Annexes

Annex 1 Key AI-related terms

This report makes reference to several key concepts in AI. To facilitate comprehension of these terms, definitions are provided hereafter.

General versus narrow AI

- **General AI** or artificial general intelligence (AGI) represents a type of AI system that possesses a broad range of capabilities that matches or outmatches humans (Morris et al., 2024). True AGI systems do not yet exist. The concept of AGI remains a visionary goal, but the rapid pace of development of AI hints at the possibilities and potential directions AGI might take.

- **Narrow AI:** Narrow AI refers to a type of AI system that is designed to address specific tasks or solve particular problems. Unlike AGI, which aims for broad capabilities, narrow AI focuses on defined tasks and exhibits expertise within a limited domain. Narrow AI systems are tailored to excel in specific applications or problem domains.

AI technologies

- **Machine learning** is a subset of artificial intelligence (AI) that focuses on the development of algorithms and statistical models that enable computers to perform tasks without being explicitly programmed to do so. In other words, machine-learning algorithms learn from data, identify patterns and make decisions or predictions based on those data.

- **A neural network** is a computational model inspired by the structure and function of the human brain, composed of interconnected nodes, or artificial neurons, organized in layers. Through a process called training, neural networks learn from examples by adjusting the weights of connections to minimize the difference between predicted and actual outputs, thereby enabling them to recognize patterns, make predictions and perform complex tasks across a wide range of domains.

- **Deep learning** is a subset of machine learning that involves training artificial neural networks with many layers of processing units, or neurons, to learn representations of data. The term "deep" refers to the depth of the neural networks, which typically consist of multiple hidden layers between the input and output layers.

- **Large language models** (LLM) are advanced AI systems that are trained on massive amounts of text data to understand and generate human-like language. These models are characterized by their vast size, often containing hundreds of millions to billions of parameters, which enables them to capture intricate patterns and nuances in language.

Supervised versus unsupervised learning

- **Supervised learning** is a machine-learning approach defined by its use of labelled datasets. These datasets are designed to train or "supervise" algorithms into classifying data or predicting outcomes accurately. Using labelled inputs and outputs, the model can measure its accuracy and learn over time.

- **Unsupervised learning** uses machine-learning algorithms to analyse and cluster unlabelled datasets. These algorithms discover hidden patterns in data without the need for human intervention.

In certain AI models, the distinction between supervised and unsupervised learning is more nuanced than in others. For instance, in reinforcement learning, the machine is given only a numerical performance score as guidance, and in weak or semi-supervision models, a small portion of the data are tagged.

Other terms

- **Foundation models** are large-scale, pre-trained models that serve as the basis or foundation for developing more specialized AI applications or models. These foundation models are typically trained on vast amounts of data using techniques such as unsupervised learning. Developers can fine-tune these pre-trained foundation models on specific datasets or tasks to create more specialized AI models tailored to particular applications or domains.

- **Source code** refers to the human-readable instructions written by programmers to define the behaviour, algorithms and models used in AI systems.

- **Artificial Intelligence of Things** (AIoT) refers to the integration of artificial intelligence (AI) technologies with Internet of Things (IoT) devices and systems. AIoT combines the capabilities of AI algorithms with the vast amounts of data generated by IoT devices to create intelligent and autonomous systems.

- **Intelligent automation** combines AI technologies, such as machine learning, computer vision, natural language processing and robotics process automation, to automate and optimize processes, tasks and workflows in various domains and industries.

Annex 2 Technical Appendix on the simulation scenarios

Productivity shocks

The changes projected as a result of AI in labour productivity differ according to skills and sectors,[1] distinguishing between high-skilled, medium-skilled and low-skilled labour.

The size of the productivity shock, or changes to productivity, in the optimistic scenarios is based on a study conducted by Goldman Sachs (2023). The study projects that AI will increase total factor productivity in the United States by 1.5 percentage points annually for 10 years, starting in 2027, 10 years after AI started to transform the technology industry. Since the productivity shock will be phased in over 14 years (2027-40) in the simulation conducted for this report, this implies an approximate shock of 1.06 percentage points per year.

The size of the productivity shock in the cautious scenarios is partially based on Acemoglu (2024), who projects that total factor productivity will go up by 0.66 percentage points in 10 years as a result of AI. However, Acemoglu (2024) follows Svanberg et al. (2024) in assuming that only 23 per cent of AI projects can be profitably implemented. Since a long-term perspective has been employed here, this profitability scaling-down is not applied, which thus leads to a productivity shock of 0.2 percentage points per year.

In the global synergy scenarios, the productivity shocks are applied uniformly across economies. In the tech divergence scenarios, the productivity shocks are applied taking into account variation in the International Monetary Fund (IMF)'s AI Preparedness Index[2] across economies. The IMF's AI Preparedness Index contains indicators of digital connectivity, skills, innovation capacity and regulations. A replicated AI preparedness index was used for this report, based on IMF methodology (Cazzaniga et al., 2024). This implies that low-income economies would benefit less from productivity increases, because they score lower on this index. To scale the productivity increase according to economies' AI preparedness, the productivity shocks calculated for the United States are multiplied by the AI Preparedness Index of each region relative to the United States.

In both the global synergy and tech divergence scenarios, productivity shocks vary by skill level and across economies. The variation by skill level is based on literature identifying which tasks can be automated through AI in the O*NET catalogue[3] of tasks for each occupation. O*NET describes each occupation in terms of various domains, such as work activities or tasks that need to be completed. Both the global synergy and tech divergence scenarios are based on the AI exposure indicator by Eloundou et al. (2023), who use the tasks attributed to occupations by O*NET. They calculate whether the time spent on completing a task can be reduced by 50 per cent or more through the application of ChatGPT or additional AI software, based both on AI and human judgement. Summing over all tasks for each occupation, an AI exposure indicator at the occupation level can be calculated. The AI exposure indicator is then aggregated to the sectoral level using employment data, differentiating by skill level (high, medium and low).[4]

To distinguish the global synergy scenarios from the tech divergence ones, it is assumed that the pattern of productivity increases is on aggregate (economy-wise) reversed between middle-skilled and high-skilled labour.[5] In the global synergy scenarios, productivity increase is higher for middle-skilled workers than high-skilled worker, whereas in the tech divergence scenarios, higher-skilled workers see a higher increase in productivity. However, the sectoral distribution of AI exposure is kept, as well as the relative gap between high-skilled and middle-skilled workers across sectors. Hence, sectors with larger AI exposure of middle-skilled relative to high-skilled workers will continue to exhibit a larger gap compared to sectors where the gap is smaller.

The projections for the level and variation in productivity shocks have been developed for the United States and applied for other economies. However, since productivity shocks vary according to skill and sector, and other regions do not have the same industrial and skill structures as the United States, productivity gains will differ across economies. Regions with a greater proportion of middle-skilled and high-skilled workers, and with a larger presence in sectors with the highest projected productivity shocks, will achieve higher average productivity growth. Also, the degree of convergence between middle and high-skilled workers may differ.

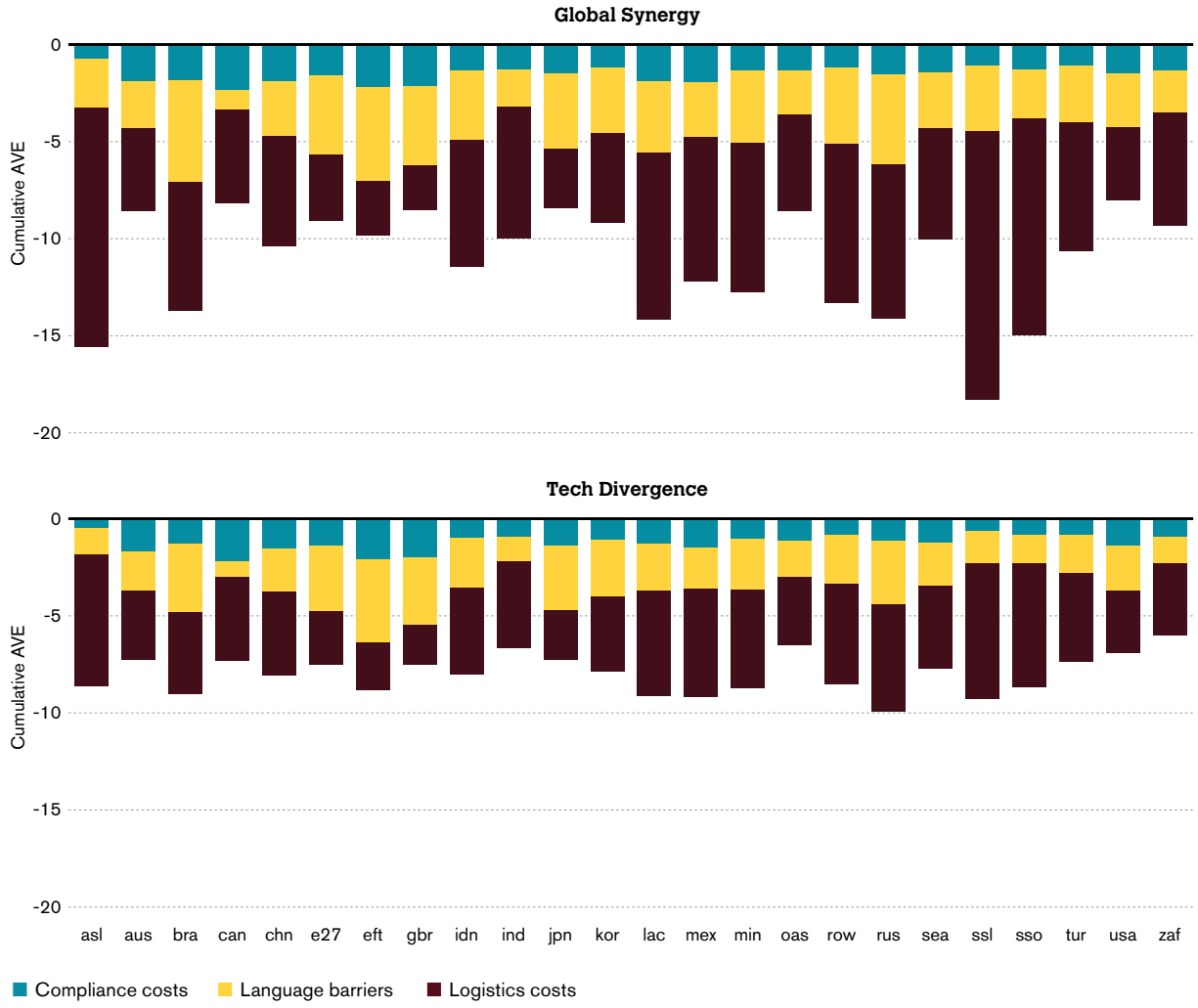
Trade cost shocks

As discussed in Chapter 2, AI is projected to impact trade costs through three channels: diminished compliance costs, reduced language barriers and improved logistics. To gauge the size of the impact, insights from the literature concerning the impact of AI have been considered. According to these estimations, reductions in trade costs can occur per the three channels:

- A reduction in the **costs of compliance with regulations**. To determine the associated trade cost reduction, a measure for compliance costs has been included in a regression of inferred trade costs (employing the Head and Ries (2001) formula) on trade cost proxies. The compliance cost measure employed is the World Bank Group's "Doing Business" indicator, *Documentary compliance to export*, defined as the hours needed to comply with all documentary requirements to export. This generates the ad valorem equivalent trade costs of the documentary compliance. In the counterfactual scenarios, it is assumed that these trade costs fall by 70 per cent. This value is based on a case study of DHL's experience: when using AI-based intelligent document processing to prepare the necessary documentation for international shipments, DHL observed an efficiency gain of 70 per cent.[6] Since costs of documentary compliance are proportional to the time needed to comply, this implies that trade costs can also fall by 70 per cent.

