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Global Value Chains of Digital Economy in the Indo-Pacific: Challenges and Opportunities

Edited by

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Global Value Chains of Digital Economy in the Indo-Pacific: Challenges and Opportunities

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Executive Summary

The digital economy is guiding cross-border business connectivity, market mechanisms, investments, business incubation, and digital public infrastructure cooperation. In the digital economy ecology, developing economies in the Indo-Pacific need to exchange and cooperate, and synergise their human resource capacities and infrastructure. The Economic Research Institute for ASEAN and East Asia and Leiden University have collaborated in a curated study on the inclusive and cooperative digital economy in the Indo-Pacific, Asia, and Europe. This study focuses on two questions: What are the challenges facing the developing and emerging economies of the Indo-Pacific? What preparation are they making for participating in the supply chains of the digital economy?

The digital economy has arrived rather abruptly for most developing regions, including Asia and Africa, even before these regions could fully participate in the value chains of manufacturing and industries. These economies have a mixed corps of education, innovation, technology, regulatory capacities, and investments in supply chain infrastructure. For example, India has created successful digital public infrastructure for fintech and payments and is home to several unicorns. The Association of Southeast Asian Nations (ASEAN) has a thriving start-up ecosystem in many member countries and is now working on its Digital Economy Framework Agreement. Several countries in Europe have a thriving digital economy ecology and the European Union (EU) is advancing the rules and governance of digital economy and artificial intelligence (AI).

Yet, the future of work in developing economies will be determined by the rules of cooperation and by investment in infrastructure and the capacity of the digital economy. The emerging cooperation with, and the role of, the G7 and non-G7 countries will be important for the development of services, human capital, regulations for data protection, e-commerce, and taxation. This will secure the quality, resilience, and longevity of supply chains of the digital economy. This study identifies the conditions under which emerging and developing countries in the Indo-Pacific region, especially developing Asia, can be better integrated into the global value chains (GVCs) of the digital economy. It also explains the challenges involved and addresses the conditions under which digital infrastructure and institutional capacities can be carried out in a plurilateral framework amongst partners in Asia, and between Asia and Europe, under the Asia–Europe connectivity plans.

Chapter One examines how law is facilitating digital transformation in the Indo-Pacific. This region, which is home to some of the most dynamic and rapidly growing economies – including ASEAN, China, India, Japan, and the Republic of Korea, henceforth 'Korea' – offers a unique opportunity to redefine the role of law in enabling and governing digitalisation. The law, visioned as the foundation for resilience and equity, must serve three interconnected functions of stabilisation, facilitation, and norm creation. This is

particularly important when advancements in technologies like AI, blockchain, and e-commerce are transforming industries and creating new economic models.

Digital technologies are significantly impacting international trade, taxation, and investment by facilitating smoother and more efficient cross-border transactions. Taxation policies need to address the complexities of mobile labour, digital platforms, and global supply chains, ensuring fairness and fiscal sustainability. Harmonising data protection, enhancing cybersecurity, modernising intellectual property laws, and coordinating tax strategies are essential to prevent fragmentation of regulatory landscape.

Organisations like the Asia-Pacific Economic Cooperation and ASEAN are important to facilitate dialogue, foster trust, and develop mechanisms to address conflicts. Japan and Korea's leadership in AI, robotics, and the Internet of Things, as well as their cybersecurity strategic frameworks such as Japan's Basic Act on Cybersecurity and Korea's Act on the Protection of Information and Communications Infrastructure underscores the potential of establishing regional legal standards for emerging technologies. Singapore's strategic investments in digital infrastructure and regulatory frameworks serve as the country's growth strategy. Australia's proactive Digital Economy Strategy 2030 aligns domestic legal frameworks with international standards, focussing on digital infrastructure. Substantive and forward-looking legal measures are essential for the Indo-Pacific to secure its leadership in the global digital economy.

Chapter Two explores the specific policy and economic conditions necessary for the successful participation of Indo-Pacific economies in the GVCs of digital economy. ASEAN and East Asia are manufacturing hubs with close trade relations within the region as well as with important markets in the EU and the United States (US). The potential for developing Asia (and Africa) to connect to regional or global markets greatly depends on the extent of value chain activity within the region.

Manufacturing will provide most of the volume of international trade and will be a source of employment and growth across regions. The inclusive and non-hegemonic GVCs of digital economy require new supply chain initiatives such as the India–Australia–Japan Supply Chain Resilience Initiative and the India–Middle East–Europe Economic Corridor, leading to new connectivity drives in Asia-Europe. The wide divergence in manufacturing capacities and GVC participation amongst economies, however, require policy attention for inclusive GVCs.

Amongst developing Asia, ASEAN and India are the leading economies providing competitive services to the rest of the world. Regulatory environments, investment climates, digital public infrastructure, human resources and employment, regional cooperation, and the impact of global initiatives to support digital transformation in these economies, are the new policy frontiers that require cooperation amongst countries. Digitalisation has changed the production process and the mode of interactions between consumers and producers and between employers and employees.

Human resource capacities and skills can create challenges for inclusive growth and in attracting investments in a digital economy. In the Indo-Pacific, East Asia has high levels of human capital, as do a few countries in ASEAN and Oceania. The average level of human capital in ASEAN is like the rest of the world, but levels in Oceania, South Asia, and Africa vary greatly. East Asia has the highest rate of tertiary enrolment, followed by ASEAN, South Asia, and Oceania, although the years of education do not always translate into human capital improvement. The Indo-Pacific region can cooperate in human capital development and movement of the digital workforce, which could accelerate the generation of digital skills and could make skills more transferable across the Indo-Pacific.

