Oxford Review of Economic Policy, 2023, **39**, 70–84
https://doi.org/10.1093/oxrep/grac049
Article

Digital disruption: artificial intelligence and international trade policy

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With thanks for insightful feedback from Susan Aaronson, Chris Adam, Ingo Borchert, Pepper Culpepper, Bob Fay, James Harrison, Kristina Irion, Neha Mishra, Marianne Petsinger, Roxana Radu, and Adrian Smith, as well as excellent research assistance from Rutendo Tavengerwei.

Abstract:

Digitalization of the global economy is occurring apace and has spurred a new wave of trade negotiations, as governments and technology firms vie to establish international rules and standards for the digital era. This article examines the ways that trade policy-makers are responding to artificial intelligence (AI), arguably the most disruptive of the new digital technologies. In a digitalized global economy, trade rules have implications for AI innovation, uptake, and governance, yet existing trade rules have significant shortcomings and need updating in order to assist with effective AI governance. Updating is happening but, so far, the changes focus on promoting AI and disproportionately reflect the interests of large technology firms, the major innovators and owners of AI. New digital trade rules include stringent intellectual property protections for source code and algorithms, and strong commitments to enable the free flow of data across borders. However, much less progress has been made in addressing cross-border risks and harms associated with AI, in areas such as competition policy; ethical, transparent, and accountable use of AI; personal data protection; and protections against the exploitative use of algorithms in consumer and labour markets.

Keywords: international trade, digital trade, artificial intelligence (AI), trade policy

JEL classification: F13, F68, O34

I. Introduction: AI in the global economy

Artificial intelligence (AI) was developed in the 1950s but has only become commonplace in recent years thanks to rapid advances in computational power, data availability, and machine learning techniques.[1] AI is a general-purpose technology, like the steam engine and electricity, and it is expected to fundamentally change the economy (Brynjolfsson *et al.*, 2018). It has the potential to improve welfare and well-being, including by increasing innovation and productivity, but equally raises major policy challenges, including concerns that it may exacerbate economic inequalities, and undermine democracy and human rights.

Narrow forms of AI are now embedded in many 'everyday' economic devices and processes, including voice recognition in smart phones and speakers; content moderation; facial recognition and biometric identification systems; online customer service chatbots; search functions in online shopping and streaming services; credit scoring; language translation services; diagnosis and monitoring of healthcare patients; and the management of warehouses, shipping, and logistics. AI has become an essential for many firms, including in finance (see vol. 37 no. 3 of the *Oxford Review of Economic Policy*).[2]

[1] Although there is no agreed definition of AI, it is generally understood as the development of computer programmes that can undertake tasks and solve problems that usually require human intelligence. AI works by processing data through advanced algorithms, combing large datasets, and learning from the patterns or features in the data. Technologists differentiate between 'narrow AI', which is able to carry out discrete tasks such as translation, and 'general AI', which doesn't yet exist and where the level of intelligence would approximate that of a human.

[2] In the UK, an estimated 68 per cent of large companies had adopted at least one AI technology as at late 2021 (Evans and Heimann, 2022, p. 2).

AI-driven technologies rely on a wider digital economy ecosystem. The amassing of vast datasets is vital for the training of algorithms, and data flows are integral to the real-time use of AI technologies. For AI to be effective and deliver accurate predictions that are not susceptible to bias and discrimination, algorithms need to be built on high quality, accurate data. While we often think of AI as virtual, it ultimately relies on physical infrastructure, ranging from undersea cables to data centres, and the devices and machines in which it is embedded. It also relies on a vast amount of human labour, ranging from the highly paid AI researchers and developers, to a global workforce of people tagging and labelling data, or transcribing transcripts from smart audio devices, often for little pay and in precarious conditions (Gray and Suri, 2019; Crawford, 2022; Tubaro and Casilli, 2022).

As the use of AI increases, the AI technology and the digital ecosystem in which it is embedded needs to work seamlessly across international borders. A global logistics company, for instance, may rely on AI to optimize its supply chains and manage its warehouses and transport fleet, requiring its AI technologies to operate seamlessly across borders in real time. A gig economy worker may be assigned tasks and managed via algorithms through a platform company based in another country and will want to know that they will be treated fairly and will have means of redress if things go wrong. A consumer purchasing a smart speaker manufactured abroad and will want to know that it meets security and privacy standards, and that the AI software will be regularly updated.

Cross-border policy coordination and cooperation is becoming vitally important for realizing the opportunities and mitigating the problems associated with AI. As AI is such an important technology, governments around the world are rapidly developing policies and regulations to govern its development and use: while 18 countries had AI strategies in 2019, this had risen to 49 by 2021 (ITU, 2021). Regulating AI is challenging. Regulations need to be sufficiently flexible to support and respond to technological innovation, and they need to address a range of public policy objectives from promoting innovation, to ensuring fair competition, non-discrimination, privacy, and security which often involves trade-offs. International dimensions arise as AI policies implemented by one government may be viewed as an unjustified barrier to trade, a threat to national security, or infringement of fundamental rights by another; divergent regulatory approaches across jurisdictions pose inter-operability challenges and increase compliance costs for international firms; and new cross-border mechanisms are needed to ensure that digital markets are competitive, and to uphold rights of consumers and workers engaging in cross-border transactions.

In response to the broader trends of digitalization, policy-makers are looking to update international economic rules. At the World Trade Organization, more than 80 countries are engaged in digital economy negotiations, although major policy differences among governments have impeded progress. For this reason, the most extensive updating has occurred in bilateral and regional trade agreements with many recent agreements including dedicated 'digital trade' chapters. In 2020, Singapore, Chile, and New Zealand pioneered a Digital Economy Partnership Agreement (DEPA), a digital-only trade agreement which seeks to elaborate rules for a global digital economy, a move since emulated by several other countries. In tandem, governments are negotiating international regulatory standards for new digital technologies, including at the International Telecommunications Union. Where governments have found it challenging to negotiate binding rules, they have sought to coordinate digital economy policies through bespoke organizations such as the US and EU Trade and Technology Council, created in 2021, and the more recent EU–India Trade and Technology Council.

