天津外国语大学(天外)
Tianjin Foreign Studies University (TFSU)

Online class starts at 14:00

(Beijing Time, GMT+8)

Ivan Monich, PhD

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Economic Policy 2023

View of Saint-Petersburg

December 21, 2023

Ivan Monich, PhD (www.Monich.pro)

Class starts at 14:00 (Beijing Time, GMT+8)

How is AI going to change the Economy and Economic Policies?

Microsoft

AI is going to change the economy and economic policies by creating new opportunities and challenges for productivity, employment, income distribution, and social welfare.

Google

“AI is going to change the economy and economic policies by automating tasks, developing new products and services, and improving decision-making.”

Open AI

AI is poised to significantly impact the economy and economic policies by enhancing productivity, automating tasks, and transforming industries, while also necessitating the adaptation of regulations and workforce skill sets.

Baidu

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Artificial intelligence (AI) can have a significant impact on the economy, increasing productivity, creating new jobs, changing the structure of the economy, and requiring changes in economic policy.

A

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B

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C

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文心一言

AI will change the economy and economic policies through increasing productivity, driving innovation, changing consumer behavior, and posing challenges related to social inequality.

How is AI going to change the Economy and Economic Policies?

Microsoft

Google

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Baidu

How is AI going to change the Economy and Economic Policies?

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PaLM2

The image you sent asks the question, "How is AI going to change the Economy and Economic Policies?"

AI is already having a significant impact on the economy, and its influence is only going to grow in the years to come. Here are just a few ways that AI is changing the economy and economic policies:

- **Increased productivity:** AI can automate many tasks that are currently performed by humans, which can lead to significant increases in productivity. This can boost economic growth and create new jobs.
- **New products and services:** AI is also being used to develop new products and services, and to improve existing ones. This can lead to increased consumer spending and economic growth.
- **Improved decision-making:** AI can help businesses and governments make better decisions by analyzing large amounts of data and identifying patterns that would be difficult or impossible for humans to see. This can lead to more efficient and effective use of resources.

Economic policymakers are still grappling with the implications of AI, but there are a few areas where they are likely to focus in the coming years:

- **Education and training:** AI is likely to change the nature of work, so it is important to ensure that workers have the skills they need to succeed in the AI-powered economy. This may require investments in education and training programs.
- **Social safety nets:** As AI automates more jobs, it is important to have social safety nets in place to help workers who are displaced. This may include programs like universal basic income or retraining programs.
- **Competition policy:** AI could give large companies an even greater advantage over smaller ones. Economic policymakers may need to review competition policies to ensure that markets remain competitive in the AI era.

Overall, AI is a powerful tool that has the potential to significantly improve the economy. However, it is important to be aware of the potential challenges as well, and to take steps to mitigate them.

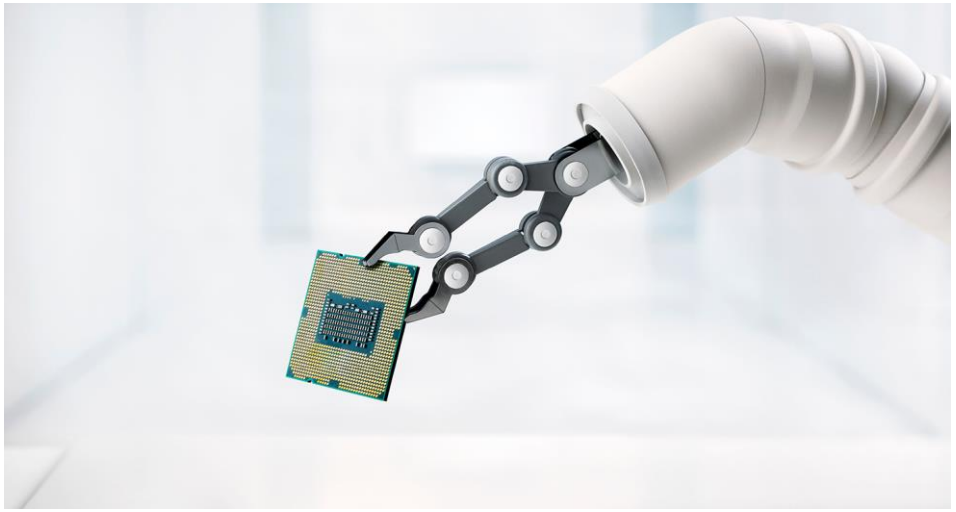
Here are some specific examples of how AI is being used to change the economy and economic policies:

- **AI-powered tax preparation:** AI is being used to develop new software that can automatically prepare tax returns. This could save businesses and individuals a significant amount of time and money.
- **AI-powered fraud detection:** AI is being used to develop new fraud detection systems that can identify fraudulent transactions more quickly and accurately than human-based systems. This could save businesses and governments billions of dollars each year.
- **AI-powered predictive policing:** AI is being used to develop new predictive policing systems that can identify areas where crime is likely to occur. This could help police departments to allocate their resources more efficiently and effectively.

These are just a few examples of the many ways that AI is changing the economy and economic policies. As AI continues to develop, we can expect to see even more innovative and transformative applications in the years to come.

How is AI going to change the Economy and Economic Policies?

We are going to analyze the potential impacts of artificial intelligence on economic growth and productivity, jobs and wages, sectors, government policy and regulation, and geopolitics.

