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Artificial Intelligence and International Economic Law

A Research and Policy Agenda

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I INTRODUCTION

By approaching the complex set of phenomena the term "artificial intelligence" (AI) encapsulates from the vantage point of international economic law (IEL), we aim to advance the discourse surrounding the ways in which the development and use of AI transform economies, societies, and (geo)politics. We raise what we regard as important but also daunting questions regarding how IEL might, for better or worse, shape these developments – while being transformed itself in the process, both substantively and practically.

These questions include foundational clarifications about the nature, scope, and transformative potential of AI. In this context, it is essential to distinguish not only between different kinds of AI – ultimately an underspecified umbrella term – but also between what already exists, what is yet to come, and what might only materialize in the distant future (if ever). Moreover, even within (relatively) clearly defined forms or fields of existing AI, there is considerable variation in the methods and technologies used. For these reasons, the traditional lawyerly task of "defining AI" is caught between the Scylla of variety and specificity and the Charybdis of vagueness and expansiveness, which may jeopardize (if not eliminate) practical usefulness. In other words, while it is certainly possible to define AI as a field of inquiry or as an umbrella term for algorithms and robots with certain functionalities, comprehensive legal analysis requires a careful dissection of AI's constitutive parts and its applications. AI technologies constitute complex sociotechnical systems involving humans, machines, algorithms, and data, and their deployment raises legal questions across a wide range of domains, including but not limited to data protection and privacy law, antidiscrimination law, intellectual property law, and tort law.

As the chapters in this volume illustrate, IEL speaks to various aspects of AI development, deployment, and use, as well as their corresponding regulation. In this chapter, we introduce three cross-cutting themes that illustrate the relationship between AI and IEL: disruption, regulation, and reconfiguration.

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We begin by exploring the theme of continuity and *disruption*: we trace contemporary AI's foundational ideas back to the 1950s and explain how a combination of exponential growth in datafication and computing power enabled a certain AI technology – machine learning (ML) via "deep" neural networks (deep learning) – to advance in largely unexpected, and hence sometimes disruptive, ways since the mid-2000s. Contemporary ML's dependence on large datasets is but one illustration of how AI is generally intertwined with the digital transformation of the economy. While some of these transformations contribute to long standing goals of IEL, others stretch and potentially disrupt certain assumptions, under which IEL has developed since the creation of the General Agreement on Tariffs and Trade (GATT) in 1947 and the founding of the World Trade Organization (WTO) in 1995.

We then turn to the important theme of AI *regulation*, or indeed the absence thereof. The deployment of digital technologies, including AI-powered applications, has effects that can themselves be understood as regulatory in nature, as they enable certain activities (but not others), shape and condition human behavior, and expand and (re)allocate wealth and resources. They may also empower or diminish people. Growing concerns about the adverse impact of AI technology, especially with regard to patterns of inequality, exclusion, and outright discrimination, have led to a plethora of initiatives that seek to regulate AI technology through often overlapping but ultimately rather vague value sets (often emphasizing human-centered design and fundamental principles of ethics). These initiatives aspire to have a transformative effect on the technological development and societal deployment of AI, which is fundamentally driven by the academic-industrial complex and in significant part regulated by various, often transnational, standard-setting bodies. Governments have only slowly begun to confront AI-enabled transformations through legislative and regulatory action, with the European Union (EU) emerging as the most aggressive AI regulator. IEL provides a (meta)regulatory framework that aspires to govern these regulatory initiatives. Yet IEL's traditional focus on state-led regulation and its preference for multilateralism pose particular challenges in this regard.

All of these developments raise the question of IEL's ongoing and future *reconfiguration*. Several traditional domains of IEL, especially its multilateral trade dispute settlement system and the largely bilateral albeit widespread web of investor–state dispute settlement mechanisms, have been under pressure to reform and adapt. Major geopolitical shifts, most notably the rise of China, have called into question the WTO's relevance, as well as its capacity to sustain a quasi-universal multilateral trading system and prevent the "decoupling" of major trading blocs. The digital transformation of the global economy, which is in significant part influenced by the development and deployment of AI, adds further pressure to reconfigure the procedural, substantive, and enforcement aspects of IEL. Ultimately, AI technologies could be deployed to reconfigure the practice of IEL itself. Along these lines, we

assess the extent to which IEL has already been reconfigured and explore the need for further reconfiguration.

In the following, we expand on the three themes of disruption, regulation, and reconfiguration that permeate the volume. Ultimately, this book seeks to engineer a broader discourse around AI and IEL as a field of scholarly inquiry and technologically informed legal practice. To this end, we conclude this introduction by bringing the contributions we assembled in this volume into conversation with one another and identify topics that warrant further research.

II THE (RE)EMERGENCE OF ARTIFICIAL INTELLIGENCE AND THE TRANSFORMATION OF THE GLOBAL ECONOMY

AI is often grouped together with other "disruptive" technologies, as Clayton Christensen's influential theory of innovation has entered the mainstream.[1] In this section, we explore the theme of disruption with regard to AI along three dimensions: first, we show how, *technologically*, the emergence of contemporary AI demonstrates remarkable continuity with ideas from the 1950s that only came to fruition after the 2000s because of exponential increases in computing power and the availability of large datasets. Second, we explain how, *economically*, AI, in combination with other digital technologies, is gradually but significantly transforming the global economy. Third, we show how these transformations lead to *legal* disruptions of longstanding assumptions and conceptualizations on which IEL has come to rely. This trifecta of AI-related technological, economic, and legal change is not a force of nature but is, rather, the result of human ingenuity in pursuit of innovation, efficiency, and profit maximization.[2]

A *Artificial Intelligence's Technological Development*

As we noted earlier, the term "artificial intelligence" is difficult to neatly define for legal purposes.[3] The term is being used in various interdisciplinary research communities encompassing computer and data science, philosophy and ethics, as well as the study of human and machine minds by psychology, cognitive science, and neuroscience. Even within computer science, definitions and related aspirations for AI differ.[4] The term's invention is usually credited to John McCarthy and his

[1] CM Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Boston, Harvard Business School Press, 1997). For a sharp critique of the use of the term in the tech discourse see A Daub, "The Disruption Con: Why Big Tech's Favourite Buzzword Is Nonsense" (*The Guardian*, 24 September 2020), https://perma.cc/92VM-WM58.

[2] This is not to say that these are the only objectives that could or should be pursued; see, for example, the innovation-skeptical account by L Vinsel and AL Russell, *The Innovation Delusion: How Our Obsession with the New Has Disrupted the Work That Matters Most* (New York, Currency, 2020).

[3] See also the chapter by Mercurio and Yu in this volume (Chapter 7), which uses the definition adopted by the World Intellectual Property Organization (WIPO).

[4] "Artificial Intelligence and Life in 2030: One Hundred Year Study on Artificial Intelligence – Report of the 2015 Study Panel" (2016), https://ai100.stanford.edu, at 12 (claiming that the "lack of a precise,

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collaborators, who convened the legendary 1956 workshop at Dartmouth to investigate "the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it."[5] This definition still encapsulates the field of AI research today.[6] It also identified human intelligence as the relevant benchmark against which developments of artificial or machine intelligence are to be assessed. One well-known, albeit reductive, instantiation of this idea is the Turing test.[7] Inversely, the AI effect denotes the phenomenon that once machines have mastered a task that used to be accomplished exclusively by humans, the task itself is no longer deemed to require "intelligence."[8] Another paradox is that what is easy for humans is often hard for machines.[9] Increasingly, however, human intelligence is being displaced as the relevant benchmark for what counts as "intelligence."[10]

In any case, humans are not merely a baseline by which to assess advances in AI. They also make decisions about how AI is developed and deployed at every point along the way. Mentioning this fact may seem trite, but it appears to be necessary in light of the frequent confusion between the (limited) autonomy of AI applications on the one hand and the essential roles that (largely) autonomous humans play in AI development and deployment on the other. This includes the human labor-intensive tasks of data preparation and model selection and training.[11]

AI development is a complex process, with humans, machines, algorithms, and data serving as its key components (see Figure 1.1). AI problem domains range from perception, reasoning, knowledge-generation, and planning to communication. The AI paradigms invoked to tackle these challenges include logic- and knowledge-based modeling (where human rationales and expertise are turned into code), statistical methods (including traditional probabilistic methods, now encompassed by "data science"), and subsymbolic systems that venture toward distributed and evolutionary AI.[12]

The most important AI technology today is deep learning, a machine learning technique based on neural networks of several ("deep") layers (hence "deep"

universally accepted definition of AI probably has helped the field to grow, blossom, and advance at an ever-accelerating pace").