This article examines this new wave of policy-making in international trade, with a focus on AI. In a digitalized global economy, trade rules have implications for AI innovation, use, and governance. However, existing trade rules have significant shortcomings and need updating in order to assist with effective AI governance. Updating is happening but, so far, the changes focus on promoting AI and disproportionately reflect the interests of large technology firms, the major innovators and owners of AI. New digital trade rules include stringent intellectual property protections for source code and algorithms, and strong commitments to enable the free flow of data across borders. However, much less progress has been made in addressing cross-border risks and harms associated with AI, in areas such as competition policy; ethical, transparent, and accountable use of AI; personal data protection; and protections against the exploitative use of algorithms in consumer and labour markets. This arguably reflects the disproportionate expertise, advocacy, and lobbying resources of large technology companies and their relatively privileged access to trade policy-makers, compared with small businesses, and consumer and labour groups.

I examine the interface between AI and trade policy in five areas: international technical standards; trade-related intellectual property rights; competition in global digital markets; consumer and worker protection in cross-border transactions; and cross-border data regulation. In each area I explain the cross-border policy challenges posed by AI, examine the ways in which trade rules are being updated, and reflect on the political economy dynamics. The conclusion reflects on the strengths and weaknesses of trade agreements for helping to govern AI, and ways to rebalance the updating process to ensure that new trade rules and standards pay greater attention to the interests of smaller business, workers, and citizens.

II. AI and international technical standards

International standards are a vital but frequently overlooked aspect of the international trade system. Technical standards set out specific characteristics that a product is required to meet—such as its size, shape, design, functions, and performance, or the way it is labelled or packaged—before it is put on sale. In most cases, the negotiation of international technical standards is a dry, technical exercise that takes place under the auspices of little-known international bodies. However, for AI and other frontier technologies, shaping international standards has become a geostrategic imperative, with governments including the US and China announcing an intent to shape international standards, and vying for leadership positions in the key international standard-setting bodies.

Standards are an important policy instrument for regulating AI technologies and ensuring that they are reliable, trustworthy, and accountable. In most countries, AI standards are at an early stage, tend to be sector-specific rather than horizontal (applying to all uses of AI), and their stringency varies from sector to sector. For instance, while the use of AI in health and civil aviation is heavily regulated, use in sports is much less regulated (Ciuriak and Rodionova, 2021). As is often the case for new technologies, many jurisdictions rely principally on voluntary standards and industry self-regulation, including in controversial areas like connected and autonomous cars. Deference to industry reflects governments' lack of technical expertise and the challenges of designing mandatory performance standards for emerging technologies that are complex and evolving rapidly (Peng, 2021). Many guidelines aiming at 'ethical AI' have been proposed by industry, raising concerns of 'ethics washing' whereby industry players adopt a light-touch approach to self-regulation in a bid to assure consumers without requiring substantive changes to their practices (Radu, 2021).

As concerns about the ethical impacts of AI have grown, governments have started to develop cross-cutting regulations that will apply to all AI technologies. The EU has proposed the world's first comprehensive attempt to regulate AI. Its proposed AI Act would ban some uses of AI (such as social scoring), heavily regulate high-risk uses (such as hiring and admissions software, and credit scoring), and lightly regulate less risky AI systems (such as customer service chatbots); meanwhile its proposed AI Liability Directive would make it easier for the enforcement of civil law compensation for damage caused by AI systems. While the EU is a first mover, other governments and sub-national governments are following suit, including China's Shanghai Province, which has developed its own AI Act, and several legislative proposals have been tabled in the US.

National AI standards have implications for trade, as a firm wishing to export must be able to demonstrate that its product conforms to the AI standards of the importing market. Under the EU's proposed AI Act for instance, exporters of AI products deemed 'high risk' will need to implement a risk management process; conform to higher data standards; more thoroughly document their AI systems and systematically record their actions; provide information to users about AI functions; and enable human oversight and on-going monitoring (Engler, 2022). They will also need to undergo conformity assessment by designated bodies before entering the EU market. Third-party suppliers in the AI supply chain must also be able to show compliance. Data suppliers, for instance, will have to explain how data were obtained and selected, the labelling procedure, and the representativeness of the dataset (Bertuzzi, 2021).

As the EU is a major market, the fact that it is an early mover on AI standards has extra-territorial implications (the so-called 'Brussels effect'), particularly at a sector level (Bradford, 2020). Many AI products are manufactured via large-scale industrialized processes, so once a firm looking to export to the EU has brought its production in line with EU standards, it is likely to lobby for the same (or similar) standards to be implemented in its other markets. Similarly, for AI products embedded in virtual platforms, it will be difficult for companies to comply with different standards. For example, many of the algorithms used by LinkedIn on its global platform will fall under the EU's high-risk category. Changes that LinkedIn makes to meet EU standards, including modifications to its algorithmic modelling processes and functions, as well as documentation and analysis of its AI systems, are likely to be platform wide (Engler, 2022). For such companies it will be hard to conform with standards in other jurisdictions, if these conflict with EU standards (see also Fletcher (2023) and Franck and Peitz (2023), in this issue), so other jurisdictions will face strong incentives to emulate the EU's regulatory approach.

While individual governments determine their own standards, international standard-setting bodies exist to promote convergence, helping to reduce compliance costs for firms looking to export into a variety of markets, thereby promoting trade. This is particularly important in the digital space: for the global digital economy to be interconnected and interoperable, cooperation on international AI standards is vital. Different devices, software, and siloed systems based on varying standards must be enabled to interconnect, interoperate, and communicate securely. A series of international bodies are developing specific technical standards for AI technologies, including the International Telecommunications Union, International Electrotechnical Commission, and International Standards

Organization (all inter-governmental), and the Institute of Electrical and Electronics Engineers (private sector). As concerns around AI have grown, there have been moves to develop broader principles and guidelines for the ethical use of AI, including at the UN and OECD, while the Council of Europe is looking to negotiate a binding international treaty on AI. Cooperation in AI standards is also a focus of the US–EU Trade and Technology Council (European Commission, 2021*b*). Despite the existence of multiple international bodies looking to foster a common regulatory approach, agreement is impeded by the complexity of the technology and speed of innovation; a myriad of ethical concerns; variation in societal values and preferences; and different interests within the private sector.