ASEAN and India have created an extensive ecosystem of digital public infrastructure in their respective domestic markets, enabling their participation in domestic markets and global trade. At the same time, the rapid growth of digital trade and its rising importance in the global economy has accelerated the development of international common rules. The GVCs behind digital trade cover both the physical world and cyberspace, with borderless internet preventing cyberspace from fragmenting due to various barriers. There are opportunities and challenges in new policy alignments and various levels of willingness amongst governments to fortify changes in supply chain linkages and to move towards a newer construct of trade and economic cooperation. This should include provisions to deal with both tariff and non-tariff measures. To maximise opportunities amongst larger and developed economies, developing economies must engage in rule-setting processes to ensure inclusivity and fairness in digital trade regulations.

The Indo-Pacific Economic Framework for Prosperity is an opportunity to deepen US ties with Indo-Pacific countries. The global consensus on regulating digital trade will require more beyond-the-border measures (i.e. modification of domestic laws and regulations to meet international commitments), with consequent social and economic adjustment and policy interventions.

Existing supply chain dependency and efficiency are being re-examined and sometimes rebuilt with bilateral and trusted partners. In 2023, G7 meetings hosted by Japan and G20 meetings hosted India underlined the importance of the Indo-Pacific region in global trade as well as the need for more equitable and inclusive value chains where the conditions of transparency, reliability, and resilience are met.

The Indo-Pacific is preparing for new economic demands. Structural transformation and employment-generation policies in developing Asia and the Pacific must understand, prepare for, and respond to the new digital economy, as the latter will affect the patterns and geographical location of industries, employment, trade, and economic growth. Participation in international GVCs of goods and services will continue to change under the influence of digitalisation, and the Indo-Pacific region must reap the benefits of this progress, ensuring that digitalisation promotes inclusiveness amongst countries, especially for youth and women.

Chapter Three examines the emergence of digital economy agreements (DEAs) in the

Indo-Pacific region and their role in shaping international economic law. The complex and dynamic landscape affected by the approaches of China and the US to international relations and trade provides space for other actors – including middle powers – to promote their own vision of the global digital economy. The DEAs in the Indo-Pacific region have emerged as a legal innovation to promote the transformation of international trade law through enhanced regulatory cooperation. Three key areas of difficulty have emerged: data governance, technical infrastructure and interoperability, and regulatory capacity. To ensure their successful implementation, DEAs must help develop regulatory capacity and coordination, which requires sophisticated regulatory frameworks and coordination mechanisms. This challenge is particularly acute in the Indo-Pacific region, where jurisdictions have varying levels of regulatory capacity.

In analysing the implementation, challenges, and opportunities of DEAs, the focus is on Singapore's role as a 'norm entrepreneur' in developing practical frameworks for digital economy cooperation.

Data governance represents the most significant challenge in implementing DEAs effectively, for various economic and strategic reasons. Singapore's Personal Data Protection Act is an example of how developing countries can build capacity for cross-border data flow. Successful implementation requires both technical standardisation and frameworks for mutual recognition of various national systems. Singapore's experience illustrates that advancing the technical infrastructure and interoperability needed for digital trade is a must in the Indo-Pacific region.

As DEAs are mainly governed by soft law commitments, effective implementation requires a regional leader with financial capabilities and neutrality concerning major powers. The ASEAN experience highlights soft law commitments in the face of diversity and the importance of more advanced countries building the capacity of smaller countries. Collaboration to enhance each other's regulatory capacities and to ensure interconnection and interoperability are most needed to fully realise DEA provisions.

Middle powers can help construct more inclusive frameworks for international economic cooperation by bridging different regulatory approaches. Chapter Three shows how middle powers, such as Singapore, can help shape international economic law through their demonstrated technical capability rather than through market power alone. This suggests important lessons for digital economy integration in the Indo-Pacific region, as well as highlighting the region's significant contribution to global digital economy regulation. Expertise in specific domains can allow middle powers to shape international norms even without broader power resources.

Chapter Four discusses the current global debate on the regulation and governance of AI. This chapter identifies and analyses the main regulatory challenges posed by AI to help formulate some broad recommendations if the region is to tackle the complex and disruptive effects of AI and its related technologies.

It focuses on specific principles formulated by the different jurisdictions, such as human oversight throughout the AI life cycle promoted by China, transparency by the US, and a risk-based approach by the EU. It argues that a new form of dynamic thinking – that includes important oxymoronic elements of the contradictory and complementary relationship between innovation and regulation – is needed to develop and regulate AI.

Amidst this global race to regulate AI, the Indo-Pacific region has emerged as a potential epicentre of the future global digital economy. There are several notable national regulatory initiatives in the region regarding AI. In India, the National Institution for Transforming India published the National Strategy for Artificial Intelligence. In 2023, India also adopted the Digital Personal Data Protection Act and is now preparing a draft AI law, which can either be a piece of independent legislation or part of the Digital India Bill. Australia has recently circulated a proposal paper and voluntary AI standards to make the regulatory system 'fit for purpose to respond to the distinct risks that AI poses' and to give 'practical guidance to all Australian organisations on how to safely and responsibly use and innovate with AI'.[1]

The trend amongst national governments to formulate AI strategies and binding regulations is positive and necessary. Special attention, however, should be paid to similar activities at the regional level. The Asia-Pacific Economic Cooperation forum, the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (which evolved from the Trans-Pacific Partnership following the withdrawal of the US), the Regional Comprehensive Economic Partnership (which counts 15 members including China and several members of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership) are all regional initiatives. ASEAN also plays a crucial role in the region but has not yet devised a regional governance framework for AI.