5 J McCarthy et al., "A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence" (31 May 1955), reprinted in (2006) 27 *AI Magazine* 12, at 12.

6 An excellent introduction to contemporary AI and its history is provided by M Mitchell, *Artificial Intelligence: A Guide for Thinking Humans* (London, Picador, 2019).

7 AP Saygin et al., "Turing Test: 50 Years Later" (2000) 10 *Minds and Machines* 463.

8 D Hofstadter, *Gödel, Escher, Bach: An Eternal Golden Braid* (New York, Basic Books, 1979), at 609 (allegedly misquoting Larry Tesler, who said: "Intelligence is whatever *machines* haven't done yet," with emphasis added to highlight the divergence).

9 M Minsky, *The Society of Mind* (New York, Simon and Schuster, 1986), at 29.

10 S Dick, "Artificial Intelligence" (2019) 1.1 *Harvard Data Science Review*.

11 D Lehr and P Ohm, "Playing with the Data: What Legal Scholars Should Learn About Machine Learning" (2017) 51 *UC Davis Law Review* 653.

12 See the helpful visualization in F Corea, *An Introduction to Data: Everything You Need to Know About AI, Big Data and Data Science* (Cham, Springer, 2019), at 26.

learning).[13] The basic idea behind this kind of ML dates back to the 1960s: deep neural networks simulate the processes through which neurons in the human brain make determinations about the world. It is ultimately a process of pattern recognition on the basis of large datasets. Initial enthusiasm for the idea dissipated, as alternative routes of AI development seemed more promising until the 1990s. It was only after sufficiently large datasets became available after the 2000s and the computing power necessary to compute these amounts of data was readily available that deep learning finally took off. Achievements that had been presumed to be out of reach in the near future became possible within surprisingly short timeframes.

AlphaGo's stunning success against one of the world's leading Go players, Lee Sedol, was enabled by deep learning, which trained the algorithms toward maximizing win probability and produced a nonhuman move that stunned Go experts.[14] Its later iteration, AlphaZero, was trained entirely by playing against itself and mastered the games of Go, chess, and shogi.[15] In addition, the prospect of autonomous driving vehicles has attracted significant attention. The Defense Advanced Research Projects Agency (DARPA), the US defense research organization also responsible for funding the Internet's foundational technology, launched its "Grand Challenge" for self-driving vehicles in 2004. The goal was to travel 150 miles through the Mojave Desert but no car reached the finish line, with the furthest advancing vehicle getting stuck after traversing less than eight miles. One year later, this marker was surpassed by all but one of the twenty-three finalists, and five cars completed the full distance of 132 miles. Suddenly, the prospect of (more or less) autonomous vehicles seemed to become a more near-term possibility – with implications for both AI regulation and IEL.[16]

The remarkable progress made by AI technology over the course of the last two decades notwithstanding, contemporary AI technology's significant limitations must not be ignored. In this regard, one can distinguish between tasks that AI is not able to perform at all and tasks that AI is supposedly able to do but that are executed poorly and with adverse effects, potentially causing harm to humans. The latter is an issue that we will address further later when we discuss the relevance of IEL to AI regulation, including AI regulation meant to guard against AI-caused harms. The former deserves clarification at this point: AI remains far from what has been termed "artificial general intelligence" (AGI); that is, the ability to perform the human-like functions of reasoning, knowledge-generation, and planning *generally*.

[13] I Goodfellow et al., *Deep Learning* (Cambridge, MA, MIT Press, 2016); TJ Sejnowski, *The Deep Learning Revolution* (Cambridge, MA, MIT Press, 2018).

[14] Contrast IBM's "Deep Blue" victory against chess world champion Gary Kasparov in 1998, which symbolizes the achievements of AI in the pre-deep learning era but also indicates its limitations: the machine had to use its vast resources to analyze human-played matches in real time to calculate the best move.

[15] David Silver et al., "A General Reinforcement Learning Algorithm That Masters Chess, Shogi, and Go Through Self-Play" (2018) 362 *Science* 1140.

[16] See the chapters in this volume by Peng (Chapter 6) and Lin (Chapter 12).

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Contemporary AI remains largely limited to *discrete tasks* for which the algorithms have been trained with large datasets. Nondiscrete tasks, or tasks for which no reliable datasets exist, are beyond the ambit of contemporary AI technology. Companies that claim otherwise are often in the business of selling AI snake oil.[17] These limitations notwithstanding, the impact of AI technology on the global economy, to which we next turn, is already tangible and is likely to increase over the course of the next decade.

B *Artificial Intelligence and the Digital Transformation of the Global Economy*

As we have seen, the resurgence of AI and its transformative potential are intertwined with other technological developments in the global economy, most notably digitalization, computation, and interconnectedness, the latter of which is made possible by the Internet. AI relies on these foundational technologies of the digital era and coexists in synergy with other advanced digital technologies. For these reasons, our volume does not address AI in isolation but, rather, considers AI in the context of other transformative digital technologies, most notably "big data," cloud computing, the Internet of Things (IoT), and new forms of robotics.

Big data is often used quasi-synonymously with AI, but it is worth distinguishing between the two concepts to understand their respective impact on the global economy. Big data denotes the generation and analysis of datasets whose quantity surpasses human comprehension – only through machine-provided computing power can the available data be "mined" and insight gleaned from it.[18] However, the fact that because of its large quantity, big data cannot be analyzed by humans without help from machines in itself does not justify its designation as a form of (human-comparable) "intelligence." It is only when data analysis resorts to ML methods through which the algorithms themselves detect those patterns that justify a certain conclusion or prediction that it is appropriate to refer to AI. Contemporary data science teaches the statistical foundations of data analytics (including Bayesian networks) but increasingly includes and trends toward the use of ML to glean insights from data. Both technologies are dependent on large quantities of data, thereby transforming data into an important yet contested resource in the AI economy.[19]

The data on which both big data analytics and AI rely flow through the interconnected networks that constitute the Internet. Cloud computing builds on this

[17] A Narayanan, "How to Recognize AI Snake Oil" (Arthur Miller lecture on science and ethics, Massachusetts Institute of Technology, 18 November 2019), www.cs.princeton.edu/~arvindn/talks.

[18] V Mayer-Schönberger and K Cukier, *Big Data: A Revolution That Will Transform How We Live, Work, and Think* (London, John Murray, 2014).

[19] See the chapter in this volume on regulating data as a resource under IEL by Streinz (Chapter 9); see also Zufall and Zingg's chapter (Chapter 11) on data portability as a way to reallocate data.

underlying infrastructure and makes data storage and processing capabilities available at a distance ("infrastructure as a service," or IaaS). AI development is increasingly reliant on and in symbiosis with cloud computing. As part of their "platform as a service" (PaaS) business, cloud providers offer virtual AI development environments that integrate access to large datasets and libraries of algorithms. AI-enabled services, for example the translation of text or the transcription of audio recordings, can be offered on a cloud basis ("software as a service," or SaaS).[20]

Another evolution of the Internet – the IoT – also has AI-related implications. IoT denotes the Internet-enabled connectivity installed in objects (things) that previously did not possess the capability to interconnect and communicate with other objects or, indeed, humans. The Internet-enabled fridge is the stereotypical example, and a wide range of household items are expected to become equipped with internetworking ability. However, the IoT extends far beyond the household and features important industry applications as it enables interconnected machines (e.g., for farming) to operate in sync. Complex systems of this kind may rely on AI for management. Moreover, the interconnected objects that constitute the IoT are also often equipped with sensors used for data gathering, thereby expanding the volumes of data on which contemporary AI/ML relies. To the extent that IoT devices feature sufficient computing power, they may also be used to (re)train AI algorithms with local data in a decentralized fashion, thereby reducing the reliance on (centralized) cloud computing.

It is a mistake to believe that AI or other digital technologies occupy a virtual space detached from the physical world. To the contrary, all digital technologies are in various ways reliant on and intertwined with the physical world – for example, through the data centers where the data is stored, as well as the subsea cables through which most transnational Internet traffic flows.[21] AI-enabled services can be delivered online, including transnationally. But AI can also enable physical objects to perform certain functions locally.[22] These configurations are often called "robots": while public imagination remains captivated by human-like (humanoid) robots that seek to combine a human appearance with human-like capabilities, most robots are industrial machines that look nothing like humans. They play an increasingly important role in manufacturing, ushering in new forms of automation and mechanization that may affect developmental models and global supply chain calculations, especially in light of additive manufacturing (3D printing).[23] These

[20] C Yoo and J-F Blanchette (eds), *Regulating the Cloud: Policy for Computing Infrastructure* (Cambridge, MA, MIT Press, 2015).