Standard-setting in AI is intensely political. The EU's AI Act, for example, has been the subject of intense lobbying by large and small technology firms, consumer groups, and human-rights groups, and small business groups (Clarke, 2021). These groups are unequally matched in terms of financial resources, expertise, and advocacy techniques: recognizing the potential impact of the EU's proposed AI Act (alongside other EU legislation like the Digital Markets Act and Digital Services Act), global technology firms have ramped up their lobbying efforts, reportedly spending €97m annually in lobbying in Brussels, more than other sectors such as pharmaceuticals (Haeck, 2021; Klovig Skelton, 2021). There is also evidence that this resource advantage translates into privileged access to policy-makers, raising concerns that policies will unduly reflect the interests of major technology firms, and examples of corporate representatives and academics driving the drafting of national AI strategies while the voices of civil society and digital rights groups were largely absent (Corporate Europe Observatory, 2021; Radu, 2021). Similar concerns are present in the international standard-setting bodies where decision-making is opaque and major industry players such as Huawei and Google have seats at the table, but other groups have minimal access.

Although international standards are voluntary, substantial legal weight is conferred on them when they are cross-referenced in binding international trade treaties. The World Trade Organization (WTO)'s Technical Barriers to Trade Agreement and General Agreement on Trade in Services (Article VI) are the key mechanisms for this. They aim to ensure that technical regulations, standards, and conformity assessment procedures are non-discriminatory and do not create unnecessary obstacles to trade, while also recognizing the right of WTO members to implement measures to achieve legitimate policy objectives, such as the protection of human health and safety, or protection of the environment. The standards developed by international organizations are specifically mentioned as a basis for helping determine whether a WTO member is in conformity with its commitments.[3]

With the rapid development of national AI standards that vary in levels of stringency, it is likely that legal disputes will be brought under the WTO by members wishing to challenge national AI policies that they deem to be discriminatory or creating unnecessary barriers to trade (Mishra, 2021*b*). For instance, is a ban on facial recognition technologies a legitimate public policy measure or an unjustified trade barrier? Trade law is supposed to be technologically neutral and hence applicable to new technologies like AI, so, in theory, existing WTO law would be able to help establish the conditions under which members can impose restrictions on specific types or uses of AI technologies. However, trade law has traditionally bifurcated the world into trade in goods and trade in services, a distinction which is increasingly hard to align in a world of 'smart' devices. In the case of connected and autonomous vehicles, for instance, should new regulations targeting a mobility ecosystem be subject to the WTO's Technical Barriers to Trade Agreement (goods) or the General Agreement on Trade in Services (services)? Moreover, can cases challenging industry standards be brought under the purview of these Agreements if they are the product of collaboration between a national government and industry (Peng *et al.*, 2021)? Some AI-driven services escape the WTO's classification system altogether, thereby creating new gaps within the system. Moreover, assessing whether a measure is unfairly discriminatory would be extremely challenging at present, given high levels of technological and policy uncertainty (Mishra, 2021*a*).

AI standards also feature in a few of the most recent digital trade agreements, including the Digital Economy Partnership Agreement between Chile, New Zealand, and Singapore (signed in 2020); the Australia–Singapore Digital Economy Agreement (signed in 2020); and the more recent UK–Singapore Digital Economy Agreement (signed in 2022). They include specific articles on AI and emerging digital technologies, under which the respective governments pledge to develop domestic governance and policy frameworks for AI that draw on relevant international principles and guidelines.[4] They also contain provisions under which governments pledge to cooperate in the development of standards and conformity assessment for digital technologies to reduce barriers to trade by increasing compatibility, interoperability, and reliability.[5] For some digital technologies that commonly use AI, including digital identities, Internet of Things, fintech, and lawtech, there are specific pledges to cooperate,

[3] GATS Art VI 5(b). Note that standards set by private international bodies are unlikely to be covered, see (Mishra, 2021*a*)
[4] See Art 8.2 in DEPA; Art 8.61-R.2 in UK–Singapore DEA; Art. 31 in Australia–Singapore DEA.
[5] See Art 8.61-D.5 in UK–Singapore DEA; Article 30 DEA.

including in the development of international standards, alignment of domestic regulations, and development of mutual recognition agreements.[6]

The focus in trade agreements has been on aligning standards in order to promote AI innovation and adoption, with little attention paid to addressing the challenges associated with AI, but there are signs that this may be shifting. The UK–Singapore text is the first to explicitly recognize the need for cooperation to address some of the challenges of AI, including in the context of human diversity and unintended biases, industry-led technical standards, and algorithmic transparency.[7]

III. AI and trade-related intellectual property rights

While AI standards is the most obvious interface between AI and international trade, other aspects of trade policy have important implications for the governance of AI, including existing and new rules on intellectual property. AI innovation and intellectual property ownership is highly concentrated in a handful of large technology companies based in a few jurisdictions. As at 2019, among the top 30 AI patent applicants globally, 26 were companies (with IBM and Microsoft in the lead) and only four were universities or public research organizations, while just over three-quarters of all AI-related patents were filed in three countries: the US, China, and Japan (WIPO, 2019).

The US and China are in a geopolitical race to lead in AI, and have set out strategies to promote AI innovation, including through high levels of government spending. The US has repeatedly complained that the Chinese government does not respect the intellectual property rights of US technology firms. Intellectual property rights featured heavily in the 'Phase One' trade agreement between the US and China (signed in 2020), with China making a commitment to refrain from requiring US companies to transfer their technologies as a condition for market entry.

As with AI standards, intellectual property rules that impact AI are found both at the national and international level. Rules on intellectual property were introduced into international trade law in the mid-1980s, and the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) establishes minimum standards of protection and enforcement that each government has to give to the intellectual property held by nationals of fellow WTO members. Bilateral and regional trade agreements have often gone further, establishing more stringent protections than those found in the WTO. The inclusion of intellectual property rules in international trade law has been controversial from the outset, with many arguing that the WTO rules privilege the rights of technology-owning firms, and act to impede innovation and the diffusion of knowledge around the world (see, for example, Henry and Stiglitz (2010)).