- A reduction in the costs associated with **language barriers** in international trade, since AI will facilitate translation of written and spoken communication. To determine the impact on trade costs, the ad valorem equivalent trade cost associated with a dummy for common official language, as introduced by Melitz and Toubal (2014), was employed. In the regression, spoken common language was controlled for, as this captures the influence of common language on trade and trade costs through, for example, ease in informal communication and building trust in networks. Therefore, it is assumed that trade costs associated with a different official language completely disappear, implying a global a verage ad valorem equivalent trade cost reduction of 2.12 per cent. This is close to the projected trade cost reduction of AI through improved machine translation on eBay in a study by Brynjolfsson et al. (2019), in which ad valorem equivalent implied by the projected trade effect was 2.2 per cent.
- A reduction in **logistics** costs, since AI is expected to reduce the costs associated with logistical planning. To determine the size of the effect, we use the "timeliness" component of the World Bank's Logistics Performance Index (LPI).[7] The LPI reflects the frequency with which shipments are delivered within scheduled or expected delivery times (World Bank, 2023). To capture the potential impact of AI on logistics costs, the difference between the maximum possible value for this indicator (five) and the actual indicator was calculated and included in the regression of inferred trade costs on trade cost proxies. In the counterfactual scenarios, the associated trade cost reduction is 50 per cent, i.e. it is assumed that AI will improve the timeliness of shipments by decreasing delays by half. As developing economies and LDCs tend to have a higher frequency of delays, such an improvement will contribute to convergence effect by reducing the gap in the frequency of delays between these economies and developed economies.

Figure A.1: Cumulative trade cost ad valorem equivalents (%) averaged by importers (2017-40)



Note: Figure A.1 demonstrates projected cumulative ad valorem equivalents of trade cost reductions in the global synergy and tech divergence scenarios by means of compliance, language and logistics. The values are not additive. See Table A.1 for a list of abbreviations for region names.

Source: Simulations using the WTO Global Trade Model

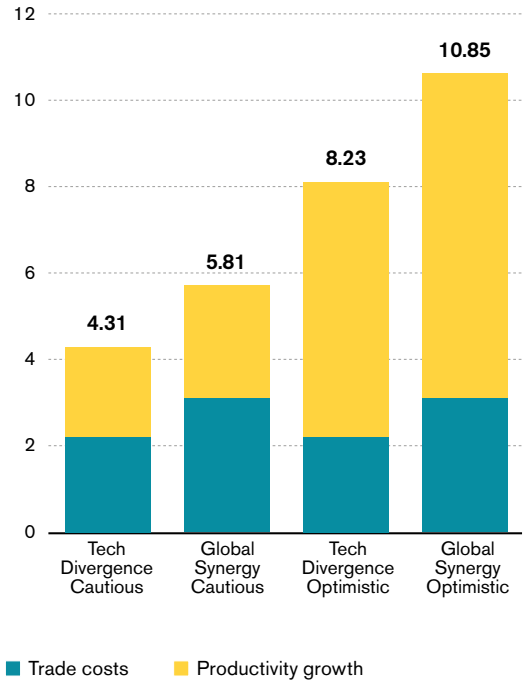
These trade cost shocks are not assumed to vary between the optimistic and cautious scenarios. However, they vary according to whether the global synergy scenarios or the tech divergence scenarios are considered. In the global synergy scenarios, it is assumed that all regions have the same means to implement AI, and that trade cost shocks are therefore identical. In the tech divergence scenarios, the IMF's AI Preparedness Index has been bilateralized and used to scale the trade cost shocks to account for differences in regions' capacity to use AI technologies. It is assumed that trade costs decrease between 2018 and 2040 because some the trends described have already started, such as the reduced costs associated with language barriers referred to in the study of Brynjolfsson et al. (2019).

Figure A.1 displays the projected cumulative trade cost reduction under the global synergy scenario (without considering AI preparedness of economies) and the tech divergence scenario (considering AI preparedness) over the period from 2017 to 2040.[8] The figure clearly shows that the largest projected trade cost reductions will be in LDCs and developing economies. This is because these regions have the greatest potential to leverage AI to lower compliance costs, logistics costs and costs related to language barriers. The largest projected trade cost reduction is expected to come from decreased logistics costs for LDCs and developing economies, while diminishing language barriers play a major role for some developed regions, such as the European Union and the European Free Trade Association (EFTA).

Figure A.2 shows the projected changes in real GDP between 2023 and 2040. In the optimistic global synergy scenario, global real GDP is expected to grow by 11 percentage points compared to the baseline over the period, highlighting the impact of AI in boosting the global economy. The results mirror those for trade, though labour productivity plays a more significant role in driving GDP growth.

Figure A.2: Cumulative global GDP growth rate (2023-40)

(Difference to baseline, percentage points)



Note: This figure demonstrates the impact of AI on projected cumulative global GDP growth (as percentages) between 2023 and 2040 in four scenarios. The values represent the deviation from the baseline scenario.

Source: Simulations using the WTO Global Trade Model

Table A.1: Abbreviations

Regions		Sectors	
AUS	Australia	AGR	Agriculture
OAS	Other Asian countries	OIL	Oil
CHN	China	ONR	Other natural resources
JPN	Japan	PRF	Processed food
KOR	Republic of Korea	TWL	Textiles, wearing apparel and leather
SEA	ASEAN	P_C	Petroleum, coal products
ASL	Asian LDCs	CHE	Chemicals and petrochemicals
IND	India	PRP	Pharmaceuticals, rubber and plastic products
IDN	Indonesia	OTG	Other goods
CAN	Canada	MET	Metals
USA	USA	EEQ	Electronic equipment
MEX	Mexico	ELE	Computer, electronic and optical products
BRA	Brazil	OMF	Other machinery
LAC	Latin America	MVT	Motor vehicles
E27	EU-27	OTN	Transport equipment not elsewhere classified (n.e.c.)
GBR	United Kingdom	UTC	Utilities and construction
EFT	EFTA countries	TRD	Trade
ROW	Rest of World	TRP	Transport
RUS	Russian Federation	WIS	Accommodation, food and services activities
MIN	Middle East and North Africa	WHS	Warehousing and support activities
TUR	Türkiye	CMN	Communication
SSA	Sub-Saharan Africa	OBS	Business Services
SSL	Sub-Saharan LDCs	INS	Insurance
ZAF	South Africa	FIN	Financial Services
		OTS	Other Services
		EDH	Education and human health
		ROS	Recreational and other services

Endnotes

1 In the Global Trade Analysis Project (GTAP) Data Base (https://www.gtap.agecon.purdue.edu/databases/), "off_pros" are mapped to "high-skilled", "tech_aspros", "clerk" and "service_shop" are mapped to "medium-skilled", and "ag_othlowsk" are mapped to "low-skilled".

2 See https://www.imf.org/external/datamapper/datasets/AIPI.

3 A survey-based database of information on jobs and occupations (https://www.onetonline.org/).

4 The skill level of each occupation is based on the International Standard Classification of Occupations (ISCO-08) major groups score per occupation (in which 1-3 are high-skill; 4-8 are medium-skill and 9 are low-skill). This classification is mapped to US Standard Occupational Classification (SOC2018) occupations.

5 It is worth noticing that such an approach does not mean that all sectors will have a larger productivity shock in middle-skill occupations than in high-skill occupations.

6 See https://www.abbyy.com/customer-stories/deutsche-post-dhl-group-increases-efficiency-by-70-with-rpa-and-abbyy-idp/.

7 See https://lpi.worldbank.org/.

8 We assume that trade cost reductions begin earlier, in 2017, compared to the increase in productivity starting in 2023, as empirical evidence suggests that AI has already contributed to lowering logistical and translation costs.

Annex 3 Key Policy and Standard-Related International Initiatives in the Area of AI

I. Policy-related initiatives in the area of AI

A. Organisation for Economic Co-operation and Development (OECD)

In May 2019, the OECD Council adopted the OECD AI Principles (OECD, 2019a), considered to be the first intergovernmental policy instrument in this area (Ebers and Navas Navarro, 2020; Morley et al., 2020). The document includes the following five high level values based principles for responsible AI stewardship:

1) "inclusive growth, sustainable development and well-being";
2) "human-centred values and fairness";
3) "transparency and explainability";
4) "robustness, security and safety"; and
5) "accountability".

The document also provides five policy recommendations intended to guide both national government policies and international cooperation, to be undertaken in a manner consistent with the five AI principles, namely:

1) investing in AI research and development;
2) fostering a digital ecosystem for AI;
3) shaping an enabling policy environment for AI;
4) building human capacity and preparing for labour market transformation; and
5) international cooperation for trustworthy AI.

The OECD AI Principles have been recognized by economies beyond the 38 OECD members. Notably, the G20 AI principles (see below) – which are mostly based on the OECD principles – were adopted by various non-OECD economies, including Brazil, China and India.

The policy recommendations of the OECD Principles suggest elements that, directly or indirectly, may relate to trade and WTO issues. For instance, they refer to the fact that national policies and international cooperation need to include the preparation and use of regulatory instruments, such as technical standards, conformity assessment (certification and verification) and international standards for interoperable and trustworthy AI.

The OECD Principles also propose a common understanding of certain key AI terms. Global agreement over key AI terminology and definitions may be a particularly important element for ensuring coherence and interoperability across economies' regulatory interventions in this area (Meltzer, 2023). The OECD Principles contain various AI definitions, of which two – "AI system"[1] and "AI system lifecycle"[2] – are key for the implementation of any national AI strategy, policy or regulation. As explained in this report, regulatory fragmentation itself can represent an important trade barrier, in particular for developing economies and MSMEs.

In February 2020, the OECD launched the AI Policy Observatory, an inclusive hub for public policy on AI. The AI Policy Observatory aims to help economies encourage and monitor the responsible development of trustworthy AI systems. It is intended to facilitate dialogue and provide multidisciplinary, evidence-based policy analysis and data on areas impacted by AI. For governments, it is also intended to serve as a centre for policy evidence collection and debate, with support from strong partnerships with a wide spectrum of external actors.[3]

B. G20

In June 2019, G20 economies committed to a human-centred AI, and, to this end, adopted non-binding AI Principles.[4] The G20 AI Principles were drawn from the OECD AI Principles described above, which include five high-level principles for responsible stewardship of trustworthy AI and five recommendations for national policies and international cooperation in the area of AI.[5]

Since 2019, the G20 has been implementing aspects of the AI Principles.[6] For instance, to foster knowledge on existing approaches and practices, the G20 launched the "Examples of National Policies to Advance the G20 AI Principles",[7] and the "Policy Examples on How to Enhance the Adoption of AI by MSMEs and Start-ups".[8] AI policy issues were a key issue at the G20 Summit in Rio de Janeiro in November 2024, which focused on the use of AI for sustainable development.

C. Council of Europe

In 2021, the Council of Europe's Committee on AI was tasked to prepare a legally-binding international instrument on the development, design and application of AI, based on the Council's standards on human rights, democracy and the rule of law.[9] These negotiations concluded in 17 May 2024 with the adoption of a "Framework Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law", the first binding international instrument on AI policy. The Framework Convention aims to ensure that activities within the lifecycle of AI systems are fully consistent with human rights, democracy and the rule of law, while being conducive to technological progress and innovation (Council of Europe, 2024). It sets out several fundamental principles related to activities within the AI systems lifecycle, such as human dignity and individual autonomy, equality and non-discrimination, transparency and oversight, respect for privacy and personal data protection, accountability and responsibility, reliability, and safe innovation.

The Framework Convention also sets requirements to ensure the availability of remedies, procedural rights and safeguards, as well as requirements for risk and impact management. It states that its membership is open not only to the members states of the Council of Europe, but also to non-members, under certain conditions.

D. United Nations Educational, Scientific and Cultural Organization (UNESCO)

In November 2021, UNESCO's 193 members adopted the first-ever global policy instrument on AI ethics – a non-binding "Recommendation on the Ethics of Artificial Intelligence" (UNESCO, 2021). The Recommendation is designed to guide the responsible development and application of AI technologies, ensuring that they are aligned with human rights and ethical standards.[10] It provides a set of ten core principles, to be followed by all actors in the AI system lifecycle, that encapsulate a human rights approach to AI, emphasizing the importance of safety, security, privacy, transparency, responsibility, accountability and non-discrimination. It also lays out the following values: "respect, protection and promotion of human rights and fundamental freedoms and human dignity"; "environment and ecosystem flourishing"; "ensuring diversity and inclusiveness"; and "living in peaceful, just and interconnected societies".