[21] N Starosielski, *The Undersea Network* (Durham, NC, Duke University Press, 2015). ML may be used to optimize these systems: M Ionescu et al., "Design Optimisation of Power-Efficient Submarine Line through Machine Learning" (24 February 2020), arXiv:2002.11037.

[22] For a discussion of the legal implications see R Calo, "Robotics and the Lessons of Cyberlaw" (2015) 103 *California Law Review* 513; I Cofone, "Servers and Waiters: What Matters in the Law of A.I." (2018) 21 *Stanford Technology Law Review* 167.

[23] For a discussion of various use cases see LE Murr, "Frontiers of 3D Printing/Additive Manufacturing: From Human Organs to Aircraft Fabrication" (2016) 32 *Journal of Materials Science & Technology* 987.

changes have inversely correlated implications for trade in goods and trade in services as production at home and service delivery abroad become more feasible, with complex ramifications for the future of workers.[24] All of these digital technology-enabled transformations taken together are sometimes described as the "Fourth Industrial Revolution," or "Industry 4.0."[25] By comparing and contrasting the digital transformation with prior industrial revolutions that were enabled by the steam engine, electricity, and the computer, the infrastructural relevance of digital technologies in general, and AI in particular, to economic development becomes apparent.[26] While various types of AI applications will transform different sectors in different ways, the generalizable feature of AI is its ability to create *insights* through ML on the basis of large datasets. At least since the information economy revolution, it has become obvious that asymmetric control over information is critical to comparative economic advantage. AI's ability to generate information based on existing digitalized information has become an essential infrastructure for all businesses, not just the financial sector, which seems to have recognized this transformation early on.[27] Dan Ciuriak has described this transformation as the shift from a knowledge-based economy to a data-driven economy.[28] AI is a central feature of the data-driven economy because of its ability to create more data, information, and knowledge from existing data. AI's reliance on data also means that existing literature on the digital transformation before current AI technology took off and its implications for IEL remains relevant but must be reassessed against the backdrop of a reality in which AI interacts with various advanced digital technologies.

C *Disrupting Established Assumptions of International Economic Law*

The technological development of AI, as well as the economic transformation it enabled and reinforced, pose distinct challenges for IEL. In this book, we focus primarily on international trade law.[29] The multilateral international economic order has been operating under the auspices of the WTO since 1995. Its

[24] R Baldwin, *The Globotics Upheaval: Globalisation, Robotics and the Future of Work* (Oxford, Oxford University Press, 2019).

[25] The term was coined by World Economic Forum founder Klaus Schwab; the chapters by Lim (Chapter 5) and Toohey (Chapter 17) in this volume use the concept for their analysis.

[26] The leading AI researcher Andrew Ng compared AI to electricity: "Just as electricity transformed almost everything 100 years ago, today I actually have a hard time thinking of an industry that I don't think AI will transform in the next several years." S Lynch, "Andrew Ng: Why AI Is the New Electricity" (*Stanford Business*, 11 March 2017), https://perma.cc/FVA3-W2GA.

[27] J Truby, R Brown, and A Dahdal, "Banking on AI: Mandating a Proactive Approach to AI Regulation in the Financial Sector" (2020) 14 *Law and Financial Markets Review* 110 (discussing regulatory challenges).

[28] D Ciuriak, "Economic Rents and the Counters of Conflict in the Data-Driven Economy" (2020) CIGI Paper No. 245.

[29] As with AI, there is no universally accepted definition of IEL but trade is generally recognized as the core domain of the field. Compare S Charnowitz, "The Field of International Economic Law" (2014) 17 *Journal of International Economic Law* 607.

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substantive rules can be traced back to the GATT of 1947, which ushered in a series of tariff liberalizations, followed by agreements that increasingly focused on regulatory matters.[30] With the founding of the WTO, the General Agreement on Trade in Services (GATS) and the agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) expanded the scope of international trade law beyond trade in goods. At the same time, the creation of the GATS led to a bifurcation of the international trade regime into trade in goods and trade in services. The distinction is significant, because countries retained more control over services liberalization under the GATS's complex system of positive lists (indicating market access) and negative lists (indicating persistent limitations).[31] The goods/services distinction,[32] however, is increasingly difficult to align with economic reality and may lead to arbitrary results.[33] Moreover, AI-enabled services, even if they are clearly services, may escape the established GATS classification of services or lead to interpretive contests regarding the question of whether a previously analog service is not being performed digitally and should be treated according to the same liberalization commitment the WTO member initially made.[34]

The goods/services distinction and the expansion of AI-enabled services are not the only ways in which assumptions IEL has come to rely on are being upended by transformations in the global economy brought about by AI. Another example concerns the complex incentive structures international intellectual property (IP) law seeks to construct in pursuit of the TRIPS agreement's twin objectives of promoting technological innovation and the transfer and dissemination of technology.[35] The question of whether underlying assumptions about human agency still hold arises, as owners of AI technology have suggested that the AI itself should be designated as "inventor."[36]

Ultimately, foundational conceptual underpinnings of IEL may be disrupted. IEL is often understood to be fundamentally about "trade," the cross-border exchange of goods and services, and "investment," the long-term commitment

[30] Ciuriak and Rodionova (Chapter 4 in this volume) take the agreement on technical barriers to trade (TBT) and the agreement on sanitary and phytosanitary measures (SPS) as a baseline to assess the regulatory challenge that AI poses for IEL. Lim (Chapter 5) and Peng (Chapter 6) discuss TBT in more detail.

[31] P Low and A Mattoo, "Is There a Better Way? Alternative Approaches to Liberalization under GATS," in P Sauve and RM Stern (eds), *GATS 2000: New Direction in Services Trade Liberalization* (Washington D.C., Brookings Institution, 2000), at 449.

[32] S-Y Peng, "A New Trade Regime for the Servitization of Manufacturing: Rethinking the Goods-Services Dichotomy" (2020) 54(5) *Journal of World Trade* 699.

[33] See the discussion by Weber (Chapter 3) and Peng (Chapter 6) in this volume.

[34] For a brief discussion of the potential and limits of technological neutrality to resolve such conflicts, see Streinz's Chapter 9 in this volume.

[35] TRIPS, art 7. On the increasing depth and breadth of intellectual property rights, see S Frankel, "It's Raining Carrots: The Trajectory of Increased Intellectual Property Protection," in G Ghidini et al. (eds), *Kritika: Essays on Intellectual Property Vol. 2* (Cheltenham, Edward Elgar, 2017), at 224.

[36] See Mercurio and Yu's Chapter 7 in this volume.

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of resources by businesses in host states. The use of inherently multijurisdictional infrastructures for global AI development and deployment may render the notion that this kind of economic activity constitutes "trade" analytically unhelpful or politically unpersuasive.[37] Similarly, digital businesses may operate transnationally without the need to commit resources to a local presence or local means of production akin to conventional "investments." Accordingly, how to conceptualize, categorize, and measure the different transnational commercial interactions in the AI economy remains a major challenge for IEL at this point.

As the next section will discuss, the need for and complexity of AI regulation and the privatization of AI governance pose further challenges for IEL, which has been traditionally geared toward constraining governmental regulation.

III ARTIFICIAL INTELLIGENCE REGULATION AND THE RELEVANCE OF INTERNATIONAL ECONOMIC LAW

AI technologies present new challenges to existing regulatory framework and may require the creation of new regulatory infrastructures. Policymakers must balance different and sometimes competing legitimate public policy objectives, such as fair competition, nondiscrimination, privacy, and security,[38] while avoiding regulatory overreach that may inhibit socially beneficial innovations. Governments around the world are contemplating various forms of AI regulation, ranging from "AI ethics" over transparency requirements for public and private algorithmic decision-making to outright bans of certain AI use cases (such as governmental use of facial recognition technology). At the same time, governments are frantically racing to develop national AI strategies to develop their digital economies. AI technologies trigger and channel political and economic pressures, as evidenced by intensive lobbying and engagement in different governance venues for and against various regulatory choices, including who and what will be regulated, for what purpose, by whom, and how.

Through this volume, we seek to inject IEL into these conversations with two objectives in mind: one is to explore how extant IEL frames these different regulatory initiatives. Which limits do WTO law and the disciplines contained in preferential trade agreements impose on AI regulators? How is IEL shaping different forms of AI regulation and with what outcomes? The other goal is to reflect on IEL's suitability and adaptability to generate societally beneficial outcomes in the context

[37] See Fukunaga's Chapter 8 (questioning whether digital trade disputes are trade disputes).