Applying existing intellectual property rules to AI raises specific challenges. The broad consensus across countries is that human involvement is a necessary factor for the granting of copyright and patent protection. However, for outputs generated by AI, there is often no clear human author (in the case of copyright) or inventor (in the case of patents), and current laws in most jurisdictions also prevent the AI itself from being named an author or inventor (Hilty *et al.*, 2021). At the international level, the WTO TRIPS Agreement provides little guidance on how to treat AI-generated content and innovations as it merely provides a minimum standard of protection for intellectual property rights, leaving WTO members with wide scope to determine how to appropriately implement the provisions (Mercurio and Yu, 2021).

A challenge for intellectual property law lies in determining when innovation has occurred, and rights should be conferred. AI innovators seek to protect their products to the greatest extent possible, as the disclosure of an algorithm or open access to a dataset may jeopardize a business based on exploiting these intangibles. Yet, from a public interest perspective, providing unwarranted protection can reduce the pace of innovation and reduce the competitiveness of markets. Under existing intellectual property laws, algorithms cannot typically be afforded patent or copyright protection, although computer programs using algorithms that have direct, technical effect in the real world often are patentable. For example, the use of a neural network and deep learning algorithm incorporated into a physical device monitoring and identifying irregular heartbeats may be eligible for patent protection (Mercurio and Yu, 2021). At an international level, the TRIPS Agreement similarly provides for very narrow and limited protections of algorithms (Słok-Wódkowska and Mazur, 2022).

Similarly, big datasets, which are crucial for AI development are not typically eligible for protection. In the US, for instance, 'merger doctrine' provides that where facts/data are inseparable from their expression, copyright protection does not apply because it would otherwise 'give a monopoly over underlying fact/idea' (Scassa, 2021). The WTO TRIPS agreement sets a baseline for copyright protection for certain categories of data, but such protection is not comprehensive and remains contested, and large databases that are generated through text

[6] See Art. 29 and Art. 32 in Australia–Singapore DEA; Art. 8.61-S.2(b), Art. 8.53, Art. 8.61-T in UK–Singapore DEA.
[7] See Article 8.61-R.2(b) in UK–Singapore DEA.

and data mining, which are increasingly used to train AI algorithms, may not meet the requisite requirements (Mercurio and Yu, 2021).

As existing patent and copyright laws typically provide little protection for their outputs, AI firms often turn to laws on trade secrets for protection.[8] Commercial practice in many AI applications has been to hold both algorithms and training data as trade secrets to maximize the protection of interests and to remain competitive in the market (Lin, 2021). In some ways, trade secrets better suit the companies which develop AI as such inventions do not require registration and can last indefinitely, provided they are kept secret (although from a public interest perspective, this may upset the balance struck between statutory protections granted for patents and copyright and the release of innovations as a public good thereafter). Trade secrets are also recognized under the WTO TRIPS agreement, although it only provides *ex post* protection: it does not prevent a secret from being revealed but merely ensures that any breach of secrecy is actionable (i.e. a company can take legal action in the case of its secrets being revealed) (Słok-Wódkowska and Mazur, 2022).

While attractive for AI firms, high levels of secrecy are likely to further impede innovation and knowledge dissemination, including by preventing competitors from accessing training datasets (Mercurio and Yu, 2021). More troubling, given the growing importance of algorithmic decision-making in all aspects of life, from credit scoring to jail sentencing, high levels of secrecy can undermine the transparent and accountable use of AI technologies (Ryan, 2020). Technology companies routinely rely on trade secrecy laws to fight transparency domestically, and many prominent developers of AI systems have cited intellectual property and trade secrets as reasons to actively disrupt or prevent attempts to audit or assess their systems (Ada Lovelace Institute, 2021). In the furthest reaching initiative to date, the Chinese government has started to require algorithmic disclosure under new regulations (March 2022) and it has since published summaries of 30 key algorithms used by its major technology platforms (Musser, 2022).

In some areas, AI innovators are accused of running roughshod over the intellectual property rights of others, particularly when they harvest data. Again, international trade law leaves substantial room for discretion at the national level, and countries vary in the scope of allowable exceptions. For example, the US uses the fair-use doctrine which covers the use of 'large volumes of copyrighted literary work for machine mining', the UK has narrower exceptions under its 'fair dealing' concept, and the EU provides an 'exception for text and data mining for scientific research' (Mercurio and Yu, 2021). Gaps concerning how to balance AI developers' need to access and reproduce large amounts of data with the rights of copyright owners still exist.

Given the strategic importance of digital technologies in the global economy, the US, EU, and other Western governments have taken steps to increase intellectual property protections for AI innovators through their trade agreements. This has taken two forms: specific provisions that prohibit governments from requiring companies to disclose their source code and algorithms, except under a very narrow set of circumstances; and additional commitments to strengthen laws on trade secrets.

Provisions prohibiting source code disclosure requirements were introduced by the US in the Trans-Pacific Partnership (TPP) negotiations and have since been emulated in many other trade agreements, although they are strongly opposed by many developing countries. The provisions prohibit the use of regulations requiring the transfer of or access to source code (and algorithms) as a condition of the import, distribution, sale, or use of such software or of products containing such software. They target the types of regulations that have been used in several countries (including China, India, Russia, South Africa, and Nigeria) that are considered a form of forced technology disclosure. The US government and leading US technology firms have been strongly and vociferously opposed to such measures.[9] Such provisions provide a higher level of protection than WTO laws, which only require governments to provide a means of redress if trade secrets are disclosed.

Although promulgated by the US and other Western governments, there is growing concern in these countries that the commitments on the protection of source code and algorithms may impede effective regulation of AI, particularly with regards to transparency and accountability.[10] There are signs that governments have started to recognize that they may be tying their hands too much through trade agreements, and the wording of exceptions in source code provisions in recent trade agreements is evolving to widen the scope for government intervention.