The Recommendation also sets out eleven key areas for policy actions which call for the development of international standards to ensure the safety and security of AI systems, achieving accountability and responsibility for the content and outcomes of AI systems, and fostering research at the intersection between AI and intellectual property (IP).

To assist its members in implementing the Recommendation, UNESCO has developed the "Readiness Assessment Methodology" (UNESCO, 2023a), a tool aimed at evaluating preparedness for the ethical deployment of AI.

Like the other AI initiatives described in this section, the Recommendation contains various elements that relate to WTO agreements and issues. For instance, it stresses the need to develop international standards (see Chapter 4(a)(iii) on TBT) as tools to support AI policies, regulations and standards adopted in furtherance of the principles and policy actions proposed by the Recommendation. It also refers to the importance of discussing the intersection between AI and IP (see Chapter 4(b)(iv) on trade-related aspects of intellectual property rights (TRIPS).

E. G7

In May 2023, G7 leaders established the "Hiroshima Process on Generative AI" with the aim of promoting safe, secure and trustworthy AI.[11] In this context, in December 2023, the G7 Digital and Tech Ministers agreed on the Hiroshima AI Process "Comprehensive Policy Framework", which includes "International Guiding Principles for Organizations Developing Advanced AI Systems"[12] and the "International Code of Conduct for Organizations Developing Advanced AI Systems".[13] These documents, which are based on the OECD AI Principles and take into account recent developments in advanced AI systems, aim to promote the safety and trustworthiness of AI systems by providing guidance, in the form of principles and actions, for organizations developing and using the most advanced AI systems.

Several principles of the "International Guiding Principles for Organizations Developing Advanced AI Systems"[14] are particularly relevant for trade. They include: taking appropriate measures to identify, evaluate, and mitigate risks across the AI lifecycle; investing in and implementing robust security controls, including physical security, cybersecurity and insider threat safeguards across the AI lifecycle; advancing the development of and, where appropriate, the adoption of international technical standards; and implementing appropriate data input measures and protections for personal data and IP.

The actions proposed in the "International Code of Conduct for Organizations Developing Advanced AI Systems"[15] include: measures to identify, evaluate and mitigate risks across the AI lifecycle (such as employing diverse internal and independent external testing measures and implementing appropriate mitigation to address identified risks and vulnerabilities); implementing robust security controls, including cybersecurity policies across the AI lifecycle; advancing the development of and, where appropriate, adoption of international technical standards; and implementing appropriate data input measures and protections for personal data and IP. In July 2024, the OECD announced a pilot phase to monitor the application of the G7 Hiroshima Process International Code of Conduct for Organisations Developing Advanced AI Systems.[16] At their October 2024 meeting, Digital and Tech Ministers announced that they would continue to work to develop the Reporting Framework with the aim to advance it by the end of the year, in collaboration with the OECD and the participating organizations.[17]

In the G7 Verona and Trento Ministerial Declaration, adopted in March 2024, beyond advancing these actions under Hiroshima AI Process, G7 economies also expressed their desire to participate in the discussions initiated by the Brazilian G20 Presidency on the specific issue of "AI for sustainable development".

Relatedly, the G7 has played an important role in developing and operationalizing the notion of "Data Free Flow with Trust" (DFFT) (Meltzer, 2023).[18] For example, the G7 Digital Trade Principles provide that "data should be able to flow freely across borders with trust", and call for unjustified obstacles to cross-border data flows to be addressed, on the one hand, and for privacy, data protection, the protection of IP rights, and security, on the other.[19] In April 2023, the G7 agreed to establish the "Institutional Arrangement for Partnership" to operationalize the DFFT concept through principles-based, solutions-oriented, evidence-based, multi-stakeholder and cross-sectoral cooperation (see also Chapter 3(b)(i)) for a discussion of cross-border data flows).[20]

The G7 also recognizes the importance of interoperability between tools for trustworthy AI (such as regulatory and non-regulatory frameworks and technical standards).[21] In this context, the G7 has developed an "Action Plan for Promoting Global Interoperability between Tools for Trustworthy AI" in which G7 economies have pledged to raise awareness of international AI technical standards development efforts, build capacity among stakeholders on ways to actively participate in such processes, and encourage adoption of international AI standards as tools for advancing trustworthy AI.[22]

F. United Nations (UN) AI Advisory Body

In October 2023, the UN Secretary-General formed a high-level AI Advisory Body, composed of experts from government, industry, academia and civil society, to develop a set of recommendations on the international governance of AI.[23] The Final Report of the UN AIAB was published in September 2024 (UN, 2024).

Rather than proposing any single model for AI governance, the UN AI Report outlines five guiding principles for the creation of new AI governance institutions.

The five guiding principles concern:

1) inclusivity (AI "should be governed inclusively, by and for the benefit of all");
2) public interest ("AI must be governed in the public interest");
3) "data governance" ("AI governance should be built in step with data governance and the promotion of data commons");
4) universality ("AI governance must be universal, networked and rooted in adaptative multi-stakeholder collaboration"); and
5) "international law" ("AI governance should be anchored in the UN Charter, International Human Rights Law, and other agreed international commitments such as the Sustainable Development Goals").

The UN AI Report identifies three main governance gaps - representation gaps, coordination gaps, and implementation gaps – and formulates recommendations to "advance a holistic vision for a globally networked, agile and flexible approach to governing AI for humanity, encompassing common understanding, common ground and common benefits to enhance representation, enable coordination and strengthen implementation". Specific recommendations include:

- the creation of an independent international scientific panel on AI, made up of diverse multidisciplinary experts in the field serving in their personal capacity on a voluntary basis.
- the launch of a twice-yearly intergovernmental and multi-stakeholder policy dialogue on AI governance on the margins of existing meetings at the United Nations.
- the creation of an AI standards exchange, bringing together representatives from national and international standard-development organizations, technology companies, civil society and representatives from the international scientific panel.
- the creation of an AI capacity development network to link up a set of collaborating, United Nations-affiliated capacity development centres making available expertise, compute and AI training data to key actors.
- the creation of a global fund for AI managed by an independent governance structure.
- the creation of a global AI data framework that would outline data-related definitions and principles for global governance of AI training data, establish common standards around AI training data provenance and use, and institute market-shaping data stewardship and exchange mechanisms for enabling flourishing local AI ecosystems globally;
- the creation of an AI office within the Secretariat, reporting to the Secretary-General.

G. Bletchley process

In November 2023, the United Kingdom hosted the AI Safety Summit, at which 28 economies and the European Union agreed on the "Bletchley Declaration" on AI Safety. The Summit brought together various governmental and non-governmental stakeholders to discuss how to mitigate the risks posed by AI through internationally coordinated action (UK Government, 2023). The Bletchley Declaration recognizes the urgent need to understand and collectively manage potential risks through a new joint global effort to ensure AI is developed and deployed in a safe, responsible way for the benefit of the global community. It agrees to focus cooperation on identifying common AI safety risks and building a shared scientific and evidence based understanding of these risks, and building respective risk-based policies across countries to ensure safety in light of such risks, collaborating as appropriate while recognising that approaches may differ based on national circumstances and applicable legal frameworks. Indeed, international cooperation is a key tenet stressed throughout the text of the Bletchley Declaration.

As part of the commitment to international cooperation and building a shared scientific and evidence-based understanding of certain AI risks under the Bletchley Declaration, the attending economies also agreed to support the development of an independent and inclusive "State of the Science" Report on "frontier AI".[24] The interim version of this report was published in May 2024.[25] The final version of the Report is expected to be published ahead of the next AI summit, scheduled for February 2025 (UK Government, 2023b).

H. UN General Assembly

In March 2024, the UN General Assembly unanimously adopted a non-binding resolution on seizing the opportunities of safe, secure and trustworthy AI systems for sustainable development (UN AI Resolution).[26] Although certain UN specialized agencies (including UNESCO, as noted above)

have adopted AI-related instruments, this resolution is the first adopted on a UN-wide basis.

The UN AI Resolution establishes a vision that AI systems[27] should be human-centric, reliable, explainable, ethical and inclusive, as well as oriented toward sustainable development. It recognizes the "rapid acceleration" of the design, development, deployment and use of AI systems and their potential to contribute to "accelerating the achievement" of the UN Sustainable Development Goals (SDGs). Consequently, it stresses the "urgency of achieving global consensus" on safe, secure and trustworthy AI systems such as by promoting the following actions:

1) developing regulatory and governance approaches and frameworks;
2) promoting internationally interoperable identification, classification, evaluation, testing, prevention and mitigation of risks of AI systems;
3) developing mechanisms of risk monitoring and management and for securing data across the lifecycle of AI systems;
4) developing internationally interoperable technical tools, standards or practices;
5) respecting IP rights, including copyright protected content;
6) safeguarding privacy and the protection of personal data when testing and evaluating systems;
7) promoting transparency, predictability, reliability, understandability and human oversight of AI systems; and
8) sharing best practices on, and promoting international cooperation in, "data governance" for greater consistency and interoperability, where feasible, of approaches for advancing trusted "cross-border data flows" for safe, secure and trustworthy AI systems.

More broadly, the resolution recognizes that the AI governance is still an "evolving area". As such, it stresses the need for "continued discussions" on possible governance approaches that are "appropriate, based on international law, interoperable, agile, adaptable, inclusive, responsive to the different needs and capacities of developed and developing countries alike and for the benefit of all". In this respect, the resolution calls for AI "regulatory and governance approaches" to be developed based on inputs from many stakeholders, i.e., the private sector, international and regional organizations, civil society, the media, academia and research institutions, technical communities and individuals.

I. World Intellectual Property Organization (WIPO)

From 2019 to 2020, WIPO, as the UN specialized organization dedicated to IP issues globally, held a series of "Conversations" on the impact of AI on IP policy.[28] As discussed in Box 3.2 (Chapter 3) of this report, AI technologies can raise important questions concerning the creation and protection of IP rights. In the WIPO "Conversations", governments and other stakeholders debated and submitted inputs about the most pressing questions likely to face IP policymakers as AI increases in importance. The key points generated from these debates were compiled in a WIPO Secretariat "Issues Paper on Intellectual Property Policy and Artificial Intelligence" (WIPO, 2020). The issues identified in the paper included patents, copyright and related rights, data, designs, trademarks, trade secrets, the technology gap and capacity-building, and accountability for IP administrative decisions.

WIPO has also developed an "AI and IP Clearing House" and an "IP policy toolkit". WIPO's AI and IP Clearing House is a searchable database that "continuously collates and publishes the main government instruments of relevance to AI and IP with the aid of the Member States".[29] The "IP policy toolkit" (WIPO, 2024) is intended to allow policymakers to engage on "how to best shape their AI innovation ecosystem and to structure their future work with a firm understanding of the current state of knowledge".

J. International Telecommunication Union (ITU) (AI for Good platform)

The ITU, in partnership with 40 UN bodies, has convened the "AI for Good" platform, the goal of which is to identify practical applications of AI to advance the UN SDGs. "AI for Good" consists of a year-round online programme and an annual "AI for Good" Global Summit.[30] The ITU has also launched a global AI Repository to identify AI-related projects, research and other initiatives that can accelerate progress towards the SDGs.

II. Standardization in the area of AI

There are significant efforts underway on developing international standards on AI. Such activities are taking place inter alia in the Joint Technical Committee of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC), the ITU and the Institute of Electrical and Electronics Engineers (IEEE) (Meltzer, 2023).

A. ISO/IEC

In 2018, the ISO/IEC Joint Technical Committee (JTC) 1[31] established a subcommittee to work exclusively on AI standardization. As the focal point of standardization on AI within the ISO and IEC, the committee looks at the entire AI ecosystem and provides guidance to ISO and IEC committees developing AI applications. Its work programme comprises standardization in the areas of foundational AI standards, data standards related to AI, big data and analytics, AI trustworthiness, governance implications of AI, testing of AI systems, and ethical and societal concerns (ISO/IEC, 2024).