[38] In this regard, Art. 198 of the EU-UK Trade and Cooperation Agreement (TCA) represents an example of creating an inclusive list of legitimate objectives. It reaffirms the Parties' right to regulate to achieve legitimate policy objectives, "such as the protection of public health, social services, public education, safety, the environment including climate change, public morals, social or consumer protection, privacy and data protection, or the promotion and protection of cultural diversity."

of AI regulation with a view toward IEL's ongoing reconfiguration and a potential need for further change.

AI is multifaceted and complex and the global regulatory landscape reflects this to a certain extent. Global AI governance is in flux and gradually and iteratively being shaped and reshaped.

The proliferation of relatively vague "AI principles" in past years established an initial pathway regarding how to further develop societal norms surrounding AI development, deployment, use, and governance. These "AI principles" present a first vision for the relationship between general AI governance (including through ethics and standards) and governmental AI regulation.[39] Although it remains to be seen what approaches will eventually materialize, some common approaches can be identified from existing national policies.[40] Increasingly, proposals for more forceful governmental AI regulation are emerging, with the EU asserting and promoting itself as a pioneering AI regulator.[41] Various global standard-setting bodies are engaged in their own initiatives to standardize and thereby address certain regulatory aspects of AI governance.

To untangle the complex and dynamic relationship between AI and IEL, we suggest three analytical prisms that shed light on different yet related aspects of AI regulation, as presented in Figure 1.1.

The first prism differentiates between different *domains* of AI regulation (economic, social, and administrative) and asks for what purpose and under what framing AI regulation is being pursued. The choices of whether or not to regulate AI, how to regulate AI, and whom should be regulated are closely related to the balancing of innovation effects and the interpretation of existing economic, social, and administrative regulation.[42]

The second prism disintegrates AI into its constitutive *components* – hardware, algorithms, and data – and asks how each of them is being regulated by domestic and international law as well as industry standards within the framework that IEL provides. While hardware and algorithms are important elements and increasingly subject to trade disputes, our focus in this volume is on "data regulation as AI regulation."

[39] See the contributions in MD Dubber, F Pasquale, and S Das (eds), *The Oxford Handbook of Ethics of AI* (Oxford, Oxford University Press, 2020).

[40] J Fjeld et al., "Principled Artificial Intelligence: Mapping Consensus in Ethical and Rights-Based Approaches to Principles for AI" (2020) Berkman Klein Center for Internet & Society, https://dash.harvard.edu/handle/1/42160420.

[41] The EU White Paper on AI left key concepts such as "high risk" and "robustness and accuracy" undefined. See European Commission, "White Paper on Artificial Intelligence: A European Approach to Excellence and Trust" COM (2020) 65 final. Contrast the European Commission's proposal for a regulation laying down harmonized rules on artificial intelligence (Artificial Intelligence Act) COM(2021) 206.

[42] E Balleisen et al., *Government and Market: Toward a New Theory of Regulation* (Cambridge, Cambridge University Press, 2010), at 93–94. See also OECD, "Regulatory Reform and Innovation," www.oecd.org/sti/inno/2102514.pdf.

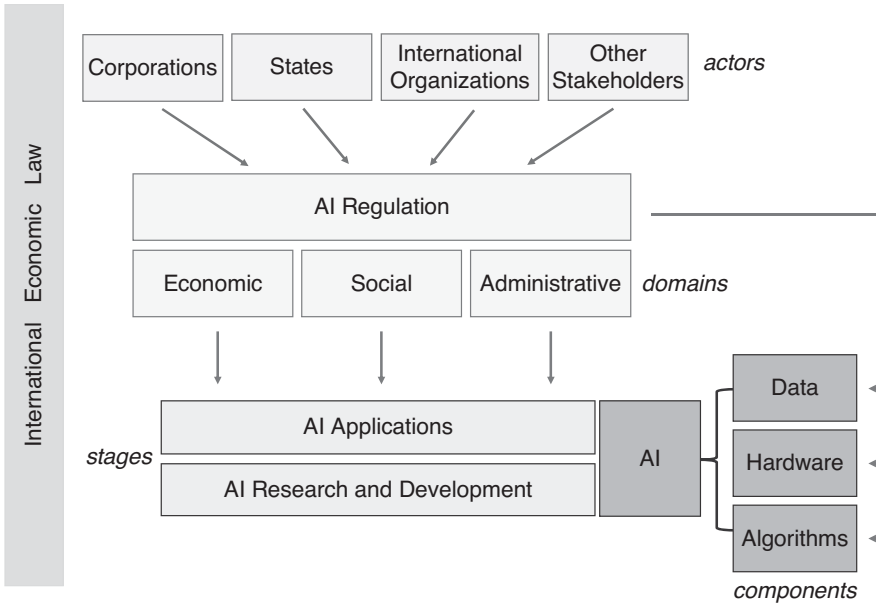

FIGURE 1.1 Artificial intelligence regulation in the context of international economic law

The third prism identifies different *actors* engaged in AI regulation including corporations, states, international organizations, and other stakeholders to assess the relative relevance or irrelevance of IEL for their regulatory interventions.

As becomes clear from this kind of analysis, the regulatory target is never "AI" in the abstract. AI regulation is about the creation of a regulatory framework that matches the complexity and distributed nature of AI research, development, and deployment and is commensurate with their economic, social, and administrative impact. This requires different regulatory interventions by different stakeholders in different domains aimed at different aspects of AI at different *stages* of AI development, deployment, and use.

A *Artificial Intelligence Regulation Across Domains*

A three-fold typology of regulation, as shown in Figure 1.1, can illustrate possible linkages between AI regulation and IEL across three overlapping but still analytically distinguishable domains: economic, social, and administrative AI regulation. Each of these advances a certain framing of AI regulation around concepts such as innovation, harm, and accountability and intersects with IEL in different ways.

The first type of AI regulation is designed to pursue economic-oriented objectives. Labeled by the OECD as "economic regulation," this type of regulation is primarily related to innovation and is often intended to improve the market efficiency of goods

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and services. It can include, among other matters, technical standards/conformity assessments, competition law, and IP rights.[43] The data-driven economy has led to winner-takes-all dynamics under which certain companies have acquired monopoly status and infrastructural importance.[44] Anticompetitive behavior enabled by the overwhelming dominance of a few players in digital markets has become the main regulatory target of competition authorities in more and more jurisdictions.[45] In a similar vein, a more subtle example of economic regulation is AI's uneasy fit with the existing IP regime.[46] Moreover, the WTO, as a system ostensibly dedicated to open, fair, and undistorted trade, embraces principles of nondiscrimination. Many of the WTO agreements are designed to secure "fair trade" conditions. Governments' turn to economic regulation raises the question of whether this kind of AI regulation may create new ambiguities in WTO law. In other words, are conventional trade rules adequate for governing the policies that governments pursue to spur AI innovation?[47]

A second group of AI regulations is shaped by noneconomic objectives, which are often designed to protect society at large or certain groups within a society. Although this kind of "social" regulation is not entirely distinguishable from "economic" regulation, such rationales may include AI regulation of privacy, security, discrimination, or other concerns. In this context, the winner-takes-all nature of the platform economy exacerbates the need to strike a balance between trade efficiency and other policy objectives. Several chapters in this book address the question of how IEL can help reduce imbalances of digital markets. One of the challenges facing the WTO e-commerce talks is the allegation that the proposed rules for digital trade will benefit large companies at the expense of small businesses. Civil society groups have been pressing for development-focused digital industrialization, indicating the need to ensure the universal benefits of the digital economy and to close the digital divide.[48] The exceptions to the general trade disciplines provided by WTO law allow members to use domestic measures to promote non-trade values. But are the existing exceptions to trade rules overinclusive or underinclusive with respect to AI applications, in general and in particular with regard to data ethics and public moral issues surrounding automated driving systems?[49]

A third domain of AI regulation is "administrative regulation," which governs the practical functioning of both public and private sectors, and therefore can function

[43] OECD, "Examples of AI National Policies" (2020), www.oecd.org/sti/examples-of-ai-national-policies.pdf.

[44] See Shaffer's Chapter 2.

[45] The EU has launched competition law proceedings against major US tech companies. In fall 2020, the US Department of Justice sued Google for violating antitrust laws; see DOJ press release of 20 October 2020, justive.gov (https://perma.cc/7RQV-QS72). See also Weber's Chapter 3.

[46] See Mercurio and Yu's Chapter 7.

[47] See Shang and Du's Chapter 14, discussing limits to AI subsidies.

[48] See Shaffer's Chapter 2.

[49] See Mishra's Chapter 13 and Lin's Chapter 12.

