**A Case Study About Job Displacement and Productivity Effects of Artificial Intelligence**

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## *Abstract*

*Job displacement and productivity effects occur in Artificial Intelligence Revolution, just as they did in past Industrial Revolutions. The lessons learned from previous experiences with these impacts are expected to be applicable in the current circumstance. This report proposes seven policies based on those lessons to prevent occupation losses, enhance job growth and mitigate the negative effects of unemployment.*

## Introduction

The development of artificial intelligence (AI) can improve the performance of several jobs but put some of them at risk of displacement as well. Routine tasks which can be automated or replaced by robots are more vulnerable than non-routine tasks (Autor et al., 2003). The demand in well-paid skilled jobs and low-paid, least-skilled jobs which typically have required non-routine skills are relatively rising, while the demand for middling jobs which typically have required routine skills will decrease (Goos and Manning, 2007). In addition, Acemoglu & Restrepo (2020) argues that the more robots exist in the economy, the lower employment-to-population ratio is, which implicates the more job will be displaced. The recent emerging of Generative AI as well as Large Language Models with the robust capability in dealing with more complex tasks such as processing images, audios and languages can broaden the range of jobs affected by AI (Eloundou et al., 2023), unconstraint in routine but non-routine jobs as well.

On the other side, the application of AI can lead to the development of more related employment as productivity increases, as well as the creation of new jobs that demand labor with new skills (Petropoulos, 2018). For example, applying effectively machine learning models in online advertising can raise the conversion rate which then can lead to demand more staff for production as well as new roles such as AI Engineers, MLOps Engineers or Machine Learning Engineers who are in charge of deploying and maintaining those models. The online working platforms like Uber or e-commerce platforms like Amazon, Ebay can connect suppliers and customers together easily through which increase the overall of employment directly or indirectly. The argument now is that whether the displacement or productivity effect will dominate in the future (Petropoulos, 2018) and what should be done to lower the harmless of these effects.

While the former is still in argue between AI will cause unemployment (Ford, 2015) and technical change will create jobs rather than destroy them in the case of significant demand elasticity and partial AI replacement (Bessen, 2018); regardless of which one become dominant, the outcome is always negative in the transition period. This study will discuss on some solutions to mitigate the negative repercussions of these effects. The report is divided into five sections: the introduction, which explains displacement and productivity effects and states the purpose of the report; the second, which reviews some policies used in previous Industrial Revolutions; the third, which proposes some recommendations; the fourth, which introduces some current policies and practices; and the conclusion.

## Policies against the Industrial Revolutions’ effects in the past

For adapting to the job displacement effect in the previous Industrial Revolution, many effective polices were introduced and applied by governments and policymakers, focusing on three main purposes including:

* *To reduce negative effects on labour causing by job displacement:* introduced social welfare system such as unemployment insurance and other social safety nets to support workers who lost their jobs due to the innovation; passed Labor Laws such as limiting the working hour, abolishing child labour and improving working conditions to protect workers against the industrial changes; regulated minimum wage to ensure that workers were paid fair wages despite of reducing the demand for labour due to the rise in mechanization; formed trade unions and expanded the voting rights for workers to have a greater political voice and be able to protect their rights by themselves; encouraged to immigrate and emigrate labour among countries to solve the shortage and redundancy of resources. (Industrial Revolution Research; n.d.)
* *To create more new jobs for unemployed labour:* invested in infrastructure such as transportation and telecommunication to create new industries as well as new jobs in sectors outside the traditional manufacturing; implemented policies to support the emerging sectors such as engineering, chemical and automotive production to absorb the displaced workers. (Industrial Revolution Research; n.d.)
* *To enhance the capable of adaption to new skill jobs:* changed and expanded the public education system to prepare the workforce with new skills for the generation of industrial economy; invested in vocational training programs to assist workers in transitioning from the declining sectors to the new one; funded research into new technologies which not only drive productivity but also make them more friendly with labour. (Industrial Revolution Research; n.d.)

These policies were effective in the past, so we expect that some of them could be applied to our current AI revolution in protection against the job displacement effect.

## Proposed solutions against AI’s effects

In general, the displacement and productivity effects can be reflected in some variables including the number of displaced jobs or the rate of unemployment, the number of job creations, the declined rate of existing jobs, the growth rate of new jobs. Besides that, the massive loss of jobs can result in many other consequences such as poverty, social stability and crimes. Therefore, when brainstorming about the solution for these effects, we will concentrate on how to change the variables mentioned so far as well as soften the consequences causing by massive unemployment.

Learning from history and adjusting to fit current circumstances, some recommendations are as follows:

* 1. **The purpose of reducing the number of displaced jobs and the declined rate of existing jobs**

The development of AI is considerably faster than the previous industrial revolution, it might be out of our ability to adapt immediately. As a result, we may implement policies to delay the spread of AI applications in the real world, giving us more time to tolerate these changes.