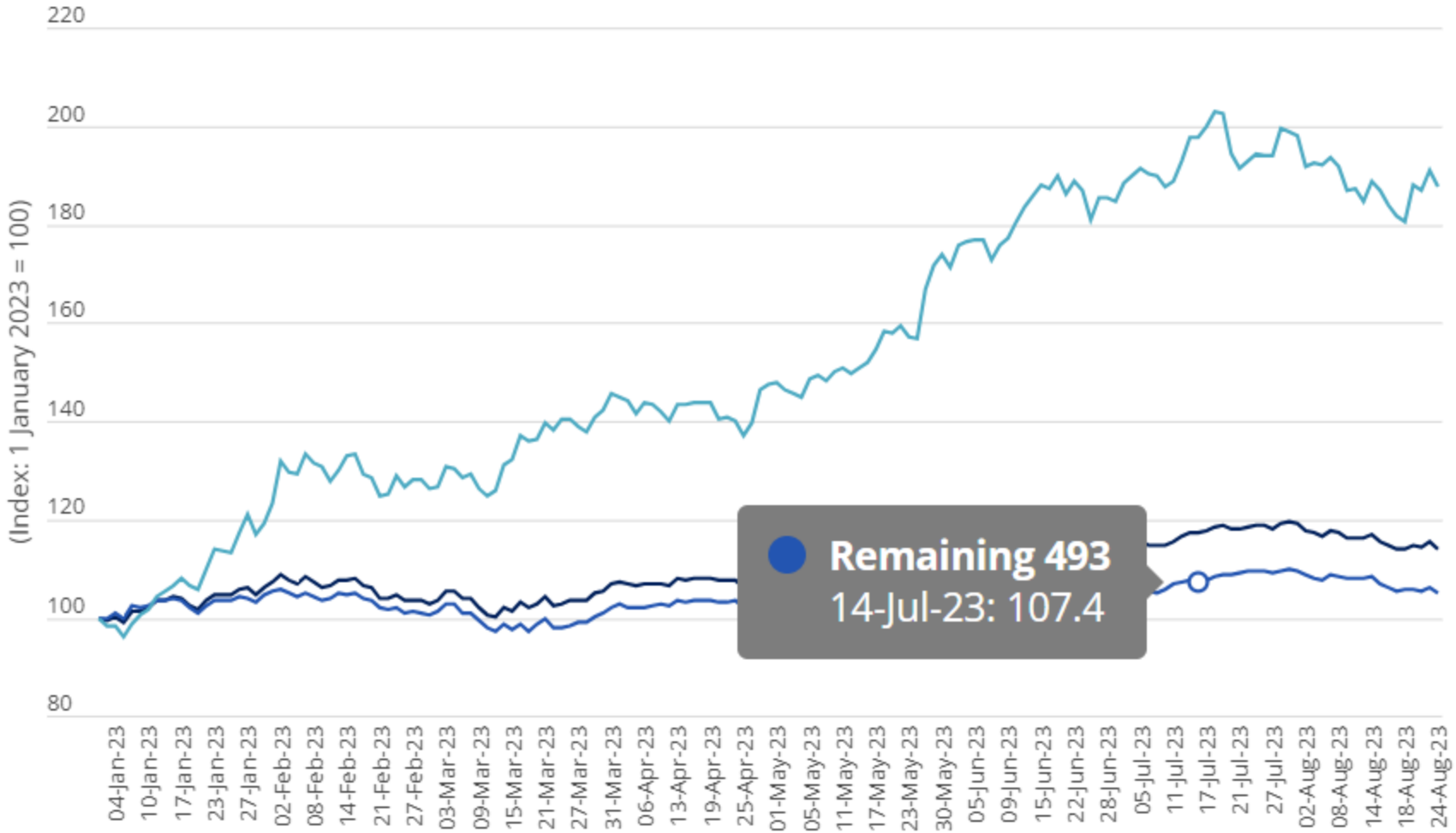


Introduction

The artificial intelligence (AI) revolution is dominating conversations about long-term growth, structural economic change, the types of jobs people will do and the skills they need to have, and the corporate winners and losers from this change.

AI is the simulation of human intelligence by machines, including understanding natural language, making decisions, recognizing patterns, learning from experience, and solving complex problems. This includes machine learning and neutral networks, natural language processing and generative AI, and computer vision and robotics.

Chart 1. US equity market gains during 2023 have been driven by a smaller number of "AI winners"