The ISO/IEC Joint Technical Committee and subcommittee have already published 25 standards on AI[32] and are currently working on developing another 31 AI standards.[33] Among the standards already published are standards on concepts and terminology, risk management and safety of AI systems. The ISO/IEC Joint Technical Committee and subcommittee also published a technical report in 2022, containing an extensive overview on the issue of "ethical and societal concerns" related to AI governance.[34] Standards still under development cover a wide range of new topics such as: "requirements for bodies providing audit and certification of artificial intelligence management systems", "guidance on addressing societal concerns and ethical considerations", "environmental sustainability aspects of AI systems" and "objectives and approaches for explainability and interpretability of ML models and AI systems".

B. ITU

The ITU's Telecommunications Standardisation Sector (ITU-T) has developed various technical standards on AI in the form of frameworks for evaluating intelligence levels of future networks and for data handling, as well as architectural frameworks for machine learning and AI-based networks.[35] The ITU-T is one of the ITU branches that develops international standards in the area of information and communication technologies.[36]

C. Institute of Electrical and Electronics Engineers (IEEE)

The IEEE has developed various standards dealing with socio-technical issues related to AI systems. Among other functions, the IEEE develops international standards on telecommunications, information technology and power-generation products and services.[37] Standards related to AI developed by the IEEE include standards for addressing ethical concerns during system design, for transparency of autonomous systems, and for algorithmic bias considerations.

D. United Nations Economic Commission for Europe (UNECE)

In February 2023, UNECE launched a new project aiming at developing new guidance on digital product regulation focused on regulatory compliance of "products with embedded AI or other digital technologies". The UNECE has historically developed and adopted standards under the "Working Party on Regulatory Cooperation and Standardization Policies" (WP.6) (UNECE, 2024). In the context of the new project, UNECE issued in November 2023 a document proposing various recommendations and approaches on the regulation of AI-embedded products that related to international trade in general, and WTO disciplines in particular, including that:

> "Governments should ensure that regulatory measures applied to products with embedded digital technologies are consistent with the World Trade Organization (WTO) Technical Barriers to Trade (TBT) Agreement. This includes, but is not limited to, the TBT Agreement's obligations pertaining to notification, publication, non-discrimination, avoidance of unnecessary barriers to trade, achievement of legitimate objectives and use of international standards" (UNECE, 2023).

This project is still ongoing, and no outcome has yet been adopted with respect to the proposals in the UNECE November 2023 document.

Endnotes

1 See Chapter 2(a) for the OECD's definition of "AI system".

2 According to OECD AI Principles (2019a), section 1.I, an "AI system lifecycle" involves: "i) 'design, data and models'; which is a context dependent sequence encompassing planning and design, data collection and processing, as well as model building; ii) 'verification and validation'; iii) 'deployment'; and iv) 'operation and monitoring'. These phases often take place in an iterative manner and are not necessarily sequential. The decision to retire an AI system from operation may occur at any point during the operation and monitoring phase".

3 See https://oecd.ai/en/dashboards/overview/policy.

4 See https://www.mofa.go.jp/policy/economy/g20_summit/osaka19/pdf/documents/en/annex_08.pdf.

5 It is important to note, however, that G20 economies did not adhere to the definitional part of the OECD AI Principles (2019), including the definitions of "AI system" and "AI system lifecycle", although they did not expressly reject this part either.

6 See http://www.g20.utoronto.ca/2020/2020-g20-leaders-declaration-1121.html#:~:text=We%2C%20the%20G20%20Leaders%2C%20meeting,century%20for%20all%20by%20empowering; https://www.governo.it/sites/governo.it/files/G20ROMELEADERSDECLARATION_0.pdf, and https://www.mea.gov.in/Images/CPV/G20-New-Delhi-Leaders-Declaration.pdf.

7 See https://g20.utoronto.ca/2020/2020-g20-digital-0722.html.

8 See http://www.g20italy.org/wp-content/uploads/2021/11/Annex1_DECLARATION-OF-G20-DIGITAL-MINISTERS-2021_FINAL.pdf.

9 See https://www.coe.int/en/web/artificial-intelligence/cai.

10 Unlike OECD (2021), the Recommendation does not define "AI". It states that it "does not have the ambition to provide one single definition of AI, since such a definition would need to change over time, in accordance with technological developments. Rather, its ambition is to address those features of AI systems that are of central ethical relevance". Nevertheless, it does provide a broad understanding of what "AI systems" mean, i.e. "systems which have the capacity to process data and information in a way that resembles intelligent behaviour, and typically includes aspects of reasoning, learning, perception, prediction, planning or control".

11 See https://www.soumu.go.jp/hiroshimaaiprocess/en/index.html and https://www.soumu.go.jp/hiroshimaaiprocess/pdf/document01_en.pdf.

12 See https://www.soumu.go.jp/hiroshimaaiprocess/en/index.html.

13 See https://www.mofa.go.jp/files/100573473.pdf.

14 See https://www.soumu.go.jp/hiroshimaaiprocess/en/index.html.

15 See https://www.mofa.go.jp/files/100573473.pdf.

16 See https://www.oecd.org/en/about/news/press-releases/2024/07/oecd-launches-pilot-to-monitor-application-of-g7-code-of-conduct-on-advanced-ai-development.html.

17 See https://assets.innovazione.gov.it/1728987577-final-g7-digital-joint-ministerial-statement-15_10_24.pdf.

18 See https://www.digital.go.jp/assets/contents/node/basic_page/field_ref_resources/390de76d-d4f5-4f45-a7b4-f6879c30c389/0fbffe8a/20231201_en_news_g7_result_00.pdf, https://bmdv.bund.de/SharedDocs/DE/Anlage/K/g7-praesidentschaft-final-declaration-annex-1.pdf, https://www.mofa.go.jp/policy/economy/g20_summit/osaka19/en/documents/final_g20_osaka_leaders_declaration.html and https://www.priv.gc.ca/en/opc-news/speeches/2022/communique-g7-220908/.

19 See https://www.gov.uk/government/news/g7-trade-ministers-digital-trade-principles.

20 See https://www.bundeskartellamt.de/SharedDocs/Publikation/EN/Others/G7_2023_Communique.pdf?__blob=publicationFile&v=2 and https://www.digital.go.jp/assets/contents/node/basic_page/field_ref_resources/390de76d-d4f5-4f45-a7b4-f6879c30c389/0fbffe8a/20231201_en_news_g7_result_00.pdf.

21 See http://www.g7.utoronto.ca/ict/2023-annex5.html and https://www.soumu.go.jp/hiroshimaaiprocess/pdf/document02_en.pdf.

22 See https://www.digital.go.jp/assets/contents/node/basic_page/field_ref_resources/390de76d-d4f5-4f45-a7b4-f6879c30c389/0fbffe8a/20231201_en_news_g7_result_00.pdf.

23 See https://www.un.org/techenvoy/ai-advisory-body.

24 "For the AI Safety Summit at Bletchley Park, frontier AIs were defined as models that can perform a wide variety of tasks and match or exceed the capabilities present in today's most advanced models" – Glossary, Interim Report (page 88).

25 See https://assets.publishing.service.gov.uk/media/66f5311f080bdf716392e922/international_scientific_report_on_the_safety_of_advanced_ai_interim_report.pdf.

26 UN General Assembly (UNGA) Resolution "Seizing the Opportunities of Safe, Secure and Trustworthy Artificial Intelligence Systems for Sustainable Development" (A/78/L.49), adopted on 11 March 2024 (available at https://documents.un.org/doc/undoc/ltd/n24/065/92/pdf/n2406592.pdf).

27 The UN AI Resolution clarifies that its content is limited to AI systems in the "non-military domain". It also clarifies that, for its purpose, the AI "lifecycle" comprises the following stages: "pre-design, design, development, evaluation, testing, deployment, use, sale, procurement, operation and decommissioning" (https://documents.un.org/doc/undoc/ltd/n24/065/92/pdf/n2406592.pdf).

28 See https://www.wipo.int/about-ip/en/artificial_intelligence/conversation.html.

29 See https://www.wipo.int/about-ip/en/frontier_technologies/ai_and_ip.htm.

30 See https://aiforgood.itu.int/

31 ISO and IEC established a joint committee (JTC 1) to coordinate development of digital technology standards in 1987. See JTC 1 (2024).

32 See https://www.iso.org/committee/6794475/x/catalogue/p/1/u/0/w/0/d/0.

33 See https://www.iso.org/committee/6794475/x/catalogue/p/0/u/1/w/0/d/0.

34 See https://www.iso.org/obp/ui/en/#iso:std:iso-iec:tr:24368:ed-1:v1:en.

35 See ITU-T Y.3172 "Architectural framework for machine learning in future networks including IMT -2020" (IMT stands for "International Mobile Telecommunications") (ITU, 2020b); ITU-T Y.3173 "Framework for evaluating intelligence levels of future networks including IMT-2020" (ITU, 2020d); ITU-T Y.3174 "Framework for data handling to enable machine learning in future networks including IMT-2020" (ITU, 2020c); ITU-T Y.3177 "Architectural framework for artificial intelligence-based network automation for resource and fault management in future networks including IMT-2020" (ITU, 2020a).

36 See https://www.itu.int/en/ITU-T/about/Pages/default.aspx.

37 See https://www.ieee.org/about/at-a-glance.html?utm_source=linkslist_text&utm_medium=lp-about&utm_campaign=at-a-glance.

Annex 4 Survey of Academics

Following a literature review, scholars working at the intersection of trade and AI were identified and invited to respond to the following two questions.

1. What are the main challenges that AI poses to the WTO's current rules, principles and practices?
2. How could WTO members ensure such rules, principles and practices remain fit-for-purpose in light of challenges? In your view, may specific rules, principles and practices need to be adjusted, and if so how?

Responses were received from Susan Aaronson (George Washington University; Centre for International Governance Innovation), Dan Ciuriak (Centre for International Governance Innovation), Johannes Fritz (Digital Policy Alert), Olia Kanevskaia (Utrecht University, Department of International and European Law, and Utrecht Centre for Regulation and Enforcement in Europe), Kholofelo Kugler (University of Lucerne; Counsel, Advisory Centre on WTO Law (ACWL)), Heidi Lund (National Board of Trade Sweden), Petros Mavroidis (Columbia Law School), Hildegunn Kyvik Nordås (Council on Economic Policies (CEP), Örebro University), Eduardo Paranhos (Head of AI Work Group at Associação Brasileira das Empresas de Software (ABES)) and Shin-Yi Peng (National Tsing Hua University). Chapter 4(f) reflects these responses.

Bibliography

Aaronson, S.A. (2024a), "Data Disquiet: Concerns about the Governance of Data for Generative AI", SSRN Electronic Journal. Available at https://doi.org/10.2139/ssrn.4784412

Aaronson, S.A. (2024b), "The Age of AI Nationalism and its Effects", SSRN Electronic Journal. Available at https://doi.org/10.2139/ssrn.4803311

Aaronson, S. A. (2019), "Data is different, and that's why the world needs a new approach to governing cross-border data flows", Digital Policy, Regulation and Governance 21(5):441–460. Available at https://doi.org/10.1108/DPRG-03-2019-0021

Aaronson, S. A. (2023), "Building trust in digital trade will require a rethink of trade policy-making", Oxford Review of Economic Policy 39(1):98–109. Available at: https://doi.org/10.1093/oxrep/grac046

Aaronson, S. A. and Leblond, P. (2018), "Another Digital Divide: The Rise of Data Realms and its Implications for the WTO", Journal of International Economic Law 21(2): 245–272. Available at https://doi.org/10.1093/jiel/jgy019

Acemoglu, D. (2024), "The Simple Macroeconomics of AI", NBER Working Paper No. 32487 Cambridge (MA): National Bureau of Economic Research (NBER). Available at https://economics.mit.edu/sites/default/files/2024-04/The%20Simple%20Macroeconomics%20of%20AI.pdf

Agrawal, A., Gans, J. and Goldfarb, A. (2019), The economics of artificial intelligence: An agenda, Chicago: The University of Chicago Press.