Another broad initiative for the Indo-Pacific region is the Indo-Pacific Economic Framework for Prosperity, which is a policy initiative launched by the US with Australia, Brunei Darussalam, Fiji, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Thailand, and Viet Nam. The intended framework aims to strengthen cooperation amongst the partners, which aim to 'pursue high-standard rules of the road in the digital economy, including standards on cross-border data flows and data localisation'.[2]

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[1] Government of Australia, Ministry of Industry, Science and Resources (2024a), *Safe and Responsible AI in Australia: Proposals Paper for Introducing Mandatory Guardrails for AI in High-risk Settings,* Canberra, https://storage.googleapis.com/converlens-au-industry/industry/p/prj2f6f02ebfe6a8190c7bdc/page/proposals_paper_for_introducing_mandatory_guardrails_for_ai_in_high_risk_settings.pdf
Neuwirth, R.J. (2024b), *Voluntary AI Safety Standard,* Canberra, https://www.industry.gov.au/sites/default/files/2024-09/voluntary-ai-safety-standard.pdf

[2] The White House (2023), 'Fact Sheet: In Asia, President Biden and a Dozen Indo-Pacific Partners Launch the Indo-Pacific Economic Framework for Prosperity', Washington, DC, 23 May, https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/23/fact-sheet-in-asia-president-biden-and-a-dozen-indo-pacific-partners-launch-the-indo-pacific-economic-framework-for-prosperity/

China also launched the Global AI Initiative in 2023, which calls on all countries 'to enhance information exchange and technological cooperation on the governance of AI' and to 'work together to prevent risks, and develop AI governance frameworks, norms and standards based on broad consensus, so as to make AI technologies more secure, reliable, controllable, and equitable'.[3] The Africa Continental Free Trade Area, which was created on 30 May 2019, brings together 55 countries of the African Union and eight regional economic communities into another megaregional free trade agreement.

Indeed, there are numerous national AI initiatives happening in the Indo-Pacific region and around the world – a good sign in view of the emerging global digital economy. However, to fully realise the potential of the new technologies and to contain some of their associated risks, regional coordination is also important. The Indo-Pacific region is in a good position to achieve this objective, but it needs to proceed carefully to avoid problems with overlapping or inconsistent laws and regulations – a phenomenon known as the 'spaghetti bowl'.

AI's complex, cross-cutting, cross-boundary, and rapidly converging nature defies traditional modes of binary thinking and poses numerous fundamental problems. The same dilemma also surfaces in the qualification of AI as a cross-cutting concept used for the cultural and creative industries, which – in the wake of digitisation – poses similar challenges for regulators.

The cross-cutting nature of AI and related industries is further reinforced by their cross-boundary or cross-border elements which cannot be regulated at the national level alone but require complementary regulatory actions at the regional and/or global level. The paradoxes of binding regulations, regulatory state, and human relationships may result in unintended social and economic results.

The simplistic market-driven regulatory model pursued by the US, a state-driven regulatory model by China, and a rights-driven regulatory model by the EU ought to be substituted with a focus on specific principles formulated by the different jurisdictions, such as human oversight throughout the AI life cycle promoted by China, transparency by the US, and a risk-based approach by the EU. In addition, the question of innovation and regulation cannot be properly addressed by way of binary thinking, that is, by simply stating that regulation is not conducive to the development of AI. New cognitive solutions based on outside-the-box thinking and greater reliance on polyvalent thinking must be sought.

The EU experience can serve as an example for the Indo-Pacific region. A sound equilibrium must be established between different competences and policies. Innovation and security are not opposed to each other; they should be regarded as a creative and dynamic process, one guided by a sense of 'flexicurity' – the underlying idea that 'flexibility

[3] Government of China, Ministry of Foreign Affairs (2023), Global AI Governance Initiative, 20 October, https://www.mfa.gov.cn/eng/zy/gb/202405/t20240531_11367503.html

and security are not contradictory to one another, but in many situations, can be mutually supportive'.[4] The same kind of thinking should be applied to the relationship between regulation and innovation in the context of AI.

Chapter Five presents a case study of Japan in the context of resilient and trustworthy supply chains for the digital economy in the Indo-Pacific and the potential of the digital economy to create such resilient and diversified supply chains. It explains Japan's strategic support for its semiconductors industry as an indispensable sector for the digital economy. In the context of strengthening the rules-based economic order in the Indo-Pacific region, the development of resilient supply chains for the digital economy continues to be significantly shaped by ongoing political tensions between the US and China. However, strategies to enhance domestic supply chains may increase costs and impose additional burdens on efforts to streamline supply chains in the region.

Given the absence of region-wide integration and significant economic heterogeneity, no single country can represent the entire Indo-Pacific, nor can any legal framework provide universally applicable solutions to ensure region-wide, sustainable, inclusive growth. Developing the region's digital economy together requires resilient, diversified, and trustworthy supply chains, given its vast geographical scope and internal diversity. This development must also ensure that the region's rich diversity and vulnerabilities are holistically recognised and addressed. The significance of various initiatives undertaken by the G7 and G20 to address the digital economy in the Indo-Pacific region therefore become very important.

The role of digital technologies in supply chain management is indispensable, especially with advancements in AI and blockchain technologies, as they enhance supply chain efficiency and security.

Digital trade holds significant potential throughout the region, but its success depends on sufficient investment and technological advancement within the region. Investment in broadband connectivity must therefore be a focus, including submarine cables and advanced broadband networks (i.e. 5G/6G and beyond). In addition, initiatives aimed at improving the population's digital skills and decentralising energy sources are critical to fully realise the benefits of digital trade. Inclusivity remains a significant concern, particularly for women; micro, small, and medium-sized enterprises; Indigenous People; and persons with disabilities.

The G7 and G20 concurrently deal with impending issues for the digital economy. Investment facilitation plays a critical role in establishing region-wide digital public infrastructure and providing subsidies to develop physical network infrastructure. Recent G7 meetings have highlighted the importance of resilient supply chains in key sectors, including semiconductors, critical minerals, and pharmaceuticals. Yet the G7's proposal

[4] Madsen, K. (2007), '"Flexicurity": A New Perspective on Labour Markets and Welfare States in Europe', *Tilburg Law Review*, 14(2).

to compartmentalise supply chains for strategic goods – particularly semiconductors – by leveraging investment regulations could create tensions amongst some emerging economies in the G20. At the same time, the G20 has underscored the importance of skilling, upskilling, and reskilling to ensure that the global workforce remains adaptable to the continuous modernisation of digital technologies. It noted that investments in education would yield broader and more sustained benefits for the entire region. Inclusiveness is also key to developing sustainable supply chains for the digital economy. The G20 and the G7 have emphasised the importance of inclusivity on several occasions.