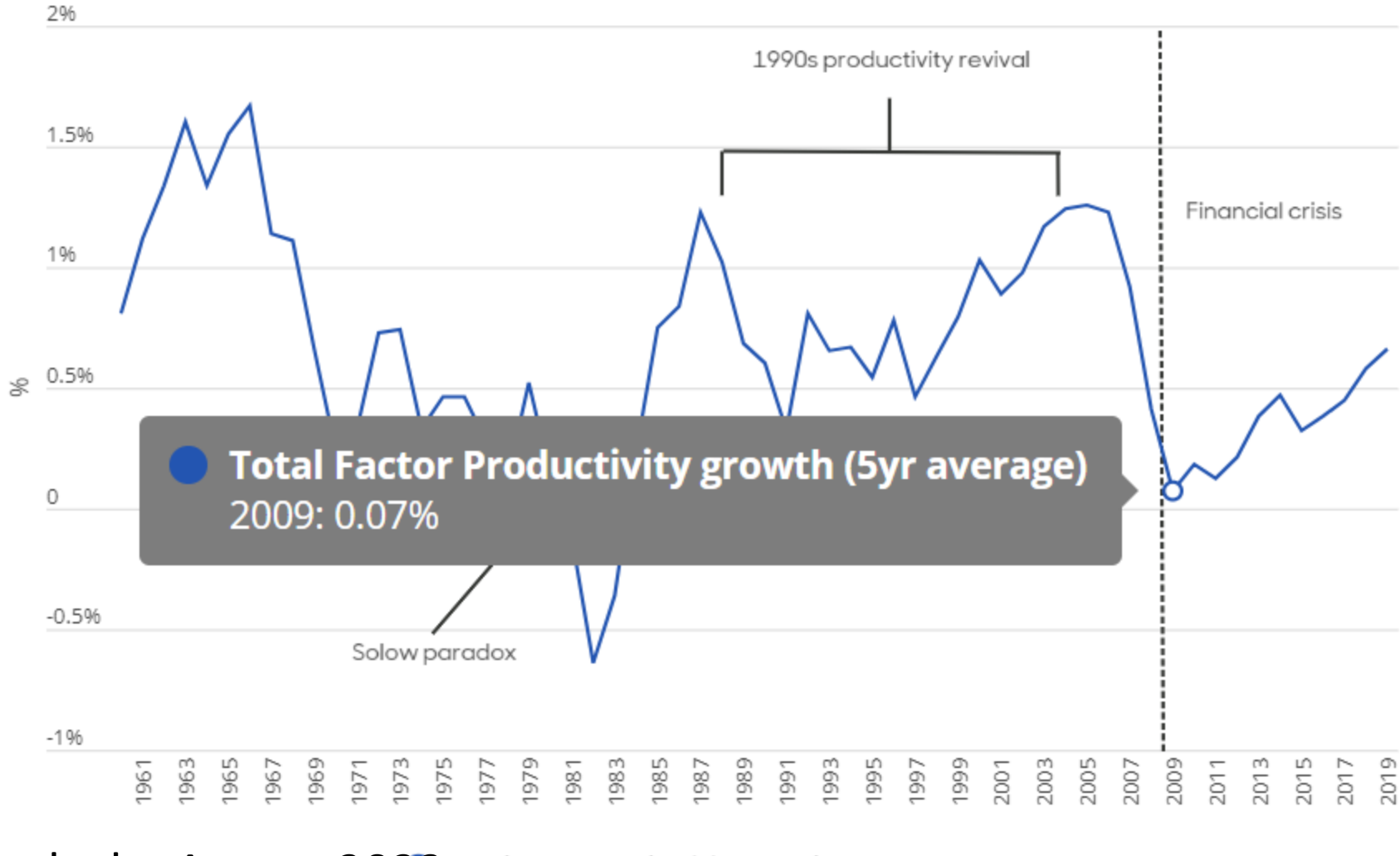
Source: Bloomberg, abrdn, August 2023.

RISE IN PRODUCTIVITY?

Unlocking higher productivity paradigms?

Developed economies have been stuck in a period of low productivity growth since the global financial crisis (Chart 2). This has been attributed to exhausting the low hanging fruit of past innovations, stagnating educational attainment, fewer spillovers from globalization, a more intangible economy, demand deficiency, and a lack of investment, and mismeasurement.

Chart 2. US productivity growth has disappointed since the mid-2000s



Source: Haver, abrdn, August 2023.

RISE IN PRODUCTIVITY?

Meanwhile, technological changes of the past few decades, including smartphones, e-commerce, cloud computing, the internet of things, and now AI, have had limited impact on measured productivity growth. This is not surprising and shouldn’t be extrapolated to mean a productivity boost from AI is not coming.

RISE IN PRODUCTIVITY?

The *Solow paradox* referred to the absence of a measurable productivity boost from the computer revolution (the “Third Industrial Revolution”) of the 1970s and 80s – which then showed up in the 1990s. Before that, electrification and the internal combustion engine in the late 19th century's Second Industrial Revolution didn't show up in the productivity data until after World War I. It takes time for innovations to diffuse into widespread use.