* **Policy 1**: ***Create a universal framework which regulates to what extent organizations can develop their applications related to AI based on their current resources such as human, finance, technology, infrastructure, and ethics guarantee.***
* *Aim*: give more constraints to deploy AI applications, supervise and enhance the control of AI spread
* *Implementation*: require international cooperation, dialogue between governments, organizations and specialists (economists, policymakers, developers, manufacturers) to define what those constraints should be.
* **Policy 2**: ***Apply taxes on AI products tending to replace human partially or completely***
* *Aim*: reduce the investment in AI technology
* *Implementation*: require dialogue between government, policymakers, researchers and organizations to define how that kind of tax should be.
  1. **The purpose of increasing the new-job creation and decreasing the rate of unemployment**

To absorb the redundancy of labour caused by the displacement of declined occupations, we need more alternatives whether new or existing. As a result, we may implement policies to enhance the employment creation in both existing and novel sectors.

* **Policy 3**: ***Invest in digital infrastructures like 5G, cloud computing, AI research center, semiconductors to further expand other industries such as digital device manufacturing, transportation and information technology***
* *Aim*: expand related industries to increase the labor demand
* *Implementation*: cooperation between governments, policymakers, researchers and organizations to build the infrastructure; dialogue with other governments/institutions for funding (if necessary)
* **Policy 4**: ***Invest/Make policies like tax incentives or financial loans to encourage organizations invest in new sectors likely to grow due to AI such as renewable energy, healthcare and AI maintenance.***
* *Aim*: increase job creation
* *Implementation*: cooperation between governments, institutions, policymakers, researchers and organizations
  1. **The purpose of adaptation and softening the consequences of massive unemployment**

In general, previous industrial revolutions indicate that in the near run, the displacement effect may prevail. However, in the long run, when markets and society are fully adjusted to big technological shocks, the productivity effect might dominate and have a beneficial impact on employment (Petropoulos, 2018). Therefore, the faster we can adapt, the less negative effects we suffer. As a result, we may implement policies to push the adaption process forward while reducing the negative effects in the short run in parallel.

* **Policy 5**: ***Expand the public education systems as well as vocational training, both online and offline in order to broadcast the knowledge of new technologies as soon as possible***
* *Aim*: train the present and future labor resources with new skills, improve the ability to adapt to the fast-changing environment
* *Implementation*: cooperation between governments, educational institutions, researchers, and industrial professionals to identify which knowledge should be trained as well as a clear and feasible strategy fitted into the future labor market demand
* **Policy 6**: ***Fund research to better understand how AI works and their impacts on employment and society***
* *Aim*: make AI more transparent and understand other social impacts to be able to adjust the policies more effectively
* *Implementation*: cooperation between governments, institutions, policymakers, researchers, and industrial professionals to do research and deliver outcomes into society
* **Policy 7**: ***Implement social income support for those who lost jobs due to AI expansion, introduce new laws to manage a new kind of employment such as gig platform like Uber and protect labor against unfairness like underpaid for their positions.***
* *Aim*: support losing-job workers and reduce the negative effects of unemployment
* *Implementation*: cooperation between governments, trade unions, policymakers, researchers and individuals to have appropriate responses for the most concerns

## Current practice against AI’s effects

In current, many countries and big-tech companies have practices to react against AI effects, as follows:

* Reskill and Upskill Program:
* *Example*: the European Commission launched their “Pact for Skills” program which aimed to “support public and private organizations with maximizing the impact of their investment in upskilling and reskilling, so they can thrive through the green and digital transitions” (European Commission, n.d.); Amazon’s "Upskilling 2025" Program was launched in 2019 to train their employees new skills which would be updated annually including technical, clouding, machine learning, robotics and so on (Amazon, 2021).
* *Comparison to proposed policies*: these examples can be categorized as Policy 5
* Worker Classification and Rights:
* *Example*: California's AB-5 Law which is a piece of legislation effective in 2020 requiring companies to reclassify independent contractors as their employees including gig workers and app-based drivers (Investopedia, 2024); European Commission’s Directive on Platform Workers which aimed to improve working conditions for people working in digital labour platforms across the EU and enable them to benefit from any labour rights they are entitled to (European Council, 2024).
* *Comparison to proposed policies*: these examples can be categorized as Policy 7
* AI Ethics Framework:
* *Example*: Australia’s AI Ethics Framework, Ethics Guidelines for Trustworthy AI which give guidelines and criterions for the deployment of AI applications (Department of Industry, Science and Resources, 2019; European Commission, 2019).
* *Comparison to proposed policies*: these examples can be categorized as Policy 1

More other actions such as reducing tax incentives for robotics in South Korea or research funding like the Pan-Canadian Artificial Intelligence Strategy were also executed, which can be categorized as Policy 6 and Policy 4 respectively (TaxFitness, 2023; Accenture & CIFAR, 2020).

## Conclusion

In conclusion, AI’s development can cause job displacement but create new occupations at the same time. It changes more rapidly than the previous Industrial Revolution which requires us to adapt more quickly. The lessons against the same effects in the past can be applied to current circumstances with some necessary adjustments. Based on these lessons, this report proposed seven policies with the main purposes of reducing displaced jobs and unemployment rate, increasing the rate of employment creation, enhancing the adaptation ability and softening the negative impact of massive unemployment. Some current practices of countries and organizations are introduced and categorized to the proposed policies as examples of those policies’ implementation. However, this report is limited in some aspects of these effects and the proposals are just in general and theoretical. Further research is encouraged to gain more detailed understanding of the problems as well as more specific and feasible action plans for policies.

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