The advent of the digital economy has brought an urgency to preparing the capacities for and participation in the GVCs of the digital economy in the Indo-Pacific. The digital economy could also allow less-developed countries/regions to skip certain stages and to leapfrog to a higher level of development. With an appropriate set of skills, the pre-globalised world could experience greater participation in trade through technology and connectivity.

Digital connectivity plans, cooperation agreements, regulatory frameworks, and resilient supply chains amongst trusted partners in the Indo-Pacific are the key to resilient and diversified GVCs of digital economy in the Indo-Pacific. The Economic Research Institute for ASEAN and East Asia and Leiden University, in cooperation with other team members from the City University of Hong Kong, Hamad Bin Khalifa University, Singapore Management University, the University of Macau, and Otaru University of Commerce have contributed these chapters for this curated study on an inclusive and cooperative digital economy in the Indo-Pacific and amongst Asia and Europe.

Chapter 1

Advancing Digital Integration in the Indo-Pacific – Legal Strategies for a Cohesive Digital Economy

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1. Introduction

The digital economy has experienced remarkable growth in recent years, propelled by advancements in technologies such as artificial intelligence (AI), blockchain, the internet of things (IoT), and e-commerce platforms. These innovations are transforming traditional industries and creating new economic models across sectors like manufacturing, health care, finance, and retail. Digital technologies are significantly impacting international trade, taxation, and investment by facilitating smoother and more efficient cross-border transactions. They reduce friction and costs associated with international trade, effectively lowering barriers and enabling businesses of all sizes to access global markets. Moreover, digital platforms are revolutionising business operations. They provide businesses with new ways to reach consumers, expand their market presence, and participate in global commerce. By lowering transaction costs and streamlining cross-border operations, these platforms enable businesses – especially small and medium-sized enterprises (SMEs) – to access international markets more efficiently.

The Indo-Pacific offers a unique context for examining the intersection of digitalisation and law. Its diversity, geopolitical significance, and economic influence make it a key area for understanding the legal and economic implications of digital transformation. Currently, the Indo-Pacific stands at a critical juncture, as it serves as a global hub for digital and

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economic activity but faces significant governance issues, which are not limited to fragmented regulations; they include deeper systemic problems. These issues certainly comprise cybersecurity vulnerabilities, which are eroding trust in cross-border digital trade and data flow. Moreover, supply chains – increasingly dependent on digital tools – lack cohesive frameworks to ensure resilience and transparency. Fiscal misalignment, particularly in taxing digital services, creates inefficiencies and hampers innovation. Uneven readiness amongst nations in the region is exacerbating these issues, leaving smaller, emerging economies unable to fully participate in the digital economy.

Existing regional initiatives – such as various digital frameworks in ASEAN (e.g. ASEAN [2020]), the Inclusive Framework on Base Erosion and Profit Shifting (BEPS) Project implemented by countries across the region, [1] and Australia's Regional Taxation Cooperation Plan[2] – provide partial solutions to some challenges but fail to reconcile national sovereignty with regional interdependence. For instance, ASEAN Member States (AMS) are collaborating on enhancing the taxation of digital services as part of their broader economic integration efforts, while India's Equalisation Levy and other unilateral measures highlight tensions in achieving a consensus on taxing such transactions. These efforts also remain fragmented and do not fully address the challenges of fiscal coordination in a highly interconnected region. Indeed, without strategic regulatory alignment, the region risks entrenching systemic inefficiencies, which could disrupt supply chains, hinder digital innovation, and escalate geopolitical tensions. A lack of cohesive action may lead the Indo-Pacific to lose its role as a global leader in the digital economy.

Integrating the digital economy within the Indo-Pacific is particularly important due to the region's substantial economic and strategic significance. Home to some of the most dynamic and rapidly growing economies – including China, India, Japan, the Republic of Korea (henceforth, Korea), and AMS like Singapore and Malaysia – the Indo-Pacific represents a significant portion of the global population and economic activity, making it a critical area for digital economic initiatives (ADB, 2011). However, countries in the region are at various stages of digital development; while some are leading in technological advancements, others are still building their digital infrastructure. The digital divide remains a pressing issue amongst the region's countries, with recognised disparities in them as well as regarding digital access and literacy between urban and rural areas and amongst different socio-economic groups.

[1] While it enhances transparency and addresses tax avoidance, implementation of the BEPS framework remains uneven. National priorities and sovereignty concerns hinder regional coordination, particularly on digital taxation and profit allocation (Chaisse, 2023).

[2] This plan aims to strengthen tax capacity and supports the implementation of BEPS measures across the Indo-Pacific. However, it prioritises national systems over regional coordination, preserving fiscal sovereignty. This fragmented approach limits alignment on issues like digital taxation and cross-border fiscal policy. See, for example, Government of Australia, Australian Taxation Office, Global Cooperation, https://www.ato.gov.au/about-ato/tax-avoidance/the-fight-against-tax-crime/our-focus/global-cooperation

Digital integration has the potential to drive economic development and to close digital divides. Nations like India and Indonesia, with large populations and growing middle classes, offer significant potential for the expansion of digital trade and services. Adoption of digital technologies in these countries can stimulate economic growth, improve public services delivery, and elevate living standards. Moreover, in an era marked by evolving geopolitical and geoeconomic conditions, the ability of Indo-Pacific nations to cooperate and to build a robust digital economy may contribute to regional stability and economic security. Digital collaboration can serve as a foundation for broader economic cooperation, fostering shared prosperity amongst the region's diverse economies.