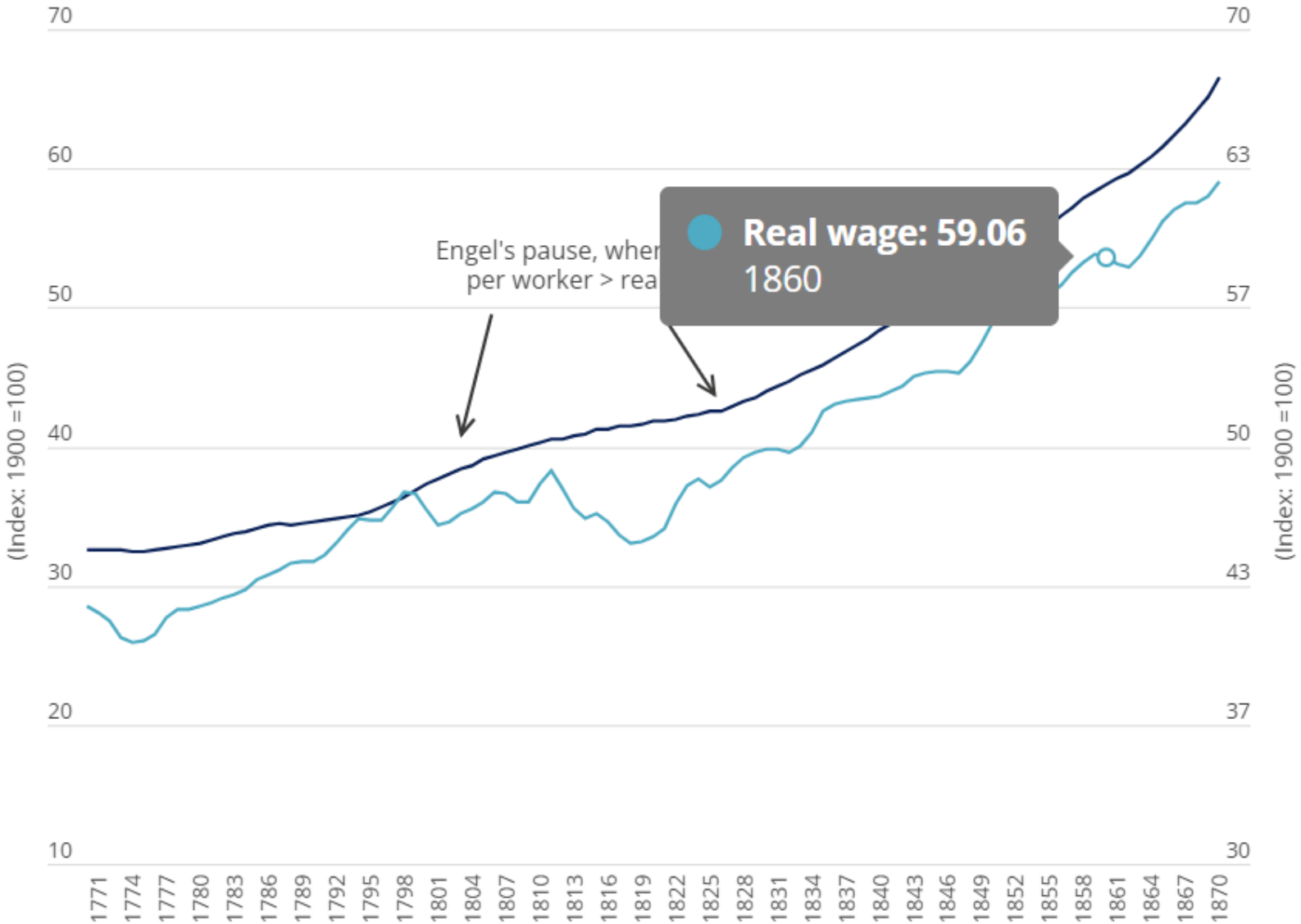
5-minute break

Does higher productivity mean higher wages?

Productivity growth is a necessary rather than sufficient condition for higher real wages. It is possible to have long periods of productivity growth **without an increase in wages.**

This famously occurred during the early First Industrial Revolution, when, from 1800 to 1820, productivity increased as a result of steam power, railways, and the telegram, but real wages stagnated (Chart 3). This period is referred to as Engels' pause, where the gains from higher productivity accrued almost exclusively to the owners of capital.

Chart 3. The Engels' pause saw real wages lag productivity growth during the First Industrial Revolution in England

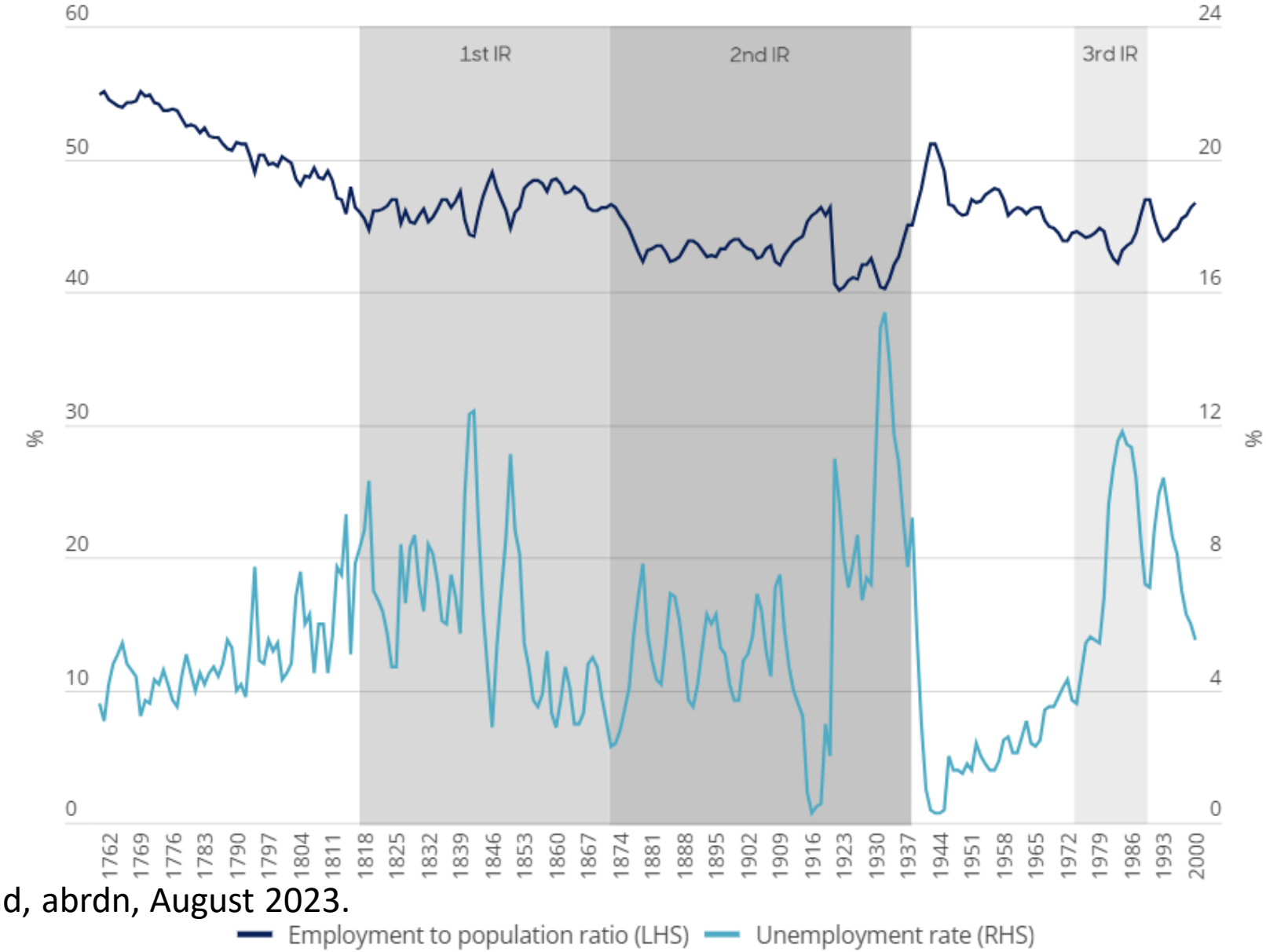


Source: Bank of England, abrdn, August 2023.