Alania, A., Firdaus, A., Callegari, A., Hana, A., Shell, S. and Ohkura, Y. (2022), "Looking Ahead: The Role of Standards in the Future of Artificial Intelligence (AI) Governance", London: University College London.

Alonso, C., Berg, A., Kothari, S., Papageorgiou, C. and Rehman, S. (2022), "Will the AI revolution cause a great divergence?", Journal of Monetary Economics 127:18–37. Available at https://doi.org/10.1016/j.jmoneco.2022.01.004

Altana (2021), "How Value Chain Visibility Protects Crucial Vaccine Supplies", Altana. Available at https://altana.cdn.prismic.io/altana/216c2ef0-51d5-420e-a413-37e6aa991edf_How+Value+Chain+Visibility+Protects+Crucial+Vaccine+-Supplies.pdf

Amodei, D. and Hernandez, D. (2024), "AI and compute", OpenAI. Available at https://openai.com/research/ai-and-compute

Ananny, M. and Crawford, K. (2018), "Seeing without knowing: Limitations of the transparency ideal and its application to algorithmic accountability", New Media & Society 20(3):973–989. Available at https://doi.org/10.1177/1461444816676645

Association of Southeast Asian Nations (ASEAN) (2024), ASEAN Guide on AI Governance and Ethics, ASEAN. Available at https://asean.org/wp-content/uploads/2024/02/ASEAN-Guide-on-AI-Governance-and-Ethics_beautified_201223_v2.pdf

Assad, S., Clark, R., Ershov, D. and Xu, L. (2024), "Algorithmic Pricing and Competition: Empirical Evidence from the German Retail Gasoline Market", Journal of Political Economy 132(3):723–771. Available at https://doi.org/10.1086/726906

Auda-Nepad (2023), "AUDA-NEPAD White Paper: Regulation and Responsible Adoption of AI in Africa Towards Achievement of AU Agenda 2063", DigWatch. Available at https://dig.watch/resource/auda-nepad-white-paper-regulation-and-responsible-adoption-of-ai-in-africa-towards-achievement-of-au-agenda-2063

Autor, D. (2022), "The Labor Market Impacts of Technological Change: From Unbridled Enthusiasm to Qualified Optimism to Vast Uncertainty", NBER Working Paper No. 30074, Cambridge (MA): National Bureau of Economic Research (NBER). Available at https://doi.org/10.3386/w30074

Autor, D. (2024), "Applying AI to Rebuild Middle Class Jobs", NBER Working Paper No. 32140, Cambridge (MA): National Bureau of Economic Research (NBER). Available at https://www.nber.org/papers/w32140

Baldwin, R. (2024), "AI's new skills twist", IMD. Available at https://www.imd.org/ibyimd/artificial-intelligence/ais-new-skills-twist/

Barteková, E. and Börkey, P. (2022), "GHG Emission Trends and Targets (GETT): Harmonised quantification methodology and indicators", OECD Environment Working Paper No. 230, Paris: Organisation for Economic Co-operation and Development (OECD). Available at https://doi.org/10.1787/decef216-en

Begenau, J., Farboodi, M. and Veldkamp, L. (2018), "Big data in finance and the growth of large firms", Journal of Monetary Economics 97:71–87. Available at https://doi.org/10.1016/j.jmoneco.2018.05.013

Bello y Villarino, J. M. (2023), "Money, Power and AI" in Bednarz, Z. and Zalnieriute, M. (eds. 1st). Cambridge (UK): Cambridge University Press. Available at https://doi.org/10.1017/9781009334297

Bonawitz, K., Eichner, H., Grieskamp, W., Huba, D., Ingerman, A., Ivanov, V., Kiddon, C., Konečný, J., Mazzocchi, S., McMahan, H. B., Van Overveldt, T., Petrou,

D., Ramage, D. and Roselander, J. (2019), "Towards Federated Learning at Scale: System Design", Cornell University, arXiv:1902.01046. Available at http://arxiv.org/abs/1902.01046

Borchert, I., Gootiiz, B., Grover Goswami, A. and Mattoo, A. (2017), "Services Trade Protection and Economic Isolation", The World Economy 40(3):632–652. Available at https://doi.org/10.1111/twec.12327

BP (2022), "BP Statistical Review of World Energy", London (UK): BP

Bradford, A. (2023), "Whose AI Revolution?" Project Syndicate. Available at https://www.project-syndicate.org/onpoint/ai-regulation-us-eu-china-challenges-opportunities-by-anu-bradford-2023-09

Brynjolfsson, E., Hui, X. and Liu, M. (2019), "Does Machine Translation Affect International Trade? Evidence from a Large Digital Platform", Management Science 65(12):5449–5460. Available at https://doi.org/10.1287/mnsc.2019.3388

Brynjolfsson, E., Li, D. and Raymond, L. R. (2023), "Generative AI at Work" NBER Working Paper No. 31161 Cambridge (MA): National Bureau of Economic Research (NBER). Available at https://doi.org/10.3386/w31161

Cambridge University (2023), "Voluntary technical standards for AI and robotics", Global AI Governance. Available at https://globalaigov.org/tools/standards.html

Castelvecchi, D. (2016), "Can we open the black box of AI?", Nature 538(7623):20–23. Available at https://doi.org/10.1038/538020a

Cazzaniga, M., Jaumotte, F., Li, L., Melina, G., Panton, A., Pizzinelli, C., Rockall, E. J. and Tavares, M. M. (2024), "Gen-AI: Artificial Intelligence and the Future of Work", International Monetary Fund. Available at https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2024/01/14/Gen-AI-Artificial-Intelligence-and-the-Future-of-Work-542379

Cernat, L. (2023), "The Art of the Mini-Deals: The Invisible Part of EU Trade Policy", Policy Brief No.11/2023, Brussels: European Centre for International Political Economy (ECIPE).

Cesario, A., D'Oria, M., Auffray, C. and Scambia, G. (Eds.) (2023), Personalized medicine meets artificial intelligence: Beyond "hype", towards the metaverse, Switzerland: Springer.

Chen, Z. (2022), "The AI revolution is underway, and this is good news for Customs", WCO News. Available at https://mag.wcoomd.org/magazine/wco-news-99-issue-3-2022/ai-revolution-is-underway/

Ciuriak, D. (2023), "Digital Economy Agreements: Where Do We Stand and Where Are We Going?", in Collins, D. and Geist, M. (eds.). Research Handbook on Digital Trade, Ottawa: Edward Elgar. Available at https://www.e-elgar.com/shop/gbp/research-handbook-on-digital-trade-9781800884946.html

Ciuriak, D. (2024), "Technological Conditions and the Rise and Fall of the Rules-Based System", SSRN Electronic Journal. Available at https://doi.org/10.2139/ssrn.4762228

Council of Europe (2024), Framework Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law, France: Council of Europe. Available at https://rm.coe.int/ai-convention-brochure/1680afaeba

Csernatoni, R. (2024), "Charting the Geopolitics and European Governance of Artificial Intelligence", Carnegie Endowment for International Peace. Available at https://carnegieendowment.org/files/Csernatoni_-_Governance_AI.pdf

Degot, C., Duranton, S., Fredeau, M. and Hutchinson, R. (2021), "Reduce Carbon Costs with the Power of AI", Boston Consultancy Group. Available at https://www.bcg.com/publications/2021/ai-to-reduce-carbon-emissions

Del Giovane, C., López González, J. and Ferencz, J. (2023), "The Nature, Evolution and Potential Implications of Data Localisation Measures", OECD Trade Policy Paper No. 278, Paris: Organisation for Economic Co-operation and Development (OECD). Available at https://doi.org/10.1787/179f718a-en

Dell'Acqua, F., McFowland, E., Mollick, E. R., Lifshitz-Assaf, H., Kellogg, K., Rajendran, S., Krayer, L., Candelon, F. and Lakhani, K. R. (2023), "Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality", SSRN Electronic Journal. Available at https://doi.org/10.2139/ssrn.4573321

Dentons, Spatial Web Foundation and Verses (2023), "The Future of Global AI Governance", Dentons. Available at https://www.dentons.com/en/insights/articles/2023/july/27/-/media/66c05c01a1684bf2aba9a34cc6b6ea96.ashx

Ebers, M. (2024), "Truly Risk-Based Regulation of Artificial Intelligence—How to Implement the EU's AI Act", SSRN Electronic Journal. Available at https://doi.org/10.2139/ssrn.4870387

Ebers, M. and Navas Navarro, S. (2020), Algorithms and law, Cambridge: Cambridge University Press.

Eloundou, T., Manning, S., Mishkin, P. and Rock, D. (2023), "GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models", Cornell University arXiv:2303.10130. Available at http://arxiv.org/abs/2303.10130

Epoch AI (2024), "Affiliation of research teams building notable AI systems, by year of publication", Epoch AI. Available at https://epochai.org/data/epochdb/visualization

European Commission (2022), The Digital Markets Act: Ensuring fair and open digital markets, Brussels: European Commission. Available at https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/digital-markets-act-ensuring-fair-and-open-digital-markets_en

European Commission (2024b), European Data Governance Act, Brussels: European Commission. Available at https://digital-strategy.ec.europa.eu/en/policies/data-governance-act

European Commission, CEPS, ICF and Wavestone (2021), "Study to support an impact assessment of regulatory requirements for Artificial Intelligence in Europe", European Commission Final Report No. D5, Brussels: European Commission (EC) Publications Office. Available at https://data.europa.eu/doi/10.2759/523404

European Parliament (2024), Artificial Intelligence Act, Strasbourg: European Parliament. Available at https://www.europarl.europa.eu/doceo/document/TA-9-2024-0138_EN.html

European Union (2024), EU AI Act, European Union. Available at https://data.consilium.europa.eu/doc/document/PE-24-2024-INIT/en/pdf

Financial Times (2022), "China's chip industry set for deep pain from US export controls", Financial Times. Available at https://www.ft.com/content/e950f58c-0d8f-4121-b4f2-ece71d2cb267

Firooz, H., Liu, Z. and Wang, Y. (2022), "Automation, Market Concentration, and the Labor Share", FRBSF Working Paper No. 2022-05, San Francisco: Federal Reserve Bank of San Francisco (FRBSF). Available at https://www.frbsf.org/economic-research/publications/working-papers/2022/05/

Fritz, J. and Giardini, T. (2024), "Emerging Contours of AI Governance and the Three Layers of Regulatory Heterogeneity", Digital Policy Alert Working Paper No. 24-001, St. Gallen: Digital Policy Alert. Available at: https://ricardo-dashboard.s3.eu-west-1.amazonaws.com/reports/1715797071525_Fritz%20&%20Giardini%20-%20AI%20Governance%20&%203%20Layers%20of%20Regulatory%20Heterogeneity.pdf

Gal, M. and Elkin-Koren, N. (2017), "Algorithmic Consumers", Harvard Journal of Law and Technology 30. Available at https://papers.ssrn.com/abstract=2876201

Gmyrek, P., Berg, J. and Bescond, D., (2023). Generative AI and jobs: A global analysis of potential effects on job quantity and quality. ILO Working Paper, 96. Available at: https://www.ilo.org/publications/genertive-ai-and-jobs-global-analysis-potential-effects-job-quantity-and

Goldfarb, A. and Trefler, D. (2018), "AI and International Trade", NBER Working Paper No. 24254 Cambridge (MA): National Bureau of Economic Research (NBER). Available at https://doi.org/10.3386/w24254

Goldfarb, A. and Tucker, C. (2012), "Shifts in Privacy Concerns", American Economic Review 102(3):349–353. Available at https://doi.org/10.1257/aer.102.3.349

Goldman Sachs (2023), The Potentially Large Effects of Artificial Intelligence on Economic Growth, New York: Goldman Sachs. Available at https://www.gspublishing.com/content/research/en/reports/2023/03/27/d64e052b-0f6e-45d7-967b-d7be35fabd16.html

Gornet, M. and Maxwell, W. (2024), "The European approach to regulating AI through technical standards", Internet Policy Review 13(3). Available at https://doi.org/10.14763/2024.3.1784

Goyens, M. (2020), "Effective Consumer Protection Frameworks in a Global and Digital World", Journal of Consumer Policy 43(1):195–207. Available at https://doi.org/10.1007/s10603-019-09423-2

Head, K & Ries, J. (2001), "Increasing Returns versus National Product Differentiation as an Explanation for the Pattern of U.S.-Canada Trade", American Economic Review, 91 (4): 858–876.