[8] Trade secrets are IP rights on confidential information which may be sold or licensed. In general, to qualify as a trade secret, information must be of commercial value because it is secret, be known only to a limited group of persons, and subject to reasonable efforts to protect its secrecy. The unauthorized acquisition, use, or disclosure of such information is then, subject to some exceptions, a violation of the trade secret protection. See https://www.wipo.int/tradesecrets/en/.

[9] See, for example, Office of the United States Trade Representative (2022).

[10] Mishra (2021*a*) argues that exceptions in trade agreements do provide adequate space for effective regulation of AI, although notes that in practice it will be challenging for WTO and other international trade tribunals to distinguish between legitimate and unduly protectionist measures owing to high levels of technical and policy uncertainty.

In the recent UK–Singapore DEA, the exception provides for a wider range of government bodies to require source code disclosure, including conformity assessment bodies, which enables *ex ante* screening of AI products (before they enter the market), and it gives authorities actual access to the source code while many other agreements merely provide for the modification of source code for law enforcement purposes (Dorobantu *et al.*, 2021; Irion, 2022).[11]

The second type of provision found in trade agreements is a commitment to strengthen domestic laws on trade secrets. This commitment featured heavily in the US–China Phase One Agreement signed in 2020, which contained a section on trade secrets under which China committed to bring its domestic laws on trade secrets in line with US laws and strengthen its domestic enforcement.

IV. AI and competition in global digital markets

With the rise of technology companies of unprecedented size and market power, governments are paying greater attention to competition policy in digital markets (see Fletcher (2023) and Franck and Peitz (2023), in this issue). AI technologies play a central role, reinforcing concentration of market power in many digital markets. Although AI-driven technologies can disrupt established markets, the network effects and economies of scale and scope associated with AI act as a source of competitive advantage and barrier to entry, contributing to the rise of dominant platform firms in the global economy. Competition and merger law are the traditional policy instruments for ensuring that markets are fair and contestable, and this has traditionally been seen as a domestic agenda. The challenges associated with digital markets have led to an overhaul of domestic competition policy, and there are moves towards greater international cooperation to address the practices of global technology companies.

AI exhibits economies of scale associated with data, which occur due to direct network externalities (more customers generate more data, this enables higher quality predictions from AI, which in turn generates more customers, generating more data, and so on). Although data are non-rivalrous in consumption, major technology companies that are able to accumulate large data sets and keep the data in private silos, are able to maintain a leading edge in AI development. There is an on-going policy debate as to whether monopolistic control of data should be allowed as it impedes access of smaller firms to 'big data' and slows down AI innovation (Furman and Seamans, 2019; Wheeler, 2020).

There are also high fixed costs associated with building AI capability, so potential uses of AI need to be sufficiently large scale to justify building in-house expertise, and there are advantages from being able to deploy AI across a range of products, so AI innovators tend to be multiproduct firms (Goldfarb and Trefler, 2018). Economies of scope also arise from the sharing of data across applications. For example, the data from Google's search engine might be valuable in helping determine the effectiveness of YouTube advertising, or its mapping services might be needed for developing autonomous vehicles. In addition, AI expertise has tended to agglomerate in narrowly defined geographies within countries, which suggests that AI involves a lot of tacit knowledge that is not easily codified and transferred to others. The economics of AI help explain why Google is by far the leading institution among the top-tier AI research institutions, while Microsoft and Facebook also feature among the top ten.

In addition to these structural dynamics, algorithms used by dominant firms may lead to predatory pricing and margin squeeze strategies that drive competitors out of markets. The use of algorithms by online platforms to display products to consumers in response to a search query can be used to exclude firms from the market or provide advantages to firms that make commercial arrangements with the gatekeeper company, affecting the experience of consumers without their awareness. They may also be used to compete downstream in anti-competitive ways, including through self-preferencing of products that they sell on the platform they operate, as in the European Commission's case against Google for self-preferencing through Google Shopping (OECD, 2021).

As existing competition and merger laws fail to address the challenges posed by new digital technologies, governments are developing new *ex ante* regulations to improve the contestability of digital markets (see Fletcher (2023), in this issue). These moves have been subject to fierce lobbying by large technology firms, including to shape the EU's Digital Markets Act (which was agreed in March 2022). There is less geopolitical contestation in this issue area, although the US government has reportedly lobbied to shape the EU's Digital Markets Act, arguing that it unfairly discriminates against US companies (Espinoza, 2022).

At the international level, there has long been recognition of the importance of competition policy to ensure that the gains from open markets are not undermined by anti-competitive business practices. However, several attempts to negotiate multilateral trade rules on competition have failed, and although recent free trade agreements contain competition chapters, competition policy has largely been pursued at the national level. Appetite for greater

[11] See Art. 8.61-K UK–Singapore DEA.

international cooperation has increased as a growing number of competition law cases have international dimensions, particularly those involving major technology companies. Cases brought by the European Commission against Google and Microsoft, for instance, involve conduct that cuts across jurisdictions. Unilateral attempts to pursue legal cases against global technology companies are costly and securing compliance can be challenging, particularly for countries with smaller markets as large companies may simply threaten to leave rather than comply, so there are clear gains to be had from cooperation.

Although there are calls for a collective, international approach to regulation and enforcement of competition in digital markets, there has been relatively little progress. Some competition authorities are starting to collaborate more extensively with, for instance, the EU and UK authorities jointly pursuing cases against Facebook. The EU–US Trade and Technology Council identified competition in digital markets as a priority area for cooperation, as have APEC, the OECD, and the International Competition Network, an inter-governmental network that was set up in 2001 to foster cooperation among competition authorities. Recent digital trade agreements including the Australia–Singapore DEA (2020), the DEPA between New Zealand, Chile, and Singapore (2020), and the UK–Singapore DEA (2022) all contain specific articles on competition policy in digital markets.[12]

So far, the emphasis is on national competition authorities learning from each other and cooperating in enforcement, rather than agreeing a common set of rules, and provisions in trade agreements stop short of placing obligations on governments to address specific anti-competitive practices. However, regulatory divergence, particularly in the area of *ex ante* rules for digital platforms, can make enforcement more difficult, especially when targeted platforms are truly global, and there are growing calls for coordinated rulemaking and enforcement (Vestager, 2022).