Creating new jobs, enhancing existing ones, or replacing humans entirely?

On the labor market front, it is helpful to distinguish between three effects that technological adoption could have on employment: job destruction, productivity enhancement, and job creation. Job destruction is the effect that typically gets the most attention. In particular, there is a growing sense that generative AI will automate white collar, or those considered creative, jobs that were previously thought beyond the reach of machines.

Chart 4. There is little evidence of technological unemployment over the long term



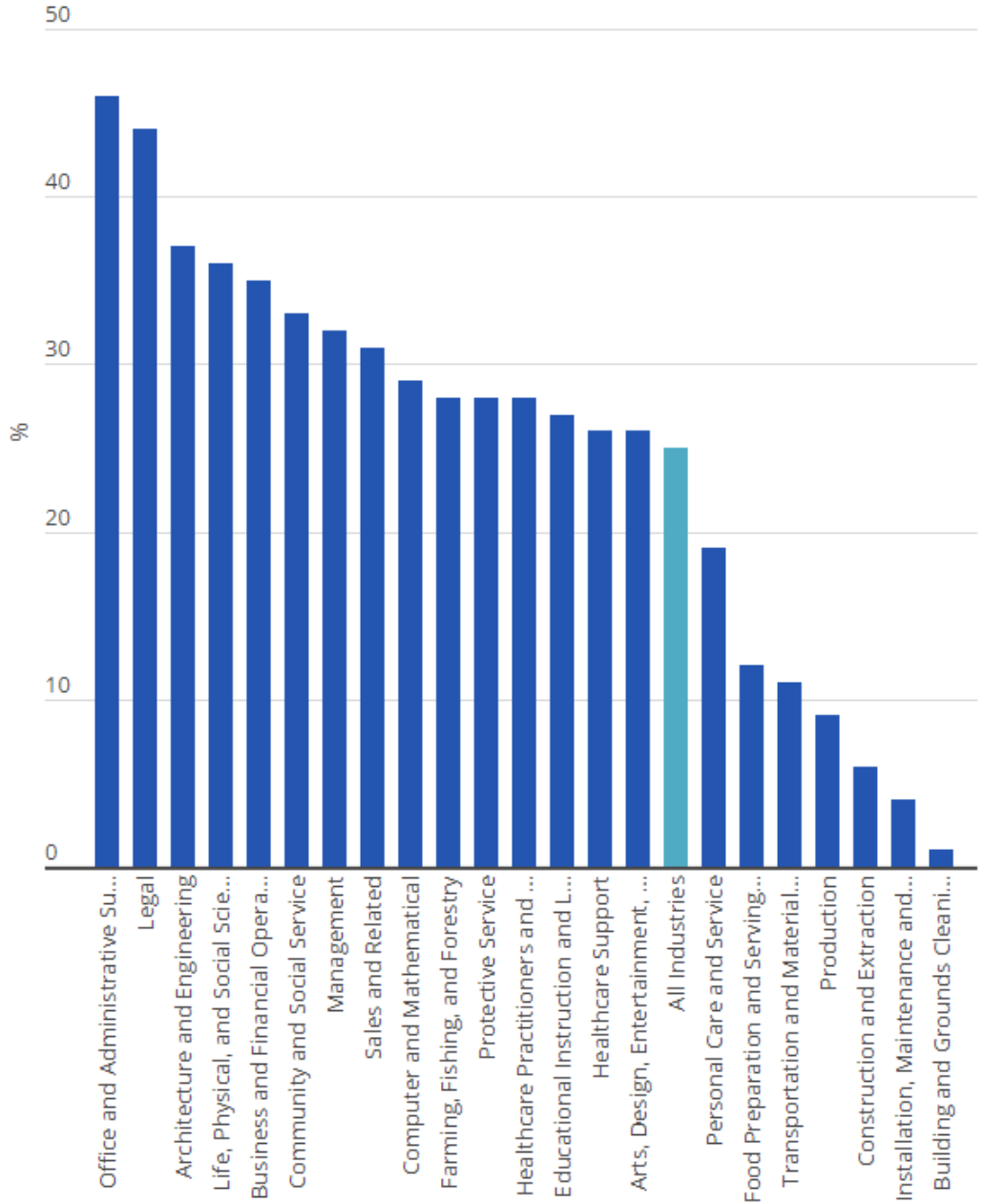
Source: Bank of England, abrdn, August 2023.

Sectoral impacts will not be distributed evenly

Even in the best-case scenario, there will be some sectors severely damaged by AI, while others will benefit hugely. In the near term, we believe the winners will fall within three categories: *enablers* (e.g., chip manufacturers), *scalers* (e.g., tech-platform businesses), and *early adopters* (e.g., software companies).

In the long term, sectoral effects are more speculative and will depend on the way the technologies are regulated. But winners (from the perspective of capital owners) are likely to be sectors with large numbers of knowledge workers like finance; administration-heavy sectors such as education, healthcare, and law; and those with technical but repetitive tasks such as high-end manufacturing. By contrast, labor in these sectors could be under significant pressure (Chart 5). Sectors with a seemingly lower ability to increase productivity using AI may include manual and outdoor labor, the hospitality sector, and personal care.

Chart 5. Estimate of the share of industry employment exposed to automation by AI



Source: Goldman Sachs, August 2023.

Governments and regulators have a lot of catching up to do

The institutional arrangements under which the adoption of AI will take place are crucial. Norms, laws, and taxes all shape the pattern of income and wealth distribution. These social processes are in part endogenous to economic outcomes. Trade unions and friendly societies arising from the First Industrial Revolution were a response to the perceived inequality of the Engels' pause. In turn, those institutions helped bring that period of stagnating living standards to an end.

