a proper approach and shift in methods which accounts for AI. Here, the application of Joseph Schumpeter's creative destruction can be observed, which states that innovation breaks down older methods and processes while facilitating economic growth. AI may lower the availability of jobs within substitutable labor, but it will raise efficiency and create new jobs in the end.

This kind of adjustment demands recognition of AI's ethical concerns. People who hold jobs, especially those at risk of substitution, experience not only fear, but also a lack of privacy and self-fulfillment, which are exacerbated due to wage inequality and cost-related bias in hiring AI. However, by promoting complementarity and mutualism, workers could feel like they can comfortably and efficiently work alongside AI, improving their job security, emotional stability, and well-being.

4.3 Significance of Computability

The three areas with the highest mean rankings can be explained by the application of computability itself. These have a much higher level of computability than those with the lowest mean rankings (Oschinski, 2023). A large reason for this involves the necessity of human oversight. The lowest ranked areas call for much more of this oversight; AI such as ChatGPT is not equipped with the same feel, touch, or emotion as humans are. Therefore, it is not able to assist, care for, or handle nearly as proficiently as humans would be able to. However, when it comes to areas which do not call for these human aspects, AI can use its unparalleled speed and accuracy to execute at an extremely high level.

4.4 Digitalization

As demonstrated by the case study's results, AI's effect is not identical across different regions. Its potential for and level of use depends greatly on the level of development and economic stage. High-tech AI is not widely employed in developing economies such as Lao PDR due to a limited capital stock, but its potential for adoption can increase nonetheless.

Digitalization is highly reflective of regional and socioeconomic factors. The three most sizable bubbles for Vietnam revolve around industrial and technological methods, which can be carried out by AI just like the computable tasks shown in the table. On the other hand, Lao PDR's biggest bubble is almost entirely agricultural. The three lowest ranked areas in the study involving ChatGPT (working with computers, information skills, and management skills) are present within subsistence farming, meaning that Lao PDR demonstrates a lower level of digitalization in general.

A lower level of AI adoption means less transformation is possible, but also that destruction is less likely, as agricultural methods will be protected from AI. Lao PDR is situated within these agricultural conditions. However, Vietnam finds itself in a position entirely different. Its tasks are rapidly increasing in computability thanks to the methods used within its labor market. While AI adoption is highly valuable to Vietnam's tasks, humans will typically be displaced at a higher rate. This dual effect is a significant reason why Vietnam has a higher level of both transformative and destructive digitalization.

In comparison, as a highly developed country among the leaders of technological innovation, the US has an even higher level of transformative and destructive digitalization thanks to high levels of AI dependency. This has a couple of implications. Firstly, the US itself must be wary of each action it takes regarding AI, as such high levels of digitalization can translate to over-substitution of AI in jobs. Secondly, countries like Lao PDR and even Vietnam can view the US as a way to gauge how to use and not use AI, what kind of practical effects AI and digitalization have, and more.

4.5 The Role of Policy

With effective and applicable policy, AI can contribute to labor without causing disruption. Such actions can lower the level of AI-induced unemployment and manage destructive digitalization in countries such as Vietnam.

Upskilling can be especially useful within complementary labor. As AI becomes commonplace in the labor market, there is a call for elevated skills and techniques promoted through upskilling. On the contrary, reskilling is crucial within substitutable labor. In this case, occupations are filled up by AI, but new openings emerge. Such openings necessitate elevated knowledge and deeper insights, essential focuses of reskilling. Both result in an increase in productivity and will yield more favorable outcomes given AI's existence.

The policy actions as recommended by Autor et al. (2019) connect directly back to these ideas. To promote upskilling, online education can emphasize working alongside AI, the tax code can properly balance human capital and AI investment to find common ground, and nudging innovation can push humans and AI to work together for optimal results. To promote reskilling, online education can expand to extended topics such as advanced machine learning, the tax code can help support the facilitation of new opportunities, and nudging innovation can motivate humans to build on their optimism in new fields. Upskilling and reskilling are the keys to successful policy, and each of the actions mentioned directly support both.

The corporate AI policies and company-wide regulations mentioned in section 3.7 have substantial effects on AI's incorporation into the workplace. However, while they do set the base for proper action, they often fail alone to sufficiently cover a number of safety and labor risks in the workplace as well as sufficiently reduce destructive digitalization. Governmental action such as the executive order can play a large role here, taking the issues that still exist and directly addressing them on a much larger scale. Together, these policymaking methods set out to use AI's transformative nature for proper benefit while also keeping their destructive power regarding labor in check.

5. Conclusion

This paper described how AI affects the labor market and what should be done to mitigate job displacement. This began with labor being identified as substitutable or complementary based on its tasks and their computability. Although substitutable labor is more prone to replacement by AI, complementary labor has many areas that can promote cooperation between humans and machines.

A country like Vietnam, which uses modern technology at a much higher rate and has much more substitutable labor than a mainly agricultural country like Lao PDR, has more opportunities to use AI but also more risk. This means it has higher levels of both transformative and destructive digitalization, and it is critical that AI is overseen and managed.

In this environment, policy can contribute heavily to minimizing harmful labor effects of AI. This can help enhance skills in workers' current positions through upskilling and prepare workers for new opportunities through reskilling. Ways to do so include increasing investment in online education, rebalancing the tax code, and assisting both the public and private sectors to raise innovation and productivity through incentivization. In addition, corporate AI policies and company-wide regulations can be paired with actions such as executive orders to manage the effects of transformative and destructive digitalization.

The findings described helped to clarify the effects of AI on the labor market. To address them, it is important to identify and respond to different types of labor, consider socioeconomic and regional variations, and promote beneficial policies. Together, these could mark a large step toward human-AI coexistence and the opening of many new opportunities in a successful labor market.

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