Hill, P. (1999), "Tangibles, Intangibles and Services: A New Taxonomy for the Classification of Output", The Canadian Journal of Economics / Revue Canadienne d'Economique 32(2):426. Available at https://doi.org/10.2307/136430

Holmes, C. (2024), "How upcoming legislation will harness algorithms, AI, and big tech for public good", Finextra. Available at https://www.finextra.com/the-long-read/933/how-upcoming-legislation-will-harness-algorithms-ai-and-big-tech-for-public-good

Holzer, K. (2019), "Addressing Tensions and Avoiding Disputes: Specific Trade Concerns in the TBT Committee", Global Trade and Customs Journal 14(3):102–116. Available at https://doi.org/10.54648/GTCJ2019011

Horn, H., Mavroidis, P. C. and Wijkström, E. N. (2013), "In the Shadow of the DSU: Addressing Specific Trade Concerns in the WTO SPS and TBT Committees", Journal of World Trade 47(4):729–759. Available at https://doi.org/10.54648/TRAD2013024

Hoyer Gosselink, B., Brandt, K., Croak, M., DeSalvo, K., Gomes, B., Ibrahim, L., Johnson, M., Matias, Y., Porat, R., Walker, K. and Manyika, J. (2024), "AI in Action: Accelerating Progress Towards the Sustainable Development Goals", Google Research Brief, San Francisco: Google. Available at https://static.googleusercontent.com/media/publicpolicy.google/en//resources/research-brief-ai-and-SDG.pdf

Hunt, K. (2020), "Safer Connected Consumer Products", ASTM International. Available at https://sn.astm.org/features/safer-connected-consumer-products-mj20.html

International Electrotechnical Commission (IEC) (2023), What are the latest tech trends?, Geneva: IEC. Available at https://www.iec.ch/taxonomy/term/411

Institute of Electrical and Electronics Engineer (IEEE) (2023), Algorithmic Bias Considerations, New Jersey: IEEE. Available at https://standards.ieee.org/ieee/7003/11357/

International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD), World Bank and World Trade Organization (WTO) (2023), Digital Trade for Development, Washington, D.C., Paris and Geneva: IMF, OECD, World Bank and WTO. Available at https://www.wto.org/english/res_e/booksp_e/dtd2023_e.pdf

Intellectual Property Repository (2023), Judgment of the first case of copyright infringement of AI-generated images, Intellectual Property Rights. Available at https://mp.weixin.qq.com/s/Wu3-GuFvMJvJKJobqqq7vQ

International Business Machines Corporation (2024), "IBM Global AI Adoption Index 2023", IBM. Available at https://www.multivu.com/players/English/9240059-ibm-2023-global-ai-adoption-index-report/

International Energy Agency (2024), "Electricity 2024", Paris: International Energy Alliance. Available at https://www.iea.org/reports/electricity-2024

International Telecommunications Union (ITU) (2020a), Architectural framework for artificial intelligence-based network automation for resource and fault management in future networks including IMT-2020, Geneva: ITU. Available at https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=14598

International Telecommunications Union (ITU) (2020b), Architectural framework for machine learning in future networks including IMT-2020, Geneva: ITU. Available at https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=13894&lang=en

International Telecommunications Union (ITU) (2020c), Framework for data handling to enable machine learning in future networks including IMT-2020, Geneva: ITU. Available at https://www.itu.int/ITU-T/recommendations/rec.aspx?id=14134&lang=en

International Telecommunications Union (ITU) (2020d), Framework for evaluating intelligence levels of future networks including IMT-2020, Geneva: ITU. Available at https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=14133

International Telecommunications Union (ITU) (2023), Global Offline population steadily declines to 2.6 billion people in 2023, Geneva: ITU. Available at https://www.itu.int/itu-d/reports/statistics/2023/10/10/ff23-internet-use/acts and Figures 2023 - Internet use (itu.int)

International Telecommunications Union (ITU) and United Nations Educational, Scientific and Cultural Organization (UNESCO) (2013), The State of Broadband 2013: Universalizing Broadband, Geneva: ITU and UNESCO. Available at https://unesdoc.unesco.org/ark:/48223/pf0000223620.locale=en

Ishai, G., -B., Dean, J., Manyika, J., Porat, R., Varian, H., and Walker, K. (2024), "AI and the Opportunity for Shared Prosperity: Lessons from the History of Technology and the Economy", Cornell University arXiv:2401.09718. Available at https://doi.org/10.48550/arXiv.2401.09718

Jones, E. (2023), "Digital disruption: Artificial intelligence and international trade policy", Oxford Review of Economic Policy 39(1):70–84. Available at https://doi.org/10.1093/oxrep/grac049

Jones, E., Kira, B. and Tavengerwei, R. (2024), "Norm Entrepreneurship in Digital Trade: The Singapore-led Wave of Digital Trade Agreements", World Trade Review 23(2):208–241. Available at https://doi.org/10.1017/S1474745624000089

International Standards Organization (ISO) and International Electrotechnical Commission (IEC) Joint Technical Committee 1 (2024), ISO and IEC Joint Technical Committee, Geneva: ISO and IEC. Available at https://jtc1info.org/

Judge, B., Nitzberg, M. and Russell, S. (2024), "When code isn't law: Rethinking regulation for artificial intelligence", Policy and Society, puae020. Available at https://doi.org/10.1093/polsoc/puae020

Karttunen, M. B. (2020), Transparency in the WTO SPS and TBT Agreements: The real jewel in the crown, Cambridge: Cambridge University Press.

Kerry, C. F. (2024), "Small Yards, Big Tents: How to Build Cooperation on Critical International Standards", Brookings Institute (Governance Studies), Washington DC: Brookings Institute. Available at https://www.brookings.edu/wp-content/uploads/2024/03/GS_03062024_standards-report.pdf

Kilic, B. (2024), "Into Uncharted Waters: Trade Secrets Law in the AI Era" Centre for International Governance Innovation (CIGI) Paper No- 295, Waterloo: CIGI. Available at https://www.cigionline.org/static/documents/no.295.pdf

Klein, E. and Stewart, P. (2024), "Envisioning a Global Regime Complex to Govern Artificial Intelligence", Carnegie Endowment for International Peace, Washington DC: Carnegie Endowment for International Peace. Available at https://carnegieendowment.org/files/Klein_Patrick_AI_Regime_Complex.pdf

Krummenacher, P. (2023), "International Trade and Artificial Intelligence: Is trade policy ready for Chat GPT?" International Institute for Sustainable Development (IISD). Available at https://www.iisd.org/articles/policy-analysis/international-trade-artificial-intelligence-chatgpt

Lam, R., Sanchez-Gonzalez, A., Willson, M., Wirnsberger, P., Fortunato, M., Alet, F., Ravuri, S., Ewalds, T., Eaton-Rosen, Z., Hu, W., Merose, A., Hoyer, S., Holland, G., Vinyals, O., Stott, J., Pritzel, A., Mohamed, S. and Battaglia, P. (2023), "GraphCast: Learning skillful medium-range global weather forecasting", Cornell University arXiv:2212. 12794. Available at https://doi.org/10.48550/ARXIV.2212.12794

Lee, S. (2024), "The Impact of Artificial Intelligence on Small Businesses", Harvard Model Congress Boston. Available at https://static1.squarespace.com/static/5cb7e5637d-0c9145fa68863e/t/6549741749fcc212c2826d2c/1699312663764/HMC2024_Senate_SBE_1.pdf

Lee-Makiyama, H. (2018), "Briefing note: AI & Trade Policy", Tallinn Digital Summit, Tallinn: Tallinn Digital Summit. Available at https://ecipe.org/wp-content/uploads/2018/10/TDS2018-BriefingNote_AI_Trade_Policy.pdf

Lim, A. H. (2021), "Trade Rules for Industry 4.0: Why the Technical Barriers to Trade Agreement Matters Even More", in Peng, S., Lin, C-F., Streinz, T., Artificial Intelligence and International Economic Law, Cambridge: Cambridge University Press. Available at https://doi.org/10.1017/9781108954006.006

Lin, C.-F. (2021), "Public Morals, Trade Secrets, and the Dilemma of Regulating Automated Driving Systems" in Peng, S., Lin, C-F., Streinz, T., Artificial Intelligence and International Economic Law, Cambridge: Cambridge University Press. Available at https://www.cambridge.org/core/product/identifier/9781108954006%23CN-bp-5/type/book_part

Liu, H. W. and Lin, C. F. (2020), "Artificial Intelligence and Global Trade Governance: A Pluralist Agenda", Harvard International Law Journal 61(2).

López-González, J., Sorescu, S. and Kaynak, P. (2023), "Of bytes and trade: Quantifying the impact of digitalisation on trade", OECD Trade Policy Paper No. TAD/TC/WP(2022)11/FINAL, Paris: Organisation for Economic Co-operation and Development (OECD). Available at https://one.oecd.org/document/TAD/TC/WP(2022)11/FINAL/en/pdf

Luintel, K. B. and Khan, M. (2009), "Heterogeneous Ideas Production and Endogenous Growth: An Empirical Investigation", The Canadian Journal of Economics 42(3): 1176–1205.

Lund, B. D., Wang, T., Mannuru, N. R., Nie, B., Shimray, S. and Wang, Z. (2023), "ChatGPT and a New Academic Reality: Artificial Intelligence-Written Research Papers and the Ethics of the Large Language Models in Scholarly Publishing", Journal of the Association for Information Science and Technology 74(5):570–581. Available at https://doi.org/10.1002/asi.24750

Manyika, J., Lund, S., Bughin, J., Woetzel, J., Stamenov, K. and Dhringra, D. (2016), "Digital Globalization: The New Era of Global Flows", McKinsey Global Institute. Available at https://www.the-digital-insurer.com/wp-content/uploads/2016/06/709- mgi_digital_globalization.pdf

Maskus, K. and Reichman, J. (2004), "The Globalization Of Private Knowledge Goods And The Privatization Of Global Public Goods", Journal of International Economic Law 7(2):279–320.

Maslej, N., Fattorini, L., Perrault, R., Parli, V., Reuel, A., Brynjolfsson, E., Etchemendy, J., Ligett, K., Lyons, T., Manyika, J., Niebles, J. C., Shoham, Y., Wald, R. and Clark, J. (2024), "The AI Index 2024 Annual Report", Institute for Human-Centered AI, Stanford: Stanford University.

Mavroidis, P. (2016), The Regulation of International Trade, Cambridge (MA): MIT Press.

Mayer-Schönberger, V. and Ramge, T. (2018), Reinventing capitalism in the age of big data (eds.), London: Basic Books.

McDaniels, D., Molina, A. C. and Wijkström, E. (2018), "How Does the Regular Work of WTO Influence Regional Trade Agreements?" WTO Working Paper No. 2018/06, Geneva: World Trade Organization (WTO). Available at https://doi.org/10.30875/10cbd249-en

McKinsey (2022), "Localization of data privacy regulations creates competitive opportunities", Mckinsey. Available at https://www.mckinsey.com/capabilities/risk-and-resilience/our-insights/localization-of-data-privacy-regulations-creates-competitive-opportunities

McKinsey (2023), "Economic potential of generative AI", McKinsey. Available at https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-AI-the-next-productivity-frontier#introduction

Melitz, J. and Toubal, F. (2014), "Native language, spoken language, translation and trade", Journal of International Economics 93(2).

Meltzer, J. P. (2023), "Toward international cooperation on foundational AI models", Global Economy and Development-Brookings Institute. Available at https://www.brookings.edu/wp-content/uploads/2023/11/Foundational-AI-Models_Meltzer.pdf

Miller, C. (2022), Chip war: The fight for the world's most critical technology (eds.), New York: Scribner.