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Governments and regulators have a lot of catching up to do

Because transformative innovations are by their nature hard to predict, it is unlikely that childhood education systems can equip future workers for all the appropriate skills demanded by the future labor market. Instead, adult education and retraining is likely to be especially important to help workers acquire the necessary skills and help displaced workers find new work. A flexible labor market combined with a generous safety net could be the institutional arrangement that countries gravitate towards.

Higher rates of taxation on capital and even a citizen's income are potential tools to more broadly distribute the gains to capital and ameliorate the potential harm to labor's share of income from AI.

The geopolitical angles

https://www.abrdn.com/en-us/institutional/insights-and-research/how-is-ai-going-to-change-the-economy

APEC Policy Support Unit
POLICY BRIEF No. 52
November 2022

Artificial Intelligence in Economic Policymaking

Asia-Pacific Economic Cooperation

KEY MESSAGES

- Artificial intelligence (AI) refers to systems and models that can perform tasks requiring human intelligence. What distinguishes AI is its capacity for autonomous learning. It could take in the data fed to it and teach itself to, for example, solve mathematical conjectures or to understand native human speech.
- AI is a powerful tool for policymaking and policy implementation, allowing for efficiency enhancements, improvements in quality of public services, and time savings on administrative tasks. AI has applications across the various stages of the policy cycle, from agenda setting to policy formulation, decision making, implementation, and evaluation.
- While AI can be immensely powerful in data analysis and logic, it fares less well on policy-relevant concepts such as fairness, justice and equity, which are inherently human. The ability of AI to make sense of human reality, including understanding causality and cultural nuances, remains inadequate.
- Who develops the AI and how it is developed also pose risks because human factors such as biases, prejudices or experience can influence AI algorithms and models and, ultimately, the results generated. Furthermore, data, which serve as the lifeblood fuelling AI solutions, can be vulnerable to infrastructure limitations, structural biases and ethical concerns.
- AI is already being deployed in policymaking to accomplish specific tasks or analyse large volumes of data. As the technology improves, adoption of AI will increase, and even accelerate. As such, it is imperative to promote its responsible use and to foster the supportive conditions to ensure that it remains a tool for improving human and social welfare. These include: (1) establishing AI governance frameworks, (2) enhancing digital ecosystems, (3) building trust on AI adoption and use, (4) promoting partnerships and collaborations, and (5) leveraging regional cooperation.

"It seems probable that once the machine thinking method had started, it would not take long to outstrip our feeble powers. There would be no question of the machines dying, and they would be able to converse with each other to sharpen their wits. At some stage therefore, we should have to expect the machines to take control […]."

– Alan Turing, 1951

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But Turing's prediction does not need to happen. This policy brief explores how human policymakers can still get ahead of AI and ensure that it remains a tool for the greater good. Section 1 shows how AI is already being used in policymaking and points to its potential for beneficial use in the future. Section 2 follows with a discussion of the limitations and risks of using AI in policymaking, and Section 3 concludes with some policy options and opportunities for regional cooperation to ensure that the AI-enabled future remains human-centric.

1. A Powerful Tool for Good

AI offers many benefits to policymaking and policy implementation through efficiency enhancements, public service quality improvements as well as time savings on administrative tasks.3 AI can be used as a tool to enable policymakers to formulate more effective policies, make better decisions, and improve communication and engagement with stakeholders.4 At each stage of the policy cycle, from agenda setting to policy formulation, decision making, implementation, and evaluation (Figure 1), AI could potentially assist policymakers in generating high-value inputs and creating more meaningful impacts for society.5

[1] A. Davies et al., "Advancing Mathematics by Guiding Human Intuition with AI," *Nature* 600 (2021): 70–74, https://doi.org/10.1038/s41586-021-04086-x;
[2] E. Guizzo, "IBM's Watson Jeopardy Computer Shuts Down Humans in Final Game > Silicon Prevails in Men vs. Machine Challenge," 17 February 2011, https://spectrum.ieee.org/ibm-watson-jeopardy-computer-shuts-down-humans
[3] Organisation for Economic Co-operation and Development (OECD), *Artificial Intelligence in Society* (Paris: OECD Publishing, 2019), https://doi.org/10.1787/eedfee77-en
[4] J. Berryhill et al., "Hello, World: Artificial Intelligence and Its Use in the Public Sector," working paper, OECD Publishing, Paris, 2019, https://doi.org/10.1787/726fd39d-en

1. Agenda Setting
Identify issues and problems

2. Formulation
Develop policy options

3. Decision making
Choose preferred policy

4. Implementation
Execute and administer policy

5. Evaluation
Monitor and assess impacts

1.1. Agenda setting

At the first stage of the policy cycle, AI could support policymakers in determining the most critical challenges affecting their constituents, through analyses of large datasets and crowdsourced data. The patterns revealed by such AI analyses could guide and inform policymakers in setting agenda priorities.

1.1. Agenda setting

Machine learning algorithms have also been used to analyse crowdsourced datasets. Natural language processing techniques have been utilised in Belgium to help civil servants process high volumes of data from stakeholder engagement platforms. 8 The AI technology classifies and analyses data from real-time dashboards to detect trends and uncover insights from these patterns that can be disaggregated across demographic groups and geographic locations. Similarly, in Bulgaria, territorial distributions of signals and data are being analysed to detect behavioural trends and identify issues of concern in urban areas.9

1.2.Formulation

AI could also directly contribute to policy formulation by providing evidence-based insights. At this stage of the policy cycle, the predictive power of AI is a useful and powerful tool that can help in estimating the likely impacts of economic policies, projecting the costs and benefits of policy options and properly identifying the target population. For example, AI and two-level deep reinforcement learning have been used to assess the impact of tax policy designs. 10 That AI framework, named the ‘AI Economist’, has been found to be effective and viable in formulating economic policies. Recent developments have also shown that properly trained machine learning models can rapidly and accurately forecast the impacts of green spending, which aids in crafting more effective fiscal policies.1