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as a means of setting up the conditions for technological advance.[50] This can include AI regulation that safeguards accountability, transparency/explainability, and human control of technology. How can IEL promote mechanisms to ensure that accountability for the impacts of AI applications is appropriately distributed? Can IEL incorporate transparency requirements that AI systems be designed and implemented to allow for oversight?[51] Perhaps the most basic yet heavily contested example in this regard is the improvement of transparency to ensure public access and oversight over algorithms, their application, and the underlying datasets.[52]

B *Data Regulation as Artificial Intelligence Regulation*

Another important angle is the examination of specific aspects of AI to determine whether AI-specific regulation is necessary or feasible given the breadth and range of data-driven technologies. Such legal and policy analysis needs to take account of technological developments. AI-specific regulation only makes sense when the regulatory objectives are closely connected to AI technologies. In other words, AI-specific regulation should be framed in a way that allows the "new" legal issues to be addressed in an AI-specific way by taking account of the "AI system lifecycle" and its "enabling ecosystem."[53]

Indeed, some regulatory initiatives avoid the "AI" moniker altogether and distinguish instead between regulation of "algorithmic systems" (whether entirely human coded or, in part, self-trained) and regulation of "data."[54] Algorithms are increasingly subject to novel protections in instruments of IEL to guard against mandatory source code disclosure.[55] At the same time, and in contrast to the dominant discourse in IEL, a lot of algorithmic development is being conducted by academia and industry using "open-source" licenses under which algorithms are freely available. This is not true to the same extent for data and hardware, despite various "open data" and "open hardware" initiatives. Indeed, specialized AI hardware, in particular microprocessors optimized for ML, is becoming increasingly important. In this domain, the USA retains a comparative advantage over China and has imposed export

[50] OECD, note 44 above.

[51] OECD, note 45 above, at 27.

[52] M Kaminski, "Understanding Transparency in Algorithmic Accountability," in W Barfield (ed), *The Cambridge Handbook of the Law of Algorithms* (Cambridge, Cambridge University Press, 2020), at 121. See also Weber's Chapter 3.

[53] LB Moses, "How to Think about Law, Regulation and Technology: Problems with Technology as a Regulatory Target" (2013) 5(1) *Law, Innovation and Technology* 1.

[54] One example of this approach is the Opinion of the German Data Ethics Commission (22 January 2020), www.bmjv.de (https://perma.cc/6YZW-YYX3).

[55] See K Irion, "AI Regulation in the European Union and Trade Law: How Can Accountability of AI and a High Level of Consumer Protection Prevail over a Trade Discipline on Source Code?" (23 January 2021), https://ssrn.com/abstract=3786567.

restrictions to retain this leverage in the ongoing trade conflict between the two AI superpowers.[56]

Our focus in this volume is on "data governance" as "AI governance." AI-specific regulation may create additional requirements for data quality, transparency, and accountability.[57] Such requirements would complement existing data protection laws such as the EU's General Data Protection Regulation (GDPR). Data laws regulate a decisive input factor of contemporary AI technology that is fundamentally data-driven because of its reliance on ML algorithms.[58] Therefore, a broader perspective – data regulations as AI regulation – is adopted in this book to explore the interaction between AI and data governance. Why is data governance critical for AI and ML?[59] How can a balance be struck between data protection and data-driven innovations, including AI?[60] Addressing the topic of datafication as a technological trend, modern life, especially in the context of AI, has become dependent on computerized data.[61] AI, robotics, 3D printing, blockchain, and the IoT are converging into "digitally connected networks of production, communication and consumption."[62] The tension between the emerging regulatory interventions in AI and the existing international trade and investment rules, therefore, can be understood along the dimensions of data control and data mobility.[63]

C *Privatization of Artificial Intelligence Regulation*

One important issue for AI regulation is that there are many actors at play, developing norms of varying quality, precision, and significance that could potentially shape the regulatory framework. Considering the rapid pace of AI developments, a regulatory framework that is sufficiently flexible to keep up with technological innovation and business developments is a significant challenge.

Many AI principles have been created through collaborative, multistakeholder efforts, with a wide breadth of experts involved. Relevant stakeholders have been included in pursuit of a normative consensus surrounding the governance of AI technologies. Stakeholders hail from many different public and private sector

[56] D Ernst, "Competing Artificial Intelligence Chips: China's Challenge amid Technology War" (26 March 2020), CIGI Special Report, www.cigionline.org/publications/competing-artificial-intelligence-chips-chinas-challenge-amid-technology-war. See also Winn and Chiang's Chapter 16 on the AI rivalry between China and the USA.

[57] See Article 10 of the European Commission's proposal for a regulation laying down harmonized rules on artificial intelligence (Artificial Intelligence Act) COM(2021) 206 (creating data governance and management requirements for high-risk AI systems, focusing on training, validation, and testing data).

[58] See on the GDPR as a form of AI regulation P Nemitz, "Constitutional Democracy and Technology in the Age of Artificial Intelligence" (2013) 376(2133) *Philosophical Transactions of the Royal Society A*.

[59] See in particular Zufall and Zingg's Chapter 11.

[60] See Hervé's Chapter 10.

[61] See Weber's Chapter 3.

[62] See Lim's Chapter 5.

[63] See Streinz's Chapter 9.

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entities and include individuals directly or indirectly involved with the AI system lifecycle, which may encompass governments, industry, technology developers, data providers, academic communities, civil society, and trade unions, as well as other entities.[64] Initiatives such as codes of conduct, voluntary standards, and best practices are meant to guide AI actors through the AI lifecycle, including monitoring, assessing, and addressing the harmful effects of AI applications.[65] These initiatives aspire to have a transformative effect on the technological development and societal deployment of AI, which is fundamentally driven by the academic-industrial complex and is in significant part regulated by various, often transnational, standard-setting bodies. Governments have only slowly begun to confront AI-enabled transformations through legislative and regulatory action, with the EU emerging as the most aggressive AI regulator. IEL provides a (meta) regulatory framework, which aspires to govern these regulatory initiatives. IEL's traditional focus on state-led regulation and its preference for multilateralism poses particular challenges in this regard.

The widespread embrace of multistakeholder AI governance raises pivotal questions concerning AI norm development. Human rights advocates have lamented the lack of attention toward established commitments under international human rights law in the discourse on law and technology.[66] Some nongovernmental organizations (NGOs) have left multistakeholder initiatives on AI governance out of concern over corporate capture and lack of change.[67] AI governance was initially dominated by "AI ethics" because of a widespread belief that such frameworks were best suited to govern the emerging technology.[68] Governments initially embraced such initiatives but then ventured toward more traditional forms of regulation. The EU is contemplating comprehensive AI regulation more akin to the regulation common in other regulated industries (such as chemicals or pharmaceuticals).

For these reasons, the question of the appropriate role of government in regulating AI is resurfacing. The industry-led voluntary standards for autonomous vehicles, as an example, demonstrate that the development of disruptive innovation inherently involves changes in governance frameworks and calls for new governance approaches that break the boundaries of existing trade disciplines.[69] The WTO needs to respond to the predominantly decentralized nature of data governance, including market-driven or self-regulatory alternatives to data-related

[64] OECD, note 43 above, at 56.

[65] WA Kaal and EPM Vermeulen, "How to Regulate Disruptive Innovation: From Facts to Data" (2017) 57 *Jurimetrics Journal* 169.

[66] See generally MK Land and JD Aaronson, "Human Rights and Technology: New Challenges for Justice and Accountability" (2020) 16 *Annual Review of Law and Social Science* 223.

[67] Khari Johnson, "Access Now Resigns from Partnership on AI Due to Lack of Change Among Tech Companies" (*Venturebeat*, 14 October 2020), https://venturebeat.com/2020/10/14/access-now-resigns-from-partnership-on-ai-due-to-lack-of-change-among-tech-companies.

[68] J Cowls and L Floridi, "Prolegomena to a White Paper on an Ethical Framework for a Good AI Society" (2018).

[69] See Peng's Chapter 6.

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measures.[70] However, if governments reassert themselves as AI regulators,[71] the WTO may be in more familiar territory in terms of the relevant actors, but still faces considerable conceptual challenges.

IV ARTIFICIAL INTELLIGENCE AND THE RECONFIGURATION OF INTERNATIONAL ECONOMIC LAW

IEL may need to reconfigure itself to remain relevant, but there is no consensus that the venues that produce and administer IEL – such as the WTO – are the optimal forum for states and nonstate actors to deliberate over AI governance. The study of trade law architecture after the Fourth Industrial Revolution demonstrates that there is potential to use emergent technologies, including AI, to transform the functions and operations of the WTO, and to reconfigure its management of trade.[72] Indeed, there are several reasons why the WTO is probably not the best forum for global AI governance and should hence not be the only or dominant one. For example, a central, preliminary question is whether special or additional dispute settlement rules and procedures should be incorporated into the international trade regime to handle digital trade disputes,[73] when a particular AI-related domestic regulation constitutes a violation of a right or obligation provided for in an international agreement. At the same time, one may never identify an ideal, uncontested forum. From an organizational capacity perspective, it certainly makes sense to leverage the WTO and its existing networks of actors, agreements, and institutions to engage with AI technologies and applications, because the economic implications are obvious. Beyond the WTO, bilateral, regional, and plurilateral endeavors aim to reconfigure IEL to keep abreast of the changing faces of the AI economy.