Mishra, N. (2024), International trade law and global data governance: Aligning perspectives and practices, Oxford: Hart Publishing.

Mitchell, A. D., Let, D. and Tang, L. (2023), "AI Regulation and the Protection of Source Code", International Journal of Law and Information Technology 31(4):283–301. Available at https://doi.org/10.1093/ijlit/eaad026

Mitchell, A. D. and Mishra, N. (2018), "Data at the Docks: Modernising International Trade Law for the Digital Economy", Vanderbilt Journal of Entertainment & Technology Law 20.

Moon, S. (2008), "Does TRIPS Art. 66.2 Encourage Technology Transfer to LDCs? An Analysis of Country Submissions to the TRIPS Council (1999-2007)", UNCTAD-ICTSD Project on IPRs and Sustainable Development Policy Brief No. 2, Geneva: United Nations Conference on Trade and Development. Available at https://unctad.org/system/files/official-document/iprs_pb20092_en.pdf

Morley, J., Floridi, L., Kinsey, L. and Elhalal, A. (2020), "From What to How: An Initial Review of Publicly Available AI Ethics Tools, Methods and Research to Translate Principles into Practices", Science and Engineering Ethics 26(4):2141–2168. Available at https://doi.org/10.1007/s11948-019-00165-5

Morris, M. R., Sohl-dickstein, J., Fiedel, N., Warkentin, T., Dafoe, A., Faust, A., Farabet, C. and Legg, S. (2024), "Levels of AGI: Operationalizing Progress on the Path to AGI", Cornell University arXiv:2311.02462 arXiv. Available at http://arxiv.org/abs/2311.02462

Muralidharan, K., Singh, A. and Ganimian, A.J. (2019), "Disrupting Education? Experimental Evidence on Technology-Aided Instruction in India", American Economic Review, 109(4): 1426–1460.

National Board of Trade Sweden (2023), "Innovation, AI, Technical Regulation and Trade". Available at https://www.kommerskollegium.se/globalassets/publikationer/rapporter/2023/innovation-ai-technical-regulation-and-trade-short-version.pdf

Nicoletti, G., Von Rueden, C. and Andrews, D. (2020), "Digital technology diffusion: A matter of capabilities, incentives or both?", European Economic Review 128:103513. Available at https://doi.org/10.1016/j.euroecorev.2020.103513

Nordås, H. K. and Rouzet, D. (2017), "The Impact of Services Trade Restrictiveness on Trade Flows", The World Economy 40(6):1155–1183. Available at https://doi.org/10.1111/twec.12424

Noy, S. and Zhang, W. (2023), "Experimental evidence on the productivity effects of generative artificial intelligence", Science 381(6654):187–192. Available at https://doi.org/10.1126/science.adh2586

Organisation for Economic Co-operation and Development (OECD) (2016a), Economic and social benefits of internet openness, Paris: OECD. Available at https://doi.org/10.1787/5jlwqf2r97g5-en

Organisation for Economic Co-operation and Development (OECD) (2016b), OECD Science, Technology and Innovation Outlook 2016, Paris: OECD. Available at OECD. https://doi.org/10.1787/sti_in_outlook-2016-en

Organisation for Economic Co-operation and Development (OECD) (2019a), OECD AI Principles overview, Paris: OECD. Available at https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449

Organisation for Economic Co-operation and Development (OECD) (2019b), Open Government Data, Paris: OECD. Available at https://www.oecd.org/fr/gov/gouvernement-numerique/open-government-data.htm

Organisation for Economic Co-operation and Development (OECD) (2021a), Competition and AI. In OECD Business and Finance Outlook 2021: AI in Business and Finance, Paris: OECD. Available at https://doi.org/10.1787/ba682899-en

Organisation for Economic Co-operation and Development (OECD) (2021b), "Data portability, interoperability and digital platform competition", OECD Competition Committee Discussion Paper No. DAF/COMP/WD(2021)44, Paris: OECD.

Organisation for Economic Co-operation and Development (OECD) (2021c), Putting the OECD AI Principles into practice: Progress and future perspectives, Paris: OECD. Available at https://oecd.ai/en/mcm

Organisation for Economic Co-operation and Development (OECD) (2022a), "Artificial Intelligence and international trade: Some preliminary implications", OECD Trade Policy Paper No. 260, Paris: OECD. Available at https://doi.org/10.1787/13212d3e-en

Organisation for Economic Co-operation and Development (OECD) (2022b), "Measuring the environmental impacts of artificial intelligence compute and applications", OECD Digital Economy Paper No. 361, Paris: OECD. Available at https://doi.org/10.1787/cf87ae8f-en

Organisation for Economic Co-operation and Development (OECD) (2023a), Measuring the Internet of Things, Paris: OECD. Available at https://doi.org/10.1787/021333b7-en

Organisation for Economic Co-operation and Development (OECD) (2023b), "Raw materials critical for the green transition: Production, international trade and export restrictions", OECD Trade Policy Paper No. 269, Paris: OECD. Available at https://doi.org/10.1787/c6bb598b-en

Organisation for Economic Co-operation and Development (OECD) (2023c), Regulatory Sandboxes in Artificial Intelligence, Paris: OECD. Available at https://doi.org/10.1787/8f80a0e6-en

Organisation for Economic Co-operation and Development (OECD) (2024a), "Explanatory memorandum on the updated OECD definition of an AI system", OECD Artificial Intelligence Paper No. 8, Paris: OECD. Available at https://doi.org/10.1787/623da898-en

Organisation for Economic Co-operation and Development (OECD) (2024b), "Using AI in the workplace", OECD

Artificial Intelligence Paper No. 11, Paris: OECD. Available at https://doi.org/10.1787/73d417f9-en

Organisation for Economic Co-operation and Development (OECD) and World Trade Organization (WTO) (2024), A Song of Data Flows and Trust – A Quantitative Analysis of Cross-border Data Flow Regulation, Paris: OECD.

Organisation for Economic Co-operation and Development (OECD) and World Trade Organization (WTO) (2019), "Facilitating Trade Through Regulatory Cooperation: The case of the WTO's TBT and SPS Agreements and Committees", Geneva: WTO. Available at https://www.wto.org/english/res_e/booksp_e/tbtsps19_e.pdf

Ossa, R. (2023), "Digital trade is key to boosting growth in developing economies", World Trade Organization, Geneva: WTO. Available at https://www.wto.org/english/blogs_e/ce_ralph_ossa_e/blog_ro_15dec23_e.htm

Owoyemi, A., Owoyemi, J., Osiyemi, A. and Boyd, A. (2020), "Artificial Intelligence for Healthcare in Africa", Frontiers in Digital Health 2:6. Available at https://doi.org/10.3389/fdgth.2020.00006

Parkin, B. and Kay, C. (2024), "AI could kill off most call centres, says Tata Consultancy Services head", Financial Times. Available at https://www.ft.com/content/149681f0-ea71-42b0-b85b-86073354fb73

Pasquale, F. (2015), The black box society: The secret algorithms that control money and information, Cambridge (MA): Harvard University Press.

Possada, K. C., Ganne, E. and Piermartini, R. (2022), "The Role of WTO Committees through the Lens of Specific Trade Concerns Raised in the TBT Committee", World Trade Review 21(4):411–431. Available at https://doi.org/10.1017/S1474745621000616

Pouget, H. (2023), "What will the role of standards be in AI governance?", Ada Lovelace Institute. Available at https://www.adalovelaceinstitute.org/blog/role-of-standards-in-ai-governance/#_ftnref14

Prüfer, J. (2020), "Competition Policy and Data Sharing on Data-driven Markets", Freidrich-Ebert-Stiftung, Geneva: Freidrich-Ebert-Stiftung. Available at https://library.fes.de/pdf-files/fes/15999.pdf

Quigley, B. (2024), "Improving connectivity and accelerating growth across Africa with new investments", Google. Available at cloud.google.com/blog/products/infrastructure/investing-in-connectivity-and-growth-for-africa.

Raul, A. C. and Mushka, A. (2024), "The U.S. Plans to 'Lead the Way' on Global AI Policy", Lawfare. Available at https://www.lawfaremedia.org/article/the-u.s.-plans-to-lead-the-way-on-global-ai-policy

Ren, S. (2023), "How much water does AI consume? The public deserves to know", OECD.AI Policy Observatory. Available at https://oecd.ai/en/wonk/how-much-water-does-ai-consume

Rozite, V., Miller, J., and Miller, S. (2023), "Why AI and energy are the new power couple", International Energy Agency. Available at https://www.iea.org/commentaries/why-ai-and-energy-are-the-new-power-couple

Sastry, G., Heim, L., Belfield, H., Anderljung, M., Brundage, M., Hazell, J., O'Keefe, C., Hadfield, G. K., Ngo, R., Pilz, K., Gor, G., Bluemke, E., Shoker, S., Egan, J., Trager, R. F., Avin, S., Weller, A., Bengio, Y. and Coyle, D. (2024), "Computing Power and the Governance of Artificial Intelligence (arXiv:2402.08797)",Cornell University arXiv. Available at http://arxiv.org/abs/2402.08797

Seong, J., White, O., Woetzel, L., Smit, S., Devesa, T., Birshan, M. and Samandari, H. (2022), "Global flows: The ties that bind in an interconnected world", McKinsey Institute Discussion Paper, New York: McKinsey.

Shadbolt, N. (2022), "From So Simple a Beginning": Species of Artificial Intelligence", Daedalus 151(2):28–42.

Smuha, N. (2024), "The European Union's AI Act: Beyond motherhood and apple pie?", in The Cambridge Handbook on the Law, Ethics and Policy of Artificial Intelligence, Cambridge: Cambridge University Press.

Stanford University (2023), "The Stanford Emerging Technology Review 2023", Stanford University, Stanford: Stanford University. Available at https://setr.stanford.edu/sites/default/files/2023-11/SETR_web_231120.pdf

Streinz, T. (2021), "International Economic Law's Regulation of Data as a Resource for the Artificial Intelligence Economy", in Peng, S., Lin, C.-F., and Streinz, T. (eds.), Artificial Intelligence and International Economic Law, Cambridge: Cambridge University Press. Available at https://doi.org/10.1017/9781108954006.010

Suleyman, M. and Bhaskar, M. (2023), The coming wave: Technology, Power, and the Twenty-First Century's Greatest Dilemma, New York: Crown.

Sun, R. and Trefler, D. (2023), "The Impact of AI and Cross-Border Data Regulation on International Trade in Digital Services: A Large Language Model", NBER Working Paper No. 31925, Cambridge (MA): National Bureau of Economic Research (NBER). Available at https://doi.org/10.3386/w31925

S & S Insider (2024), "AI Chip Market Expected to Reach USD 621.15 Billion by 2032, at Rising CAGR of 29.4%", GlobalNewswire, 28 October 2024. Available at: https://www.globenewswire.com/news-release/2024/10/28/2970177/0/en/AI-Chip-Market-Expected-to-Reach-USD-621-15-Billion-by-2032-at-Rising-CAGR-of-29-4-Exclusive-Report-by-S-S-Insider.html

Svanberg, M., Li, W., Fleming, M., Goehring, B. and Thompson, N. (2024), Beyond AI Exposure: Which Tasks are Cost-Effective to Automate with Computer Vision?, MIT FutureTech Working Paper, Cambridge (MA): FutureTech. Available at https://futuretech-site.s3.us-east-2.amazonaws.com/2024-01-18+Beyond_AI_Exposure.pdf

The Economist (2024), "AI holds tantalising promise for the emerging world", The Economist.