1.2.Formulation

AI can offer advanced data analysis by processing both traditional and innovative data sources and helping to ensure inclusive policy interventions are better targeted. For example, the Asian Development Bank (ADB) has used computer vision techniques on satellite imagery to predict and map poverty at a granular level in the Philippines and Thailand, thus providing policymakers with timely poverty data even between household survey cycles.13 The use of AI tools has also been explored in Quebec, Canada for assessing the wellbeing of diverse communities, allowing a more targeted approach in formulating policy interventions.14

1.3. Decision making

The third stage of the policy cycle involves the decision-making process in adopting policy interventions. At the policy formulation stage, AI could serve as a simulator to test and forecast the potential impacts of economic policies; in contrast, at the decision-making stage, AI could be a tool to improve the quality and speed of the daily decisionmaking process in legislative bodies. For example, AI can help provide solutions to issues related to congressional and committee scheduling and in creating optimal models to improve the planning of hearings and the scheduling of votes, which allows the decision-making process in the legislature to be more efficient.15 Members of legislative bodies can also benefit from the use of natural language processing technologies to analyse bills, amendments and laws, and of AI chatbots to ask questions about the status of bills, resolutions and the oversight procedure, which helps policymakers to speed up the decision-making process. 16 Understanding the application of AI at this step is especially important given that an estimated 60 percent of investments in government AI will have a direct impact on real-time operational decisions by 2024.17

1.4. Implementation

Policymakers can benefit from advanced AI systems and hardware in executing policies. Through automation, quick data processing and real-time analysis, the use of AI can lead to improvements in the quality, speed and efficiency of the delivery and implementation of policies. In terms of implementing transport-related policies, the US city of Pittsburgh, Pennsylvania utilised AI technology in its traffic systems to reduce travel time. 19

1.4. Implementation

To improve the maintenance and operation of roads and highways in China, machine learning and data-driven analysis were implemented to enhance defect detection capability, create a road defects management system and classify the defects found.21 In terms of policies related to fraud detection, the Federal Service for Veterinary and Phytosanitary Supervision of Russia has utilised AI technology to reveal counterfeit and falsified food products.22 To reduce the proportion of counterfeits and strengthen the traceability system, the agency developed and implemented an AI-based technology to detect violations across the various stages of the production and movement of food products, by analysing veterinary certificates and processing a large volume of datasets to reveal suspicious patterns of falsifications. This innovation has protected consumers from purchasing potentially dangerous and low-quality products.

https://www.istockphoto.com/se/foto/aerial-view-of-bridge-sea-with-waves-and-mountains-at-sunset-in-lofoten

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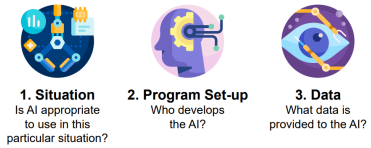
1.5.Evaluation

Policymakers must ensure that the policies they implement are indeed efficient and effective in achieving their desired objectives. AI could advance the evaluation stage of the policy cycle by providing faster and more accurate data that can assess the impact of policies. For example, the World Bank developed machine learning algorithms to quantify and evaluate the impact of trade agreements on trade flows. 23 Some advantages of using AI in international trade research include improved data selection accuracy and the lack of a need for ad hoc assumptions in the aggregation process of individual provisions, providing more accurate and evidence-based analysis of impacts.

2. Understanding the Limitations and Risks



As discussed, AI can and has been used to benefit policymaking in various ways. While AI can have immense power in data analysis and logic, policyrelevant concepts such as fairness, justice and equity are inherently human. Hence, the adoption of AI in policymaking faces its own set of challenges since policies have widespread implications that can affect many human lives. It is also worth emphasising that incorporating AI into policymaking requires more thought and consideration compared to commercial applications: while consumers can generally opt out of commercial AI applications, it is harder for stakeholders to avoid the impacts of policy.

Figure 2: Factors influencing the adoption of artificial intelligence in policymaking

1. Situation
Is AI appropriate to use in this particular situation?

2. Program Set-up
Who develops the AI?

3. Data
What data is provided to the AI?

Box 1: Artificial narrow intelligence (ANI) and artificial general intelligence (AGI)

What many people think of as AI is often ANI, which refers to AI that can outperform a human on a narrowly defined and structured task. Applications based on ANI do not think for themselves but simulate human behaviour based on a set of rules, parameters and contexts that they have been trained for. One example is a chatbot, which accomplishes a customer representative's basic and repetitive tasks and learns from repeated interactions, but cannot do other unrelated activities such as writing a news article or composing music. Thus, while an ANI enhances productivity and efficiency, it is constrained on what it can do.

In contrast, AGI can potentially reason, think and learn just like a human. It could even theoretically have human consciousness or self-awareness, if it is possible to define and code those attributes. Although some ongoing AI research has the goal of creating one, a fully capable AGI has arguably not yet been achieved because of the complexity of the human brain and the challenges of modelling it accurately (e.g., replicating the formation of neural interconnections). At the minimum, AGI should hypothetically have the attributes usually associated with human intelligence such as common sense and abstraction, and different tests to confirm the achievement of AGI have been considered, such as the Turing test.

Current limitations notwithstanding, significant developments such as natural language processing and computer vision, complemented by continuous improvements in computing power, are starting to make AGI less like science fiction and more a real possibility.

Source: Z. Larkin, "General AI v Narrow AI," Levity, 5 October 2022, https://levity.ai/blog/general-ai-vs-narrow-ai

2.2.Program set-up: Who develops the AI?