Advancing the digital economy in the Indo-Pacific depends on establishing a governance structure grounded in legal principles. Robust digital law, alongside international trade and investment regulation, forms the backbone of a regulatory framework for managing cross-border data exchanges, securing digital transactions, and resolving (digital) disputes efficiently. To achieve leadership in the digital sphere, regulatory systems must be flexible, inclusive, and well-coordinated. Strong cybersecurity infrastructure regulation is essential for building trust in digital interactions across national boundaries. Aligning fiscal measures, such as taxation frameworks for digital services and mobile workers, is essential to reducing inefficiencies and to encourage innovation. Use of the law to promote the development of resilient supply chains, supported by technologies like blockchain and IoT, should be a key aspect of digital law in the region. At the same time, laws and policies must prioritise inclusiveness, providing targeted assistance to emerging economies and vulnerable populations to address capacity gaps and to enable equitable participation in the digital economy. Together, these legal and policy efforts can foster innovation, enhance economic development, as well as solidify the Indo-Pacific's role in the global digital economy.

Following an examination of digital integration's role and impact in the Indo-Pacific, this chapter addresses critical issues surrounding data protection and privacy regulations that influence this integration. It then analyses the complexities of taxing digital businesses, highlighting how fiscal policies must adapt to the evolving digital landscape. Building upon these insights, strategies for enhancing regulatory coordination are discussed to foster a more cohesive digital economy. The chapter concludes by contemplating the future of the digital economy in the Indo-Pacific, considering the implications of these regulatory and economic developments.

2. Digital Integration in the Indo-Pacific

Many countries in the Indo-Pacific have set precedents for legal standards and practices that influence global trade norms. China is obviously a special case, not only because of its dominant position in the digital economy but also because of its unique regulatory approach that aims to balance innovation with tight control measures. Its data localisation and cybersecurity measures emphasise the goal to promote the country's economic

interests while protecting national security. As China continues to expand its Digital Silk Road as part of its Belt and Road Initiative, digital laws alongside international trade and investment frameworks are evolving to accommodate the growing influence of China's digital infrastructure and technology standards.

Japan and Korea's leadership in AI, robotics, and IoT underscores the potential of establishing regional legal standards for emerging technologies. Their legal frameworks support innovation while ensuring compliance with international trade norms. Korea's emphasis on developing a high-speed internet network, fostering digital literacy, and supporting tech startups has resulted in a vibrant digital ecosystem (Government of South Korea, 2023). This environment has attracted substantial foreign direct investment and has enabled Korean companies to become global leaders in technology and innovation. The country's digital policies and innovation ecosystems serve as models for other countries to enhance their digital economies.

Similarly, Singapore has identified the digital economy as a niche for growth. Its strategic investments in digital infrastructure and regulatory frameworks have cemented its status as a key player in global digital trade. The Smart Nation Singapore initiative plays a central role in the country's industrial strategy, integrating digital technologies across sectors; various digital economy initiatives have led to the development of robust e-commerce ecosystems supported by advanced logistics and payment systems. These initiatives have boosted domestic economic activity and positioned Singapore as a regional hub for digital trade. Singapore's approach to digital technologies is further supported by an open trade policy, which is underpinned by numerous preferential trade agreements and digital economy agreements (DEAs), which aim to ensure that Singapore remains a key player in global supply chains.[3]

Australia's proactive digital economy policies reflect its commitment to foster a conducive environment for digital trade and investment. The country's strategic initiatives underscore the importance of aligning domestic legal frameworks with international standards to promote digital trade. Australia's *Digital Economy Strategy 2030* aims to position the country as a leader in the global digital economy by fostering innovation, enhancing digital capabilities, and enabling seamless digital transactions.[4] Digital infrastructure is a focus, particularly the development of 5G networks, cloud computing, and secure data environments, which are regarded as essential to Australia's broader digital transformation. This infrastructure will support both large corporations and SMEs, facilitating their integration into the global digital economy.

[3] The TAPED dataset provides a comprehensive mapping of digital trade provisions in preferential trade agreements since 2000, encompassing over 465 agreements. It includes 130 coded items addressing digital trade, intellectual property, services, governmental procurement, trade in goods, exceptions, and emerging issues; see University of Lucerne, Faculty of Law, TAPED: A Dataset on Digital Trade Provisions, https://www.unilu.ch/en/faculties/faculty-of-law/professorships/burri-mira/research/taped/

[4] Government of Australia, Department of Foreign Affairs and Trade, Towards 2030: Positioning Australia as a Leading Digital Economy and Society, https://digitaleconomy.pmc.gov.au/

Innovation constitutes another significant component of Australia's strategy, emphasising emerging technologies such as AI, blockchain, and quantum computing. The government is promoting collaboration with the private sector to create an environment conducive to digital startups, offering financial and regulatory support through initiatives such as the *Digital Business Plan*. This plan, launched alongside the broader *Digital Economy Strategy 2030*, seeks to lower regulatory obstacles and to increase investment in digital transformation, particularly for businesses transitioning to digital operations following the COVID-19 pandemic. It also prioritises the development of trust through robust cybersecurity frameworks and is aligned with national regulations with international standards on data privacy, digital rights, and cybersecurity.[5]

Emerging economies, such as India, Indonesia, Malaysia, and Viet Nam, present vast – and often untapped – opportunities for digital economy expansion. Yet they also highlight the challenges of harmonising legal frameworks across diverse regulatory environments. India's digital economy is rapidly expanding, driven by initiatives such as Digital India, which aims to transform the country into a digitally empowered society. Undeniably, India's focus on digital infrastructure development has been instrumental to its economic transformation. Further investments in India's digital infrastructure, such as expanding broadband access and promoting digital literacy amongst its population, are crucial for sustaining this growth trajectory. The Digital India initiative emphasises the need for legal frameworks that support digital payments, data protection, and cybersecurity.