V. AI and rights of consumers and workers in cross-border transactions

As AI becomes more widespread, there are growing questions about how best to protect the interests of consumers and workers. Although consumer and labour policy has traditionally been domestic in nature, digitalization has led to a greater number of consumers and workers engaging directly in cross-border transactions, including purchasing goods and services from companies based abroad, and selling labour via global platforms.

For consumers, algorithmic systems can provide major benefits, including individualized recommendations that are relevant, saving people time, while businesses can use algorithmic systems to reprice portfolios of thousands of products in real-time and pricing efficiencies can be passed on to customers. However, firms may also misuse AI applications, whether intentionally or unintentionally, and can cause specific harms to other firms, consumers, and workers, as well as wider societal harms.[13]

Direct harms to consumers can arise in many ways, including using personalized data to predict and exploit consumer behaviour. Machine-learning algorithms can be used to approximate the user's willingness to pay and adjust prices accordingly, a practice that can be harmful where there is insufficient competition (i.e. monopolist price discrimination) or where personalized pricing is particularly complex or lacking transparency (UK Competition and Markets Authority, 2021). For instance, there have been reports that Uber's opaque 'route-based pricing' charges customers based on what it predicts they are willing to pay. Personal information may also be used to decide which results to display and in what order (personalized ranking), enabling firms to manipulate consumers into making decisions that are more profitable for the firm, and which the consumer would not have made under more objective or neutral conditions.

In the workplace, AI has come to augment, or even replace, traditional management and there are concerns that its use may erode the ability of workers to exercise their fundamental rights. During hiring, AI-driven software is increasingly used to automate background screening, analyse CVs, rank candidates, make offers, and determine salary levels, with sometimes deeply problematic consequences: in early 2019, media reports suggested that Amazon had been forced to abandon its automated recruitment tool after the machine learning algorithm had begun systematically to reject female applicants for engineering roles within the firm (Adams-Prassl, 2019). Once employees are hired, AI technologies enable the monitoring and management of workers' activities to an extent unthinkable in the past, improving efficiency and productivity, but also causing harms. More and more workers use wearable work instruments that enable employers to track their movements and location minute-by-minute, also measuring their work pace as well as breaks. In the transport sector, drivers working through platforms are assigned work by algorithms, which are also designed to measure the speed and diligence of the worker in completing

[12] See, for instance, Art. 8.4 in DEPA; Art. 8.61-U.2 in UK–Singapore DEA

[13] Beyond the harms to other firms, consumers, and workers discussed here, there are numerous examples of wider societal harms, including potentially illegal discrimination when AI is used in criminal justice and health systems, and online harms, including amplifying hate speech.

the tasks, including by factoring in the rating and reviews that customers assign. Algorithmic management systems are rarely transparent, as companies do not share the methods through which ratings and customer feedback over the workers' activities are gathered and processed, and low scores can lead to the exclusion of the worker from the platform and thus to dismissal (De Stefano, 2019).

At a national level, governments are moving rapidly to develop policies to protect consumers and workers as they engage in digital transactions, with some specifically addressing algorithmic harms. The EU incorporated some protections for consumers and workers in its General Data Protection Regulation (GDPR) which, *inter alia*, provides citizens with the right to contest legal or similar decisions made through an algorithm, having the option to appeal for human intervention, and to opt out of targeted ads generated using algorithms. More recently, the European Commission has drafted proposals to address harms to workers that arise from algorithmic management, which would increase transparency in the use of algorithms by digital labour platforms, ensure human monitoring in respect of working conditions, and the right to contest automated decisions (European Commission, 2021*a*). In China, new far-reaching regulations on the use of algorithms came into effect in March 2022, prohibiting a range of practices with the aim of protecting consumers and gig economy workers (Conrad, 2022).

However national approaches are insufficient for addressing algorithmic harms that arise in cross-border transactions. Consumer protection laws tend to be national in scope, providing little protection when harms are generated in the context of cross-border transactions as national authorities and courts only have jurisdiction within national borders. Obtaining redress is particularly challenging when consumers buy via intermediary platforms, as it can be hard to trace the seller, and when the complex legal structures of companies make it hard to identify liability and the applicable regulatory regime. While international cooperation—or regulatory dialogues—exist between national agencies, this cooperation is piece-meal and does not provide for an efficient and transparent system of international enforcement of consumer rights (Goyens, 2020).

Similar problems arise for gig economy workers. The digital platform Upwork, for instance, headquartered in California, hosts and parcels out assorted computer programming, graphic design, and data-entry tasks. It posts tasks from requesters around the world and, likewise, the workers on the platform live around the world, most often working from their homes. Such computer crowdwork on a global technological platform presents a unique and almost existential challenge for traditional territorial labour law (Cherry, 2019). It is not obvious which set of laws should apply if, for instance, a group of crowdworkers from around the world want to file a suit against a platform company for unethical algorithmic decisions in the termination of contracts or allocation of tasks. Moreover, in many jurisdictions, private actors can stipulate in the contract which country's laws will govern the relationship, and many platform companies opt to use a third country, a move that some experts argue enables firms to evade the jurisdiction of local courts and the enforcement of labour protections. When, for instance, Uber drivers in the UK looked to take legal action against Uber over their working conditions, there were questions of legal jurisdiction as the contracts that the drivers had entered into stipulated that Dutch law would be used to settle disputes. Despite this, UK courts ruled that, as the work was habitually carried out in the UK, UK courts had jurisdiction and UK labour law could be applied (Novitz, 2020).