Moreover, while an effective multidimensional and multisectoral AI development team is necessary for the application of AI to policymaking, teams with diverse skillsets can be susceptible to communication challenges as members with multiple backgrounds can make conflict or miscommunication more likely. For instance, mismatched motivations or insufficient understanding of each other's point of view can make it difficult for teams to communicate using the same 'language' or to relay AI-augmented insights to decision makers.36

1. Design, Data, and Modelling
Strategically process data in preparation for model building and interpretation

4. Operation and Monitoring
Operate and continuously identify issues for model recalibration or termination

2. Verification and Validation
Execute and assess performance against objectives

3. Deployment
Quality checking to adhere with technical and managerial considerations

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1. Situation
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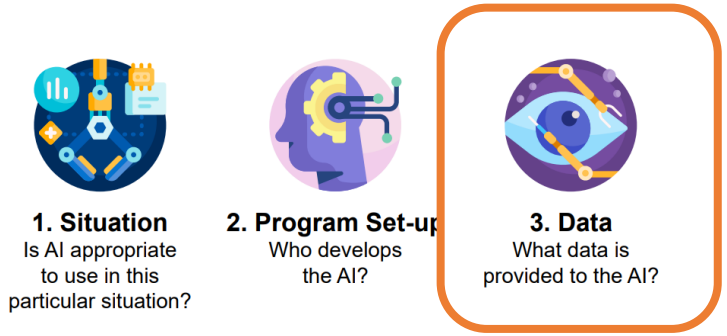
2. Program Set-up
Who develops the AI?

3. Data
What data is provided to the AI?

Another factor influencing AI adoption into policymaking is the program set-up. This involves not only the team responsible for developing the AI but also how it was developed. The development of AI solutions often involves a team composed of data scientists (e.g., programmers, engineers and statisticians) and subject-matter experts (e.g., economists, public health specialists or other specialists).

Challenges can occur at every phase of the AI life cycle, which includes (1) design, data and modelling; (2) verification and validation; (3) deployment; and (4) operation and monitoring (Figure 3). Who develops the AI solution matters because human factors such as biases, prejudices or experience can influence AI algorithms and models and, ultimately, the results, at each stage of the AI life cycle. For example, cognitive biases can be introduced, whether intentional or not, during the crucial phase 1 when policymakers set objectives, data scientists process data, and specialists interpret models. These biases become even more relevant when one considers that the choice of AI model can have different outcomes for various demographic groups even if the same underlying data are used.34

2.3. Data: What data is provided to the AI?



Data serve as the lifeblood fuelling AI solutions. Data are needed for machine learning and for developing AI-formulated solutions. Data, however, can be vulnerable to at least three challenges: (1) infrastructure limitations; (2) structural biases; and (3) ethical concerns.

3. Developing the Policies and Frameworks

AI is starting to be steadily applied to policymaking work, aiding policymakers in accomplishing specific tasks or analysing large volumes of data. As the nascent technologies improve, the role of AI in policymaking would likely gain wider recognition and adoption. However, as with many technologies, AI is not a silver bullet. This is particularly so in the context of policymaking where a decision could have wide-ranging implications on society and the economy. It is thus imperative that there is a supportive environment to promote its responsible use and ensure that AI remains a tool for improving human and social welfare. Some policy approaches that policymakers can consider are discussed below.

3.1.Establish AI governance frameworks

As the earlier sections have clearly articulated, AI is a tool that could be employed to achieve different objectives, depending on the motivation of the users. However, there must be guardrails to ensure its trustworthy, safe and responsible use. Economies could develop AI governance frameworks to provide clarity on its use and ensure that regulatory imperatives are met, while at the same time encourage innovation.

3.1.Establish AI governance frameworks

As operationalising these principles and frameworks could be challenging, economies could consider translating them into practical measures by which users could showcase and deploy their adherence to the principles. Where possible, economies could also provide case studies and examples of how specific users have operationalised the principles in practice. 48 Additionally, governments could encourage the private sector to develop their own self-regulatory mechanisms in the form of, for example, codes of conduct, voluntary standards and best practices.

3.2.Enhance digital ecosystems

What recommendation on the ethics of AI do you consider essential? What principals are important and why?

https://unesdoc.unesco.org/ark:/48223/pf0000377897/PDF/377897eng.pdf.multi

Good quality data is fundamental to AI adoption and use. Data serve as critical inputs for AI-based analysis. Consequently, an enabling digital ecosystem must be in place for data to be collected and analysed. Economies would therefore need to tackle the digital divide at different levels. One would be to ensure universal and affordable material access (such as to smartphones and computers) and access to the internet. Doing so would require economies to, among others, provide incentives such as grants and subsidies to support first-time purchases, work with providers to widen their network coverage, and explore innovative approaches to provide access in underserved areas.

Box 2: UNESCO recommendation on the ethics of AI

The recommendation comprises eight main sections, among them scope of application; aims and objectives; values and principles; areas of policy action; and monitoring and evaluation.

The recommendation aims to provide a universal framework of values, principles and actions to guide economies in the formulation of legislation, policies or other instruments regarding AI consistent with international law. It also aims to foster multi-stakeholder, multidisciplinary and pluralistic dialogue and consensus building on ethical issues related to AI systems.

The recommendation lists and expands on the values and principles that should be respected by all actors in the AI system life cycle. Examples of the values that are included are the importance of ensuring diversity and inclusiveness, and respect, protection and promotion of human rights. Examples of the principles mentioned are safety and security; fairness and non-discrimination; transparency and explainability; and responsibility and accountability.

Importantly, the action-oriented policy chapters elaborate on what economies and various stakeholders should put in place to operationalise the stated values and principles. Policy areas include ethical impact assessment; ethical governance and stewardship; data policy; communication and information; gender; and education and research.

The monitoring and evaluation section notes that economies should use a combination of quantitative and qualitative approaches to credibly and transparently monitor and evaluate policies, programmes and mechanisms related to AI ethics.

Source: UNESCO, "Draft Text of the Recommendation on the Ethics of Artificial Intelligence," 25 June 2021, https://unesdoc.unesco.org/ark:/48223/pf0000377897

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Thank you