Apart from the ongoing plurilateral negotiation on e-commerce at the WTO,[74] at the multilateral level there have been limited (if any) endeavors in response to the challenges brought about by the gradual embrace of AI technologies. At the minilateral level, there have been increasing negotiations among various WTO members, leading to a variety of dynamic interactions and innovative arrangements that have engineered an incipient reconfiguration of IEL. A growing number of free trade agreements (FTAs) incorporate new rules to discipline government regulations on cross-border data flows, privacy and personal data, competition, and source code.[75]

[70] See Mishra's Chapter 13.

[71] See F Pasquale, *New Laws of Robotics: Defending Human Expertise in the Age of AI* (Cambridge, MA, Harvard University Press, 2020), who, inter alia, calls for licensing requirements for certain AI applications.

[72] See Toohey's Chapter 17.

[73] See Fukunaga's Chapter 8 for a discussion on dispute settlement issues under the prospective e-commerce agreement.

[74] See Gao's Chapter 15 for an overview of the joint statement initiative.

[75] See M Burri and R Polanco, "Digital Trade Provisions in Preferential Trade Agreements: Introducing a New Dataset" (2020) 23 *Journal of International Economic Law* 187 (observing that new digital trade provisions in FTAs have increased in both length and scope).

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For instance, both the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the United States-Mexico-Canada Agreement (USMCA) incorporate provisions that facilitate the "free flow" of data.[76] Such reconfiguration tends to focus on the imminent challenges of data regulation but has not traversed the extra mile to address broader AI governance issues. Some argue for new approaches to be developed at the WTO level, so as to provide foundational data regulation principles to address the regulatory challenges of cross-border data flows.[77] Others contend that "free flow" of data is not an absolute principle and should not be readily embraced as the "gold standard" for digital trade.[78] The tension between various economic, political, social, and even ideological underpinnings among WTO members regarding their approaches to addressing data and AI regulation will shape the form and substance of IEL's future reconfiguration.

Specifically, the emerging geopolitical, geoeconomics, and geotechnological power struggle between the USA and China may have a lasting impact on the future reconfiguration of IEL in relation to AI. The "free flow" of data enhances efficiency and welfare but it also facilitates economic processes that exacerbate inequality. Attempts to regulate data flows will likely be divergent and contested, which creates a need for broadly enough defined international frameworks.[79] The Comprehensive Economic and Trade Agreement's (CETA's) reference to international standards of data protection in the context of e-commerce, which can be seen as part of its regulatory approach to the AI economy, could be a promising first step.[80] Japan's G20 Data Free Flow with Trust (DFFT) initiative, embraced by the World Economic Forum, is another attempt to reconcile the competing interests under a common framework.[81]

The Digital Economy Partnership Agreement (DEPA) between Chile, New Zealand, and Singapore presents an innovative reconfiguration – and remodulation – of IEL for the AI economy.[82] Recognizing that the line between trade and nontrade is blurring, DEPA takes a much broader perspective to AI and the digital economy and covers a wide range of issues.[83] DEPA not only strengthens obligations in now conventional "digital trade" provisions – such as the nonimposition of custom duties on electronic transmissions, nondiscriminatory treatment, promotion and facilitation of e-commerce, rules on data flows, paperless trading, electronic

[76] See T Streinz, "Digital Megaregulation Uncontested? TPP's Model for the Global Digital Economy," in B Kingsbury et al. (eds), *Megaregulation Contested: Global Economic Ordering After TPP* (Oxford, Oxford University Press, 2019), ch. 14.

[77] See Weber's Chapter 3.

[78] See Gao's Chapter 15.

[79] See Shaffer's Chapter 2.

[80] CETA, Article 16.4.

[81] World Economic Forum, "Data Free Flow with Trust: Paths towards Free and Trusted Data Flows" (May 2020), www.weforum.org (https://perma.cc/KYR7-AZAM).

[82] Signed in June 2020, www.mfat.govt.nz (https://perma.cc/U23E-URUS).

[83] Per DEPA, Article 1.1 the agreement encompasses all measures that "affect trade in the digital economy." Notably, DEPA avoids the term "digital trade" altogether.

authentication, and data localization – but also includes new rules for algorithms, digital inclusion, financial technology (FinTech), and AI-related ethical and governance frameworks.[84] A crucial institutional design that may greatly expand DEPA's normative impact is that it is open to all other nonmembers to join as new members or agree upon and use any of the modules as building blocks to update existing FTAs and relevant domestic policies. DEPA's "modular" approach to regional cooperation – dividing the agreement into "modules" covering rights and obligations under different digital economy issue areas – marks a deviation from the WTO's single undertaking approach that "comprehensive" FTAs have replicated.

In addition to DEPA, a few other WTO members have concluded new agreements on the broader theme of the digital economy to expand upon and deepen their cooperation under existing FTAs, continuing the trend toward nonmultilateral agreements. For instance, the Australia-Singapore Digital Economy Agreement (ASDEA) was signed in August 2020 to update and replace the e-commerce chapter of the Singapore-Australia Free Trade Agreement (SAFTA) previously signed in 2003. Like DEPA, ASDEA "moves away from the increasingly antiquated, unhelpfully narrow notion of 'e-commerce' in international trade negotiation,"[85] and offers much broader coverage of emerging issues of technological and regulatory cooperation. Cross-border data flows, personal data protection, IP and algorithms, FinTech and RegTech, digital standards, and access to government data are addressed, albeit with significant variation in terms of specificity. Through ASDEA, Australia and Singapore aim to expand their normative influence globally, "signaling vital directions for the WTO negotiations on . . . e-commerce."[86]

The parties to DEPA and ASDEA – Australia, Chile, New Zealand, and Singapore – are also parties to CPTPP, whose "electronic commerce" chapter was significantly shaped by the USA before it abandoned the initial TPP after the election of Donald J. Trump as president. However, even under his presidency and despite the withdrawal from the TPP, the USA has inserted essentially the same model into further agreements, including the United States-Japan Digital Trade Agreement (USJDTA), which was concluded between two of the most digitally advanced economies in October 2019.[87] Similar to ASDEA, the USJDTA includes rules on digital products, cross-border data flows (prohibiting data localization measures), cybersecurity, protection of proprietary computer source code and algorithms, cryptography, and access to government data. DEPA, ASDEA, and USJDTA demonstrate certain WTO members' ambition to play a leading role in global rulemaking for the AI economy. Their shared endorsement of the "free flow" of data is in

[84] DEPA, Articles 8.1 and 8.2; DEPA, Module 11.

[85] J Drake-Brockman, "Australia-Singapore Digital Trade Agreement: Setting New Benchmarks in Trade Governance" (Institute for International Trade, University of Adelaide, 24 August 2020), https://perma.cc/3FLA-WEPE.

[86] Ibid.

[87] Signed on 7 October 2019. Text available at www.ustr.gov (https://perma.cc/UUA9-7NUD).

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tension with the EU's GDPR, which restricts the cross-border transfers of personal data.[88] Future multilateral rules would need to account for these systemic differences, for example by differentiating between different kinds of data flows.

Treaty creation and change are not the only ways through which IEL is being reconfigured. Contestation in committees and litigation through dispute settlement procedures will test the application of existing IEL disciplines to new technologies, business models, and regulatory approaches. The continued reinterpretation of IEL may gradually clarify boundaries under existing disciplines but may also reveal, conversely, where new rules are needed. Growing pressure for change – in whatever form – is in tension with IEL's commitments to stability, predictability, and legal certainty, which have been widely regarded as vital for trade-enabled economic growth. Whether rules that purport to address challenges arising from fast-developing digital technologies and associated fast-scaling business models can or should aspire to the same levels of evenhanded generality as their predecessors or whether more flexible, differentiated, and granular rules are needed is an important question for IEL's future development.