Indonesia's rapid digital transformation, spearheaded by initiatives such as Making Indonesia 4.0, illustrates the need for a legal infrastructure that facilitates digital trade and investment as well as broader digital transformation. Making Indonesia 4.0, developed in 2018, is a roadmap towards 2030 that aims to help make the country a leader in the digital economy. It is further supported by initiatives such as the *100 Smart Cities Movement,* which aims to accelerate digital transformation across urban areas by leveraging AI, IoT, and big data to enhance efficiency in areas like transport, public safety, and e-governance. The *National Strategy for Artificial Intelligence (2020–2045)* provides a national roadmap for developing AI, emphasising ethics and policies, infrastructure and data, talent development, and industrial research and innovation. Moreover, the *2045 Digital Indonesia Vision* was launched in 2023 by the Ministry of Communication and Information Technology, with the aim of positioning the country as a leading digital economy by its centennial. A key focus is strengthening cybersecurity alongside digital infrastructure and talent development while ensuring secure, inclusive, and sustainable digital growth.

Malaysia's *MyDIGITAL* strategy is a comprehensive national digital development strategy designed to drive the country's transition into a high-income digital economy by fostering digital innovation, industrial transformation, and investment in emerging technologies. It

[5] *Ibid.*

aligns with national development policies like the *New Industrial Master Plan (NIMP) 2030*[6] – the latest industrial masterplan of the country. The *Malaysia Digital Economy Blueprint* serves as a roadmap for expanding digital infrastructure, promoting cybersecurity, and enhancing digital literacy in the process of implementing the *MyDIGITAL* strategy, while the *National Fourth Industrial Revolution (4IR) Policy* focusses on integrating AI, IoT, and automation into key industries and the government (Government of Malaysia, 2021). Together, these initiatives aim to position Malaysia as a regional leader in the digital economy,

Viet Nam's Digital Transformation Agenda prioritises digital transformation as a key driver of economic growth (OpenDevelopment Vietnam, 2023). This initiative requires the development of legal frameworks that support e-government, smart cities, digital industries, and the regulatory challenges of digital trade and investment. The agenda aims to enhance public sector efficiency through digital governance, expand the digital economy's contribution to gross domestic product, and promote digital inclusion by improving access to digital services and infrastructure. These efforts seek to position Viet Nam as a competitive digital economy while addressing emerging risks in cybersecurity, data governance, and cross-border digital transactions.

In the broader Indo-Pacific region, both advanced and emerging economies have made significant progress towards integrating the digital economy into their national plans and have demonstrated their potential as global digital standard-makers (Zhai, 2024). The acknowledgement of the importance of technological innovation and need for digital infrastructure development – particularly in areas such as AI, e-commerce, IoT, and cybersecurity – have moved many beyond the role of simple technology adopters. These countries are actively developing frameworks to regulate data protection, cross-border data flow, and digital trade, thereby influencing the rules and practices of the global digital economy (Qian, 2024).

3. Data Protection and Privacy Regulations

Significant disparities in data protection and privacy laws exist across the Indo-Pacific region, creating obstacles for digital trade and investment. Most countries have enacted data privacy legislation, but the comprehensiveness and enforcement of these laws vary widely. Several advanced economies have implemented robust frameworks modelled after the European Union's General Data Protection Regulation (GDPR). Japan's Act on the Protection of Personal Information and Korea's Personal Information Protection Act are examples of comprehensive legal structures that safeguard personal data while facilitating international business operations (Government of Japan, 2023; Government of South Korea, 2020). In contrast, other nations are still developing their legal structures or

[6] Government of Malaysia, Ministry of Investment, Trade and Industry, *New Industrial Master Plan (NIMP) 2030*, https://www.nimp2030.gov.my/

have less stringent regulations. Indonesia, for example, only adopted its Personal Data Protection Law in 2022 after years of deliberation. This uneven regulatory environment creates difficulties for businesses operating across borders, leading to compliance issues and conflicts.

A 2021 study commissioned by the Economic Research Institute for ASEAN and East Asia (ERIA) emphasised problems related to digital connectivity and taxation in Asia and the Pacific (Mosquera Valderrama, 2021). The study stressed the need for tax administrations to ensure data privacy and to protect taxpayers' rights when collecting information through both traditional and digital means, including AI and blockchain technology. It recommended updating data protection laws based on the GDPR and becoming signatories to international conventions like the Council of Europe Convention on the Automatic Processing of Personal Data to enhance protection in cross-border data exchange. Yet adopting laws modelled after the GDPR may not suit all countries due to differences in domestic legal systems and priorities.

Moreover, reconciling data sovereignty with cross-border data flow presents significant difficulties. First, varying national laws on privacy protection and data localisation complicate international data transfers. Some countries, such as Taiwan and India, permit data to cross their borders by default, adopting a more liberal approach. Australia applies a reasonableness test when disclosing personal information overseas, weighing privacy concerns against practical business needs. Conversely, Japan and Korea enforce more restrictive policies, imposing stringent conditions on cross-border data transfer. Even countries with open policies may retain broad restrictions that can be activated under certain circumstances. China's recent legislation governing cross-border data flow has become more open compared to previous versions but still imposes considerable controls.

This fragmented regulatory landscape hinders international data flow, complicates compliance for multinational businesses, and may stifle innovation. A regional approach that considers the specific contexts of Indo-Pacific nations may offer a more effective path towards coordination. Regional alignment of data protection laws, particularly regarding cross-border data flow, offers a potential solution. Initiatives like the Asia-Pacific Economic Cooperation (APEC) Cross-border Privacy Rules (CBPR) aim to facilitate secure data transfers while respecting national laws (APEC, 2015). The CBPR provides a framework for mutual recognition of data protection standards amongst participating economies, reducing the compliance burden for businesses and enhancing trust amongst trading partners.

Addressing disparities in data protection and privacy regulations, especially when data crosses borders, is crucial for fostering a cohesive digital economy in the Indo-Pacific. Regional cooperation and alignment can mitigate risks associated with inconsistent regulations, promote secure data flow, and support economic integration, further enhancing the region's competitiveness in the global market.