The White House (2024), "What Drives the U.S. Services Trade Surplus? Growth in Digitally-Enabled Services Exports", The White House. Available at https://www.whitehouse.gov/briefing-room/presidential-actions/2023/10/30/executive-order-on-the-safe-secure-and-trustworthy-development-and-use-of-artificial-intelligence/

United Nations (UN) (2024), Final Report: Governing AI for Humanity, New York: UN. Available at governing_ai_for_humanity_final_report_en.pdf

United Nations Conference on Trade and Development (UNCTAD) (2021a), Data Protection and Privacy Legislation Worldwide, Geneva: UNCTAD. Available at https://unctad.org/page/data-protection-and-privacy-legislation-worldwide

United Nations Conference on Trade and Development (UNCTAD) (2021b), Digital Economy Report 2021, Geneva: UNCTAD. Available at https://unctad.org/publication/digital-economy-report-2021

United Nations Economic Commission for Europe (UNECE) (2021), Artificial Intelligence Demystified, Geneva: UNECE. Available at https://unece.org/sites/default/files/2021-04/ECE_TRADE_C_CEFACT_2021_19E-AI_0.pdf

United Nations Economic Commission for Europe (UNECE) (2022), White Paper on IoT Standards for Trade Facilitation, Geneva: UNECE. Available at https://unece.org/sites/default/files/2023-10/WhitePaper_IoT_TradeFacilitation.pdf

United Nations Economic Commission for Europe (UNECE) (2023), "The regulatory compliance of products with embedded artificial intelligence or other digital technologies", UNECE Report No. ECE/CTCD/WP.6/2023/9, Geneva: UNECE. Available at https://unece.org/sites/default/files/2023-12/2023-9-Compliance-AI_Eng.pdf

United Nations Economic Commission for Europe (UNECE) (2024), Working Party on Regulatory Cooperation and Standardization Policies (WP.6), Geneva: UNECE. Available at https://unece.org/trade/wp6

United Nations Educational, Scientific and Cultural Organization (UNESCO) (2021), Recommendation on the Ethics of Artificial Intelligence, Paris: UNESCO. Available at https://unesdoc.unesco.org/ark:/48223/pf0000380455

United Nations Educational, Scientific and Cultural Organization (UNESCO) (2023a), Readiness Assessment Methodology, Paris: UNESCO. Available at https://www.unesco.org/ethics-ai/en/ram

United Nations Educational, Scientific and Cultural Organization (UNESCO) (2023b), UNESCO's Recommendation on the Ethics of Artificial Intelligence: Key facts, Paris: UNESCO. Available at https://unesdoc.unesco.org/ark:/48223/pf0000385082

United Nations Office for Disaster Risk Reduction (UNDRR) (2023), "Existential Risk and Rapid Technological Change", United Nations Office for Disaster Risk reduction, Geneva: UNDRR. Available at https://sendaiframework-mtr.undrr.org/media/86500/download?startDownload=20240425

Verhulst, S. and Young, A. (2017), Open data in developing economies: Toward building an evidence base on what works and how, Cape Town: African Minds Publishers.

Webb, A. and Hessel, A. (2022), The genesis machine: Our quest to rewrite life in the age of synthetic biology (eds.), New York: Public Affairs.

Wells, S. (2023), "The "Trolley Problem" Doesn't Work for Self-Driving Cars", IEEE Spectrum. Available at https://spectrum.ieee.org/av-trolley-problem

West, S. M. (2023), "Competition authorities need to move fast and break up AI", Financial Times. Available at https://www.ft.com/content/638b5be7-fab7-4fe6-a0cf-7dabefcdd722

Wolff, A. (2022), "The Biden/Xi Meeting in Bali- What Was at Stake?", Pearson Institute for International Economics. Available at The Biden/Xi Meeting in Bali – What Was at Stake? | PIIE

World Bank (2023), Trade Has Been a Powerful Driver of Economic Development and Poverty Reduction, Washington, D.C.: World Bank.

World Bank (2023), Connecting to Compete 2023: Trade Logistics in an Uncertain Global Economy – The Logistics Performance Index and Its Indicators. Washington, D.C.: World Bank

World Bank and World Trade Organization (WTO) (2023), "Trade in services for development", WTO-WBG Paper, Geneva: WTO. Available at https://www.wto.org/english/res_e/booksp_e/trade_in_services_and_development_e.pdf

World Customs Organization (WCO) and World Trade Organization (WTO) (2022), "WCO/WTO Study Report on Disruptive Technologies", WCO-WTO Paper, Geneva: WTO. Available at https://www.wto.org/english/res_e/booksp_e/wco-wto_e.pdf

World Economic Forum (WEF) (2018), "Harnessing Artificial intelligence for the Earth", World Economic Forum Paper,

Geneva: World Economic Forum (WEF). Available at https://www3.weforum.org/docs/Harnessing_Artificial_Intelligence_for_the_Earth_report_2018.pdf

World Economic Forum (WEF) (2020), "A Roadmap for Cross-Border Data Flows: Future-Proofing Readiness and Cooperation in the New Data Economy", World Economic Forum Paper, Geneva: World Economic Forum (WEF). Available at https://www.weforum.org/publications/a-roadmap-for-crossborder-data-flows-future-proofing-readiness-and-cooperation-in-the-new-data-economy/

World Economic Forum (WEF) (2022), "Unlocking Value from Artificial Intelligence in Manufacturing", World Economic Forum Paper, Geneva: World Economic Forum (WEF). Available at https://www3.weforum.org/docs/WEF_AI_in_Manufacturing_2022.pdf

World Economic Forum (WEF) (2023), "Global Risks Report 2023", World Economic Forum Insight Paper, Geneva: World Economic Forum (WEF). Available at https://www.weforum.org/publications/global-risks-report-2023/

World Economic Forum (WEF) (2024a), "ChatWTO: An Analysis of Generative Artificial Intelligence and International Trade", World Economic Forum White Paper, Geneva; World Economic Forum (WEF). Available at WEF_An_Analysis_of_Generative_Artificial_Intelligence_and_International_Trade_2024.pdf (weforum.org)

World Economic Forum (WEF) (2024b), "Global Risks Report 2024", World Economic Forum Insight Report, Geneva: World Economic Forum (WEF). Available at https://www.weforum.org/publications/global-risks-report-2024/in-full/global-risks-2034-over-the-limit/

World Health Organization (WHO) (2021), "Ethics and governance of artificial intelligence for health: WHO guidance", World Health Organization Paper, Geneva: World Health Organization (WHO). Available at https://iris.who.int/bitstream/handle/10665/341996/9789240029200-eng.pdf?sequence=1

World Intellectual Property Organization (WIPO) (2020), "WIPO conversation on Intellectual Property (IP) and Artificial Intelligence (AI)", WIPO Paper No. WIPO/IP/AI/2/GE/20/1 REV., Geneva: World Intellectual Property Organization (WIPO). Available at https://www.wipo.int/edocs/mdocs/mdocs/en/wipo_ip_ai_2_ge_20/wipo_ip_ai_2_ge_20_1_rev.pdf

World Intellectual Property Organization (WIPO) (2024), "Getting the Innovation Ecosystem Ready for AI", WIPO Paper, Geneva: World Intellectual Property Organization (WIPO). Available at https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2003-en-getting-the-innovation-ecosystem-ready-for-ai.pdf

World Trade Organization (WTO) (2004), A handbook on the WTO dispute settlement system (eds.), Cambridge: Cambridge University Press.

World Trade Organization (WTO) (2017), 20 Years of the Information Technology Agreement, Geneva: WTO. Available at https://www.wto.org/english/res_e/booksp_e/ita-20years_2017_full_e.pdf.

World Trade Organization (WTO) (2018), World Trade Report 2018, Geneva: WTO. Available at https://www.wto.org/english/res_e/publications_e/world_trade_report18_e.pdf.

World Trade Organization (WTO) (2020a), World Trade Report 2020, Geneva: WTO. Available at https://www.wto.org/english/res_e/booksp_e/wtr20_e/wtr20_e.pdf

World Trade Organization (WTO) (2020b), WTO TBT Committee and regulatory measures: Prevention, not litigation, Geneva: WTO. Available at https://www.wto.org/english/tratop_e/tbt_e/tbt_t40_20920_e.htm

World Trade Organization (WTO) (2021), Technical barriers to trade (Third eds.), Geneva: WTO.

World Trade Organization (WTO) (2022), Thematic Session on Digital Solutions for Conformity Assessment Procedures, Geneva: WTO. Available at https://www.wto.org/english/tratop_e/tbt_e/tbtts_e/tbtts080322pm_e.htm

World Trade Organization (WTO) (2023a), Thematic Session on Conformity assessment and e-commerce, Geneva: WTO. Available at https://www.wto.org/english/tratop_e/tbt_e/tbt_0711202315_e/tbt_0711202315_e.htm

World Trade Organization (WTO) (2023b), Thematic Session on Regulatory Cooperation between Members on Cybersecurity, Geneva: WTO. Available at https://www.wto.org/english/tratop_e/tbt_e/tbt_2006202315_e/tbt_2006202315_e.htm

World Trade Organization (WTO) (2023c), Thematic Session on Regulatory Cooperation between Members on Intangible Digital Products, Geneva: WTO. Available at https://www.wto.org/english/tratop_e/tbt_e/tbt_2006202310_e/tbt_2006202310_e.htm

World Trade Organization (WTO) (2023d), Thematic session on the Use of Digital Technologies and Tools in Good Regulatory Practices, Geneva: WTO. Available at https://www.wto.org/english/tratop_e/tbt_e/tbt_0711202310_e/tbt_0711202310_e.htm

World Trade Organization (WTO) (2024a), Disputes by agreement, Geneva: WTO. Available at https://www.wto.org/english/tratop_e/dispu_e/dispu_agreements_index_e.htm?id=A22#selected_agreement

World Trade Organization (WTO) (2024b), "Guidelines on conformity assessment procedures", WTO Committee on Technical Barriers to Trade Decision No. G/TBT/54, Geneva: WTO. Available at https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/G/TBT/54.pdf&Open=True

World Trade Organization (WTO) (2024c), Services Domestic Regulation, Geneva: WTO. Available at https://

www.wto.org/english/tratop_e/serv_e/sdr_factsheet_feb24_e.pdf

World Trade Organization (WTO), Organisation for Economic Co-operation and Development (OECD), International Monetary Fund (IMF) and United Nations (UN) (2023), Handbook on Measuring Digital Trade (Second eds.), Washington DC: International Monetary Fund. Available at https://doi.org/10.5089/9789287073600.071

Yee, C. (2023). "With help from next-generation AI, Indian villagers gain easier access to government services". Microsoft Source. Available at: https://news.microsoft.com/source/asia/features/with-help-from-next-generation-ai-indian-villagers-gain-easier-access-to-government-services/

Zhou, B. (2019), Artificial Intelligence and Copyright Protection -Judicial Practice in Chinese Courts, WIPO. Available at https://www.wipo.int/export/sites/www/about-ip/en/artificial_intelligence/conversation_ip_ai/pdf/ms_china_1_en.pdf

World Trade Organization
154, rue de Lausanne
CH-1211 Geneva 2
Switzerland
Tel: +41 (0)22 739 51 11
www.wto.org

WTO Publications
Email: publications@wto.org
WTO Online Bookshop
http://onlinebookshop.wto.org

Report designed by Touchline

Printed by the World Trade Organization.

Print ISBN 978-92-870-7661-8
Web ISBN 978-92-870-7660-1
Published by the World Trade Organization.

WORLD TRADE ORGANIZATION

Artificial intelligence (AI) is transforming the way we live, work, produce and trade. As it further develops, AI is expected to unlock unprecedented economic and societal opportunities. However, it is also a source of significant risks and challenges.

This report examines the intersection of AI and international trade. It discusses how AI may shape the future of international trade by reducing trade costs, improving productivity and expanding economies' comparative advantages. The report reviews some key trade policy considerations, in particular the urgent need to address the growing AI divide between economies and between large and small firms, as well as data governance and intellectual property issues. It examines how to guarantee the trustworthiness of AI without hindering trade. The report also provides an overview of domestic, regional and international government initiatives to promote and regulate AI, and highlights the resulting risk of regulatory fragmentation.

Finally, the report discusses the critical role of the WTO in facilitating AI-related trade, ensuring trustworthy AI and addressing emerging trade tensions, noting that the rapid evolution of AI is prompting questions about the implications of AI for international trade rules.

9 789287 076618