To uphold labour rights, governments may act unilaterally and enact labour regulations for platforms that have extraterritorial reach, applying to all companies entering contracts with their citizens (akin to the extra-territorial reach of data privacy regulations under the EU GDPR). However, this doesn't solve the problem of regulatory fragmentation: a truly globalized platform that has workers from 50 different countries would need to comply with 50 different regulatory regimes and would also be subject to suit under all of them. There are also concerns that divergent regulations will result in a race-to-the-bottom as platforms will allocate tasks to workers based in jurisdictions with less stringent regulation. A coordinated international approach would mitigate this problem, and governments could look to negotiate and a specific international agreement for digital platform work, akin to the UN–ILO Maritime Labour Convention, which applies to seafarers where there are similar challenges of jurisdiction (Cherry, 2019).

Despite the clear gaps in existing international economic law for upholding consumer and labour rights in the digital economy, these issues have received comparably little attention. The UN and OECD have developed general principles to guide the development of consumer protection regulations for digital trade, and these address some specific algorithmic harms (e.g. in financial services) (OECD, 2020). Provisions on consumer protection can also be found in recent digital trade agreements, including DEPA (2020) and UK–Singapore DEA (2022). However, governments merely commit to adopt or implement domestic laws and make general pledges to facilitate access to redress for consumers engaging in cross-border purchases.[14] So far, trade agreements stop short of identifying

[14] See for instance DEPA Art. 6.3 and Art. 8.61-M in UK–Singapore DEA.

specific algorithmic practices that result in harm to consumers and placing substantive obligations on the parties to address them.

The challenges faced by workers have received even less attention. The only mention of worker protections in digital trade agreements is found in the recent UK–Singapore DEA (2022), in which the Parties simply 'recognize' the importance of adopting or maintaining labour policies that promote decent conditions for digital economy workers, but governments undertake no specific obligations.[15] Although the Biden administration has pledged a worker-first trade policy and has prioritized digital trade, the US is yet to make any proposals on worker protection in the digital economy in its trade negotiations.

More troubling, provisions in trade agreements may inadvertently make it harder for consumers and workers to hold foreign firms accountable in their use of AI. As discussed in the section on intellectual property rights, provisions in recent digital trade agreements aimed at protecting source code may impede moves to ensure transparency and accountability in algorithmic decision-making.

VI. AI and cross-border data flows

Data is critical for AI. The ability to amass vast datasets is vital for AI innovation, and the operation of AI technologies such as smart devices depend on rapid, real-time, cross-border data flows. At the same time there are concerns about how AI firms access and use data. Restrictions on cross-border data flows and data localization measures have been the subject of heated policy debates, with major technology companies lobbying for a lax regulatory environment and to ensure that data can freely flow across borders, while consumer rights groups have sought strict regulations, particularly for sensitive personal data.

Many citizens' groups and regulators are concerned that AI technologies might result in a loss of privacy for individuals, given AI's reliance of large amounts of data—including personal data (Bessen *et al.*, 2020). Concerns are growing with the rapid increase in the use of Internet of Things devices in homes, including smart speakers, digital assistants, and wearable devices that track health and well-being, that collect and process vast quantities of personal data, often without consumers realizing the extent. Although many governments have enacted regulations for personal data protection which apply to AI technologies, given that data from all over the world is amassed and used by AI firms it can be hard for firms to comply with national requirements and for governments to monitor and enforce compliance.

The majority of governments have now enacted data protection legislation, although it differs markedly across jurisdictions. While some governments, including the US, leave the protection of personal data largely to industry self-regulation, others, including the EU and China, impose stringent rules, including restrictions on the cross-border transfer of personal data, which is needed in order to secure jurisdictional control. Several governments also impose data localization rules, which require the storage (and/or processing) of specific types of data to be carried out within the jurisdiction where the data was generated. Although these may be justified for a range of public policy reasons, localization measures can impede AI innovation as the quality of datasets emanates from having been obtained from multiple sources and locations.

As in other issue areas discussed above, regulatory divergence creates costs for international firms, while the absence of a robust international regime for personal data protection undermines trust of consumers in digital trade, so there is clear rationale for international cooperation. Yet governments are taking such different approaches to data regulation that convergence is challenging. Differences between the US and EU have been a particular challenge: although more data flows between the US and EU than any other part of the world, divergent approaches to personal data regulation have repeatedly stymied transatlantic cooperation, with two US–EU data agreements struck down in the Court of Justice of the EU. The divergent approaches between these two major markets also create problems for third countries, especially where governments have emulated EU data protection legislation while also entering into a trade agreement with stringent commitments on data flows (see Burri (2023), in this issue).

There is a lively policy debate as to which types of data regulations should be considered as unjustified barriers to trade and actionable under international trade agreements. As existing WTO law has no specific provisions on data flows, a number of governments, including the US, have turned to free trade agreements to secure specific rules that preserve transnational data mobility (Mitchell and Mishra, 2021). A provision that is increasingly common in preferential trade agreements commits governments to allow cross-border data transfers, including transfers of personal data, and to only impose measures if they are necessary to achieve a public policy objective and are not arbitrary, unjustifiably discriminatory, a trade restriction in disguise, or more restrictive than necessary.[16] Many

[15] See Art. 8.61-P.2(e) in UK–Singapore DEA.
[16] See, for example, Art. 4.3 DEPA.

agreements also include specific articles that prohibit the use of data localization requirements, again subject to a similar public policy exception. Out of concern that such provisions would unduly restrict its ability to regulate data, the EU has taken a very different approach in its trade agreements. Although the EU has included prohibitions on data localization, it has not agreed to a general commitment to allow the free flow of data, out of concern that the wording of the public policy exception is too narrow to enable the EU to uphold its citizens' right to privacy, which is a fundamental right in the EU (Yakovleva and Irion, 2020). EU agreements also include much stronger provisions on personal data protection that seek to carve out its data protection regime, including its rules on cross-border data transfers, from external scrutiny (Yakovleva and van Hoboken, 2021).

While debates about data regulation and trade policy have centred on personal data protection, there are other aspects of data regulation that are highly relevant to both AI and trade policy, and which are starting to find their way into digital trade agreements.