4. Cybersecurity Protocols and Coordination

Cybersecurity remains a critical concern in the Indo-Pacific. Different countries maintain divergent regulations and are at varying levels of preparedness to address cybersecurity threats. Advanced economies, like Australia, Japan, Singapore, and Korea, have established comprehensive cybersecurity structures, while emerging economies often maintain less stringent regulations. This divergence often creates barriers to digital trade and investment, as inconsistent standards increase risks and compliance costs for businesses operating across the region (Burri, 2023).

Japan's Basic Act on Cybersecurity provides a foundational framework for protecting critical infrastructure sectors (Government of Japan, 2014). It mandates collaboration between national and local governments and private operators to enhance cybersecurity resilience. The Cybersecurity Strategy Headquarters formulates national strategies, while the National Center of Incident Readiness and Strategy for Cybersecurity oversees implementation. Amendments to the act have introduced mechanisms such as the Cybersecurity Council, which plays both a proactive and reactive role. It facilitates information sharing, strengthens cybersecurity frameworks, and coordinates responses to cyber threats. The council brings together government agencies, businesses, and other stakeholders to ensure an integrated and effective approach to cybersecurity, improving Japan's capacity to prevent and to respond to cyber incidents. Further, the Telecommunication Business Act governs the confidentiality of communications, limiting unauthorised disclosure of data, such as access logs and internet protocol (IP) addresses (Government of Japan, 1984). As this created various operational challenges for telecommunications carriers in sharing threat data, the Ministry of Internal Affairs and Communications issued guidelines clarifying lawful data-sharing practices that comply with privacy rights, enabling carriers to combat cyberthreats more effectively.

Korea's cybersecurity framework also mandates strict compliance and accountability. The Act on the Protection of Information and Communications Infrastructure requires operators of critical infrastructure to report incidents promptly and to undergo regular audits. The Personal Information Protection Act complements these measures by safeguarding personal data and enhancing transparency in data-handling practices (Government of South Korea, 2020).

Legislation, like Australia's Security of Critical Infrastructure Act, addresses private sector accountability for cybersecurity by mandating compliance for entities involved in critical infrastructure, including incident reporting and threat mitigation (Government of Australia, 2018; Waters, 2020). The sectors covered under the act include core sectors of the digital economy, such as communications, financial services and markets, and data storage or processing. This approach underscores the importance of comprehensive legal structures that involve both public and private sectors in cybersecurity efforts.

Beyond frameworks dedicated to cybersecurity, data localisation laws in countries like Indonesia and Viet Nam aim to enhance digital sovereignty. These laws require data to

remain within domestic borders, conflicting with certain international data transfer standards and revealing tensions between security concerns and economic integration.

Besides disparities in national laws, Indo-Pacific nations are at different stages of cybersecurity-related treaty adoption, based on concerns over sovereignty and data sharing. The reluctance of key nations, like India and China, to ratify the Budapest Convention on Cybercrime limits cross-border collaboration in cybercrime investigations. Meanwhile, other large Indo-Pacific jurisdictions, such as Japan and the Philippines, have ratified the convention, valuing the structured cooperation that it provides.

A regionally coordinated cybersecurity strategy that respects national diversity while establishing high standards is essential for enhancing the Indo-Pacific's digital competitiveness. Such an approach encourages secure digital interactions and fosters a unified, resilient digital economy prepared to accommodate future technological advancements, while allowing individual countries to adopt best practices at their own pace. There are already some examples from within the region. The *Association of Southeast Asian Nations (ASEAN) Cybersecurity Cooperation Strategy*, for example, promotes regional coordination without imposing uniform standards (ASEAN Digital Ministers, 2022). This approach allows AMS to retain control over domestic regulations while fostering cooperative responses through initiatives like the ASEAN-Japan Cybersecurity Capacity Building Centre.

5. Protecting Digital Intellectual Property

The rise of digital platforms and technologies has introduced complex intellectual property issues. Problems like digital piracy, unauthorised sharing, and the protection of software and algorithms necessitate modernised intellectual property laws that reflect the digital context. Ensuring robust protection for digital innovations is essential for fostering investment, encouraging technological advancement, and facilitating cross-border collaboration in the Indo-Pacific.

Advanced economies, like Japan and Korea, have well-developed intellectual property laws aligned with international standards set by World Intellectual Property Organization treaties. As examples, Japan's Copyright Act and Korea's Patent Act provide strong protection and enforcement mechanisms (Government of Japan, 1970; Government of South Korea, 2017). These robust structures contribute positively to digital trade by ensuring a secure environment for investments in digital technologies and digital assets. They encourage foreign firms to operate with reduced risk of theft of intellectual property, thereby enhancing cross-border innovation. Yet some countries have less stringent protections, leading to legal uncertainties that may hinder digital trade and investment. Despite recent improvements, Indonesia has faced difficulties in fully aligning its intellectual property laws with international standards (Hanafi and Lubis, 2023). Weak

enforcement mechanisms and limited resources exacerbate these issues, making it challenging to protect digital assets effectively.

In addition, traditional legal measures often fall short in addressing rapid, unidentifiable infringements on intellectual property common in the digital realm. Technological solutions like digital rights management systems and detection algorithms have been employed to combat piracy and unauthorised use in the region; however, without unified or coordinated international regulations, these approaches have limitations, as enforcement can be inconsistent across borders.

Strengthening enforcement mechanisms, promoting regional cooperation, and aligning intellectual property laws with international agreements are essential steps to address cross-border intellectual property issues. Regional agreements and collaborations can facilitate the exchange of information and expertise, helping countries improve their intellectual property regimes. For instance, ASEAN initiatives aimed at harmonising intellectual property laws support AMS in enhancing protection standards and enforcement capabilities.