The use of digital technologies for the implementation of IEL has so far been mainly explored for automation and electronic communication ("paperless trade") in the context of customs procedures under the rubric of "trade facilitation." Aligning with the text-as-data approach and moving toward the data-driven future of IEL,[89] digital technologies could lead to a more radical reconfiguration of IEL if the regulatory force of computer code is being deployed more widely as a complement to or substitute for traditional IEL rule-making.[90] Recognizing that the human-made law is not the only way to make and enforce trade rules or to settle disputes opens up a research agenda that integrates IEL into broader debates around law and technology and the relationship between "human law" and "computer law."[91] The use of AI technologies to support IEL creation and implementation may be especially warranted when the quantity or complexity of economic interactions exceeds human comprehension.[92] Considering this possibility is not an endorsement of the questionable idea of replacing human lawyers with robots. Instead of framing the debate as one about replacing human with artificial intelligence, one ought to explore the potential and purpose of human "intelligence augmentation" (IA).[93] On this basis, one could ask fundamental questions about the need for further reconfiguration of IEL: How should IEL adapt and reorient as

[88] S Yakovleva and K Irion, "Pitching trade against privacy: Reconciling EU governance of personal data flows with external trade" (2020) 10 *International Data Privacy Law* 201.

[89] See W Alschner et al., "The Data-Driven Future of International Economic Law" (2017) 20(2) *Journal of International Economic Law* 217–231.

[90] J Mohen and A Roberts, "Cracking the Code: Rulemaking for Humans and Machines" (2020), OECD Working Papers on Public Governance, No. 42, https://doi.org/10.1787/3afe6ba5-en.

[91] See Mireille Hildebrandt's project COHUBICOL on "computational law" (www.cohubicol.com).

[92] See further Toohey's Chapter 17.

[93] Pasquale, note 72 above.

a framework with relevance in this AI era? What are the key elements to be incorporated into a new vision for IEL? And finally, how should a reconfigured IEL shape the future direction of the global AI economy?

V GENERATING INTERNATIONAL ECONOMIC LAW AND ARTIFICIAL INTELLIGENCE DISCOURSE IN THIS VOLUME AND GOING FORWARD

Given the broad array of issues that are raised when AI and IEL intersect, this volume is not comprehensive in nature. And yet, we hope to provide more than a snapshot of the interplay between AI and IEL in the early 2020s. In the following, we outline the various contributions and their relationships to one another before turning to questions we could not address in this volume but hope to tackle going forward.

The first three chapters address systemic shifts in the global economic order and argue for carefully crafted responses: What readjustments are needed in an increasingly data-driven economy with pervasive deployment of AI capabilities? According to Gregory Shaffer, trade law needs to adjust "with modesty and resilience," while Rolf H. Weber calls for rule-making on the basis of regulatory principles such as transparency, accountability, safety, and robustness.[94] Dan Ciuriak and Vlada Rodionova's chapter discusses the rites of passage of AI as it enters the trading system and the need to revisit the established dichotomy between legitimate risk regulation and unjustifiable protectionism under which international trade law has operated so far.[95]

The subsequent part brings together chapters that focus on certain instruments that form part of the WTO law acquis and its application and further development with regard to AI: Aik Hoe Lim hails the toolkit provided by the Technical Barriers to Trade (TBT) Agreement as a mechanism to avoid unnecessary regulatory diversity and reduce trade costs as the global economy transition toward "Industry 4.0."[96] Shin-yi Peng strikes a different tone when she calls for the modernization of the TBT Agreement to reflect current standardization trends in the context of autonomous vehicles.[97] Bryan Mercurio and Ronald Yu discuss how international IP law, specifically the WTO's agreement on TRIPS, might need to be readjusted to account for shifts along the human–machine frontier in terms of the generation of outputs that have to date been protected and incentivized by various forms of IP.[98] Finally, Yuka Fukunaga discusses how future conflicts regarding compliance with such new rules could be resolved through WTO-provided dispute settlement procedures and

[94] See Shaffer's Chapter 2 and Weber's Chapter 3.
[95] See Ciuriak and Rodionova's Chapter 4.
[96] See Lim's Chapter 5.
[97] See Peng's Chapter 6.
[98] See Mercurio and Yu's Chapter 7.

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exposes the extent to which such conflicts deviate from conventional trade disputes.[99]

The two ensuing parts explore the relevance of IEL to AI regulation: Chapters 9 to 11 focus on governmental data regulation as a form of AI regulation, while Chapters 12 to 14 address a broader array of regulatory efforts, ranging from standard-setting to ethics and the limits IEL imposes on such initiatives. Thomas Streinz conceptualizes data as a resource for the AI economy, concentrated in Chinese and US big tech companies, and surveys governmental efforts to redistribute data by way of data localization, open data initiatives, and mandatory data-sharing. Such efforts run into limits in extant IEL, which favors data mobility and entrenches data control.[100] Alan Hervé analyzes the EU's model of data (protection) regulation in contrast with the US model and explores the extent to which these different dispositions can be accommodated in IEL.[101] Frederike Zufall and Raphael Zingg focus on one particular intervention the EU has pioneered, namely data portability for personal and nonpersonal data, to redistribute economically valuable data for AI development, and discuss whether this approach could or should be globalized, including through IEL instruments.[102]

Ching-Fu Lin explores the complex ethical questions raised by algorithmic design and divergent cultural, demographic, and value-driven factors, which may lead to heterogeneous regulation that is subject to challenges under existing IEL.[103] In a similar vein, Neha Mishra discusses the trend toward data/AI ethics and explores whether their trade-restrictive impact is defensible under the GATS.[104] Turning to governments, Kelly K. Shang and Rachel R. Du analyze the compatibility of government-mandated data-sharing mechanisms and governmental sanctions against countries that use AI technology to undermine fundamental rights or national security.[105]

The concluding part contains three thought-provoking pieces about the future of the international economic order. Henry Gao assesses the prospects of creating a dedicated instrument addressing electronic commerce and digital trade under the shelter of the WTO in the form of the Joint Statement Initiative (JSI), with particular attention accorded to China.[106] Jane K. Winn and Yi-Shyuan Chiang explore the emerging competition between the USA and China for control over global knowledge infrastructures.[107] While most of this volume has been concerned with the ways in which IEL might respond to AI and the transformation of the global

[99] See Fukunaga's Chapter 8.
[100] See Streinz's Chapter 9.
[101] See Hervé's Chapter 10.
[102] See Zufall and Zingg's Chapter 11.
[103] See Lin's Chapter 12.
[104] See Mishra's Chapter 13.
[105] See Shang and Du's Chapter 14.
[106] See Gao's Chapter 15.
[107] See Winn and Chiang's Chapter 16.

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economy it entails, the final chapter by Lisa Toohey explores how data- and AI-driven technologies could be used to operationalize IEL differently, with superior normative outcomes.[108]

The chapters contained in this book offer multiple points of view and integrate interdisciplinary analysis of AI into the discussion of IEL. One of the core purposes of this book is to inform both AI policymakers and IEL trade negotiators about the complex and dynamic interaction between domestic AI regulations and international trade rules, and thus to assist them in the formation of public policy and trade negotiating positions. One major theme of this volume can be articulated as follows: How can international trade negotiations shape the future AI economy for the better? Some of the contributors place greater emphasis on the opportunities linked to global governance initiatives in the areas of digital trade and data governance, while others focus more intently on the risks associated with the ongoing efforts to negotiate further multilateral disciplines on e-commerce/digital trade. Can or should the relationship between AI and IEL be significantly (re)shaped by future international trade arrangements? In this regard, Rolf H. Weber calls for more comprehensive and progressive IEL rule-making, whereas Gregory Shaffer argues for modest and resilient adjustments in a new AI or digital trade agreement.[109] In another example, Shin-yi Peng advocates for clear rules and a higher level of ambition in the reclassification of digital products, while Thomas Streinz cautions that the existing proxies to account for the respective value of data flows and data control seem insufficient to inform policymakers and treaty drafters.[110] By providing such different perspectives, this book is intended to be a contribution to a more informed and nuanced debate.

Another related major theme is the future of state-centric multilateral trade governance and the emerging tension between multilateral and multistakeholder AI governance in AI. To what extent should AI governance be conducted within an IEL framework? How can economic, social, and administrative regulations of AI be governed under WTO law and institutions? Can IEL disciplines contribute to sensible regulation of AI applications or may they inhibit such regulation? In this context, under the premise that the TBT agreement plays a key role for Industry 4.0, Aik Hoe Lim emphasizes the role of the WTO's multilateral TBT Committee. In contrast, based on observations regarding the WTO's experience in sanitary and phytosanitary (SPS) issues, Dan Ciuriak and Vlada Rodionova advise that dealing with risks related to AI will be "commensurately tougher."[111] In yet another example, Neha Mishra's relative optimism is demonstrated in her arguments that the multistakeholder norms on data ethics could eventually grow transnationally, and thus the WTO could play a more meaningful role in promoting strong global data ethics

[108] See Toohey's Chapter 17.
[109] See Shaffer's Chapter 2 and Weber's Chapter 3.
[110] See Peng's Chapter 6 and Streinz's Chapter 9.
[111] See Lim's Chapter 5 and Ciuriak and Rodionova's Chapter 4.