A few recent digital trade agreements include specific provisions to promote open government data, an issue on which technology companies and digital rights groups largely agree.[17] Technology companies have advocated public access to large government data sets, as they can play a vital role in the development of AI, while digital rights groups advocate for commitments to make data shareable and re-usable to promote transparency and accountability, and allow citizens an opportunity to engage with their own governance. At the national level, many governments have committed to making their data open, while at the international level the OECD also champions open government data. A more controversial practice occurs when governments collect data and 'feed' it exclusively to their AI industry. To the extent that domestic firms are given privileged access to data, this would create an indirect subsidy to the domestic AI industry that is potentially actionable under WTO rules on subsidies (Shang and Du, 2021).

Some experts express concern that open government data initiatives disproportionately benefit large AI firms as they have the capacity to collect open data and to correlate them with the 'closed data' they hold, and argue that policy-makers should help make *privately* held data more accessible to governments, businesses, and citizens (Bodó *et al.*, 2021; Streinz, 2021). At the domestic level, some jurisdictions are experimenting with legally mandated data sharing as a policy intervention to counterbalance the digital economy's tendency to create winner-takes-all dynamics and to ensure AI start-ups also have access to large datasets. In principle, data portability helps increase competition between established firms in the market because any potential customer could easily shift their data from one established firm to another. However, it is unlikely that data portability alone would increase competition from start-ups, as they would need to induce multiple individual users to port their data to the start-up. An alternative approach would be to create 'data trusts' under which trusted third parties safeguard data while allowing conditional access to large datasets for AI-enabled start-ups (Furman and Seamans, 2019). The UK–Singapore DEA is the only trade agreement to take steps in this direction and it specifically mentions 'cooperating on the development of policies and standards for data mobility, including consumer data portability' and 'sharing policy approaches and industry practices related to data sharing, such as data trusts'.[18]

Given the global nature of data markets, the myriad of challenges around data governance, and divergent national approaches, there are growing calls for a global data governance framework. Policy-makers face the challenge of developing a framework that is innovation-friendly and ensures that shared concerns such as personal data protection and national security are addressed, and that unnecessary barriers to trade are not created through regulation. While some argue that the WTO is the obvious place for such an agreement to be brokered, divergences in the policy priorities of countries, particularly among the US, EU, and China, are likely to thwart that vision for the foreseeable future (Mitchell and Mishra, 2021). In addition, it is not obvious that the trade policy community should have exclusive competence in decision-making that has ramifications for important, non-trade, policy objectives such as privacy, and to combat bias and unfair AI.

VII. Conclusion

Analysing the interface between trade policy and AI, I have shown that trade policy has important ramifications for AI governance, in ways that are often under-appreciated:

- The international guidelines and standards for AI, over which major technology firms and governments are vying for influence, are voluntary but acquire substantial weight when they are cross-referenced in trade agreements. As international standards cover AI uses and processes, it is important that they reflect public interests, yet standard-setting is dominated by major industry players and a select number of governments.

[17] See, for example, Article 9.5 DEPA.
[18] Art. 8.61-I.2(b-c) in UK–Singapore DEA.

- AI technologies are being granted additional intellectual property rights through trade agreements, including for algorithms and source code, which risks reinforcing the market power of dominant firms and impeding moves towards algorithmic transparency and accountability.
- AI technologies exhibit network effects and economies of scale and scope, amplifying concentration in digital markets. Given the global scale of major digital firms, international cooperation is vital for promoting competition in digital markets, yet cooperation is in its infancy, and rules to address market dominance by private actors remain a lacuna in international trade law.
- As the result of digitalization, consumers and workers are engaging directly in cross-border economic transactions to a greater extent than ever, benefitting from the efficiencies of algorithmic systems but also exposed to cross-border algorithmic harms. To uphold the rights of consumers and workers, new forms of international regulation and cooperation will be needed, yet this is only starting to be recognized.
- An increasing number of trade agreements include commitments on cross-border data flows, which are vital for the functioning of AI technologies; a few also promote open government data further promoting AI innovation. Yet, they do little to strengthen personal data protection, even though the acquisition and control over data can undermine the privacy of citizens; nor do they address the privileged control over datasets by major technology companies, which can act as a barrier to entry for smaller AI firms.

The updating of trade agreements is important, as international economic law and cooperation is ill-equipped to address the benefits and risks associated with the digital era and frontier technologies like AI. The business-as-usual approach, which continues to be replicated in digital trade agreements, is to use trade law to promote liberalization and cross-border economic flows, while relying on national measures to pursue other objectives, such as ensuring that AI is ethical and accountable, digital markets are contestable, and the privacy rights of citizens are upheld. Yet in a globalized digital economy where major technology companies are of unprecedented size and global reach, and harms are transmitted across borders, it is not clear that this bifurcated approach is tenable. As I have argued above, fulfilling many digital policy objectives will require new, robust international rules and stronger cooperation in areas like competition and consumer and worker protection.

If a more holistic approach to international rulemaking is needed for AI and the wider digital economy, where should it happen? Although trade policy-makers are taking the lead, including in the negotiation of digital economy agreements, it is far from clear that trade policy-makers are best placed, given the broad and complex policy trade-offs involved. Many digital rights groups are concerned that making trade agreements the focal point for digital economy rulemaking would result in outcomes that elevate trade above other policy objectives (such as ensuring that algorithmic harms are addressed, and citizens' privacy is upheld). An alternative proposal is to create a new international organization that brings issues of digital regulation and government officials from many digital policy domains under one umbrella (Fay, 2019). While this may be desirable, it is unlikely to be viable, given geopolitical competition around digital technologies. A more realistic approach would be for governments to strengthen existing inter-governmental initiatives around competition and consumer and worker protection that are often neglected and underfunded, such as the International Competition Network, the International Consumer Protection and Enforcement Network, and the International Labour Organization. The work of these bodies on digital issues could then be cross-referenced in trade agreements to provide greater recognition and strengthen enforcement.

In tandem, moves should be made to strengthen organizations representing small businesses, workers, and citizens, so they can better identify and articulate their interests in digital economy policy-making, and to open digital trade policy-making to ensure it is more inclusive, including for smaller developing countries. At a time when there are calls for AI to be transparent and accountable, it is ironic that many of the spaces where the rules for AI and the wider digital economy are being decided are opaque and suffer from accountability deficits.

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