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practices. In contrast, Ching-Fu Lin is more skeptical in pointing out the challenges inherent in reaching multilateral consensus in ethics, which he attributes to complex ethical dimensions.[112]

Taken as a whole, the chapters in this volume portray different interactions between AI and IEL. We have collectively explored and evaluated the impact of AI disruption, the need for AI regulation, and directions for IEL reconfiguration. While we may have raised more questions than provided concrete answers in this volume, we have brought various fields and angles of research and practice into conversation, which paves the way for future research. An exhaustive treatment of all issues surrounding AI and IEL's dynamic interactions in one volume strikes us as impossible, especially because this is a rapidly evolving area of law and technology, and there are constant conflicts between different values, ideologies, and governance approaches. Indeed, additional issues pertaining to the interplay between AI and IEL could and should be addressed in future research. Three such topics that we could not cover in this volume but that we want to emphasize nonetheless in this introductory chapter are the need to study AI and IEL from the perspective of different developing countries, the need for IEL to confront the implications of AI for the environment, including climate change, and the need for IEL to address the challenge of AI taxation. We briefly consider each of these topics and the important questions they raise in turn.

While some chapters mention inequality within and across countries,[113] AI's heavy reliance on data may lead to new and unconventional North–South divides that differ from the traditional Global South and Global North discrepancy. In the AI era, states with stronger technological power seem more likely to dominate markets, as well as the normative space.[114] Developing and least-developed countries without commensurate institutional capacity are more likely to be downstream users, rather than programmers – and thus rule-takers rather than rule-makers.[115] Institutions, rules, and agenda-setting in IEL and, more broadly, in international law may be led by and designed to serve the interests of dominant AI powers like the USA and China. At the same time, the EU is positioning itself as a global tech regulator with its proposals for Digital Services and Digital Markets Acts and an Artificial Intelligence Act.[116] Whether these regulatory initiatives will materialize and in what

[112] See Mishra's Chapter 13 and Lin's Chapter 12.

[113] See Shaffer's Chapter 2, Ciuriak and Rodionova's Chapter 4, and Streinz's Chapter 9.

[114] H-W Liu and C-F Lin, "Artificial Intelligence and Global Trade Governance: A Pluralist Agenda" (2020) 61(2) *Harvard International Law Journal* 407.

[115] See for a critical Global South perspective A Kak, "'The Global South Is Everywhere, But Also Always Somewhere': National Policy Narratives and AI Justice" (February 2020), AIES '20: Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society 307, https://doi.org/10.1145/3375627.3375859.

[116] On 15 December 2020, the European Commission published its Digital Services Act package which proposes two pieces of legislation: the Digital Services Act and the Digital Markets Act (DMA), https://ec.europa.eu/digital-single-market/en/digital-services-act-package. In April 2021, it put forward its proposal for an Artificial Intelligence Act, https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence.

form remains to be seen, but they are already affecting the regulatory discourse globally.[117] Whether the EU's regulatory initiatives and the AI technology developed and deployed predominantly by US and Chinese firms will further the interests and livelihoods of people elsewhere remains a major and underexplored question for IEL. In light of new winner-takes-all dynamics, one may ask (again) if there is a need for new development strategies.[118]

Development and deployment of AI incur significant concentrated and distributed environmental costs in ways that the traditional debate around the tension between global trade and environmental protection does not adequately address. Contemporary AI technology is highly dependent on rare earth minerals,[119] which are geographically concentrated in few countries. Their extraction can devastate the environment but also promises leverage over those whose AI economy depends on the global supply of rare elements. China's export restrictions have already given rise to WTO litigation[120] and the "race to AI" may exacerbate these tensions further. Moreover, while certain AI tools have been instrumental in improving our understanding of the planet and the evolving climate crisis,[121] the operation of data centers that enable the cloud computing environments in which AI is increasingly developed and deployed contributes significantly to greenhouse gas emissions.[122] The debate about how IEL should accommodate different environmental policies in the struggle against climate change needs to move beyond the important question of WTO law compliance of domestic carbon pricing schemes for trade in goods.[123] How should IEL account for the increasing climate impact of data-driven services, including AI?

The question whether taxing digital and hence often not locally present businesses is compliant with WTO law and preferential trade agreements has been

[117] See also NA Smuha, "From a 'Race to AI' to a 'Race to AI Regulation' – Regulatory Competition for Artificial Intelligence" (2021) 13 *Law, Innovation and Technology* 57.

[118] L Taylor and D Broeders, "In the name of development: Power, profit and the datafication of the global South" (2015) 64 *Geoforum* 229; D Trubek, "Law and development: Forty years after 'Scholars in Self-Estrangement'" (2016) *University of Toronto Law Journal* 301. See also A Fisher and T Streinz, *Confronting Data Inequality*, World Development Report 2021 background paper (1 April 2021), https://ssrn.com/abstract=3825724.

[119] K Crawford and V Joler, "Anatomy of an AI System: The Amazon Echo as an Anatomical Map of Human Labor, Data and Planetary Resources" (2018), https://anatomyof.ai, at XIII.

[120] *China – Rare Earths*, WT/DS431.

[121] M Reichstein et al., "Deep Learning and Process Understanding for Data-Driven Earth System Science" (2019) 566 *Nature* 195. See also the efforts by Climate Change AI, www.climatechange.ai.

[122] E Bietti and R Vatanparast, "Data Waste" (2020) 61 *Harvard International Law Journal Frontiers*, https://harvardilj.org/2020/04/data-waste.

[123] R Howse, "Distinguished Essay: Non-tariff Barriers and Climate Policy – Border-Adjusted Taxes and Regulatory Measures as WTO-Compliant Climate Mitigation Strategies" (2015) *European Yearbook of International Economic Law* 3; K Holzer, *Carbon-Related Border Adjustment and WTO Law* (Cheltenham, Edward Elgar, 2014). See also Z Ahmad, "A Trade Policy Agenda for the Diffusion of Low-Carbon Technologies" (2020) 54(5) *Journal of World Trade* 773.

highly controversial.[124] The USA has repeatedly threatened action against countries that have considered implementing a digital services tax.[125] Because of the widespread use of AI technologies in the provisioning of such services, the question can also be framed as one of "AI taxation." Given the deep economic and societal transformations that adoption of AI technologies entails,[126] raising public funds may be necessary to provide adequate support for those adversely affected or to experiment with public infrastructure-dependent digital industrial policies. Efforts by the OECD/G20 Inclusive Framework on Base Erosion and Profit Shifting (BEPS) to engineer consensus among more than 130 countries and jurisdictions have repeatedly stalled, but its mere existence may already indicate shifts in global tax governance.[127] These developments and the increased likelihood of intermittent unilateral action in the absence of global agreement raise the question how IEL should shape the taxation of digital services, including AI, going forward.

Definitive answers are difficult to come by at a point in time when AI and IEL are both simultaneously in flux and under great pressure. We hope to have made some steps toward more meaningful engagement between scholars and practitioners of IEL and those developing, regulating, and indeed resisting AI. The digital transformation of the global economy requires a reckoning with IEL's assumptions, normative propositions, and politics. This is even truer after the global COVID-19 pandemic has exposed and accelerated the global economy's reliance on digital technologies, including AI.

[124] See, for example, the different perspectives by AD Mitchell, T Voon, and J Hepburn, "Taxing Tech: Risks of an Australian Digital Services Tax under International Economic Law" (2019) 20 *Melbourne Journal of International Law* 88; W Haslehner, "EU and WTO Law Limits on Digital Business Taxation," in W Haslehner et al. (eds), *Tax and the Digital Economy: Challenges and Proposals for Reform* (Alphen aan den Rijn, Kluwer Law International, 2019), 25; O Okanga, "Testing for Consistency: Certain Digital Tax Measures and WTO Non-discrimination" (2021) 55 *Journal of World Trade* (in press).

[125] USTR, Report on France's Digital Services Tax Prepared in the Investigation under Section 301 of the Trade Act of 1974 (2 December 2019), www.ustr.gov (https://perma.cc/U3MC-KMFH).

[126] See earlier and the chapters by Shaffer (Chapter 2) and Ciuriak and Rodionova (Chapter 4).

[127] Ruth Mason, "The Transformation of International Tax" (2020) 114 *American Journal of International Law* 353.

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