6. Taxation of Digital Businesses

The rapid expansion of digital businesses has exposed significant gaps in existing tax structures within the Indo-Pacific. Traditional taxation models based on physical presence struggle to capture value from companies operating digitally across borders. Thus, many governments have introduced unilateral measures, such as digital services taxes, withholding taxes, equalisation levies, digital permanent establishment rules, and significant economic presence criteria (Mosquera Valderrama, 2023).

International efforts like the Organisation for Economic Co-operation and Development's Pillar One and Pillar Two initiatives aim to provide a coordinated approach to address taxation in the digital economy. Pillar One seeks to reallocate taxing rights by allowing market jurisdictions to tax a portion of the profits of highly digitalised businesses, even without a physical presence. Pillar Two introduces a global minimum tax rate of 15% to reduce tax competition and to counter BEPS. While Pillar Two rules are being implemented, discussions on Pillar One continue. Several Indo-Pacific countries have adopted unilateral measures in the absence of such a multilateral agreement – including India, Indonesia, Japan, Malaysia, New Zealand, Thailand, Türkiye, and Viet Nam, while a political statement endorsing the Pillar One and Pillar Two initiatives included a commitment by participating countries to refrain from introducing any new unilateral measures (OECD, 2021). The uncertainty surrounding the adoption of Pillar One rules and the associated multilateral convention adds complexity to the situation.

The interplay between trade and unilateral tax measures has generated tensions (Dimitropoulos, 2022). For example, the United States initiated trade investigations against nations implementing digital services taxes, although these are currently

suspended pending international negotiations. Implementing Pillar Two may also impact incentives designed to attract digital manufacturing and enhance technological innovation; countries need to reconsider how to provide such incentives in light of the global minimum tax rate. This may lead to differing approaches amongst nations, potentially affecting the integration of the digital economy across the region.

Indeed, the diverse tax strategies in the Indo-Pacific reveal a tension between fiscal sovereignty and the need for harmonised regulations to support digital trade and investment. Inconsistencies risk creating trade barriers within the region, potentially slowing digital integration (Chaisse, 2023). An approach that respects national interests while promoting interoperability in tax policy is crucial, as it can prevent fragmentation and ensure that digital businesses operate within a stable, predictable framework.

7. Enhancing Regulatory Coordination

Regulatory coordination is essential for mitigating fragmentation and fostering a cohesive digital economy in the Indo-Pacific. Countries in the region have adopted different types of agreements focussed on digital trade and investment. They can be grouped into traditional preferential trade agreements, specialised agreements targeting specific aspects of the digital economy, transnational cooperation instruments, and plurilateral frameworks.

Traditional preferential trade agreements, like the *Comprehensive and Progressive Agreement for Trans-Pacific Partnership* and *Regional Comprehensive Economic Partnership,* provide structure for regulatory cooperation and establishing regional standards. While primarily aimed at reducing trade barriers, these agreements include dedicated chapters on electronic commerce, setting minimum standards for data protection, electronic authentication, and paperless trading.

Within ASEAN, the digital economy has grown substantially due to widespread adoption of digital technologies across industries. Strategic frameworks, like the *ASEAN Digital Integration Framework* and its action plan serve as comprehensive roadmaps addressing priorities such as trade facilitation, data flow, electronic payments, and entrepreneurship (ASEAN, 2020). The Bandar Seri Begawan Roadmap aims to accelerate digital transformation in response to the COVID-19 pandemic, with plans to negotiate the *ASEAN Digital Economy Framework Agreement* by 2025 (ASEAN, 2021). Specialised agreements, like the *ASEAN Agreement on Electronic Commerce,* encourage regional collaboration by reducing regulatory discrepancies and establishing shared protocols for digital transactions. These frameworks lay foundational standards that enable smoother digital integration and attract international investment by reducing compliance costs for businesses operating across diverse regulatory environments.

The region has pioneered a new form of specialised agreements for the digital economy, DEAs, with Singapore leading this approach.[7] The *Digital Economy Partnership Agreement*, currently signed by Chile, New Zealand, Singapore, and Korea, focusses on cross-border digital trade policies based on free data flow and non-discrimination principles. This and other DEAs, such as the *Singapore-Australia Digital Economy Agreement,* include provisions for electronic invoicing, paperless trading, and digital identities, ensuring secure engagement for businesses and consumers. These agreements provide models for other countries to emulate in fostering and facilitating digital trade.

Further, transnational collaborations like the *ASEAN Smart Cities Network* demonstrate the potential of regional partnerships of a softer nature to drive digital innovation and to address common issues in areas such as urban planning and infrastructure. Similarly, the CBPR system offers a framework to facilitate secure cross-border data flow while ensuring robust personal data protection. CBPR allows businesses to reduce complexities associated with complying with diverse national regulations, fostering trust and enhancing trade.

Plurilateral frameworks, such as the Indo-Pacific Economic Framework for Prosperity, represent another approach to regulatory coordination (Dimitropoulos, Chen, Chaisse, 2025). The Indo-Pacific Economic Framework for Prosperity brings together multiple Indo-Pacific countries and aims to address issues like supply chain resilience, a clean economy, and a fair economy, with implications for digital trade. While the initial focus on digital trade has seen some countries, such as India, opt out or reconsider their involvement, these frameworks demonstrate efforts to align regulations and to foster cooperation in the region (Chaisse and Hsieh, 2023).

Enhancing regulatory coordination is essential for building an integrated digital economy in the Indo-Pacific. Aligning standards and fostering collaboration can reduce compliance costs and promote a stable environment for businesses. Coordinating on issues such as data governance and privacy will allow the region to create a resilient, predictable environment that supports innovation and competitiveness in the global market. Moreover, adopting flexible yet coherent regulatory approaches will enable the Indo-Pacific to accommodate the diverse needs of its countries while promoting integration. This coordination is critical for sustaining regional competitiveness and ensuring that the digital economy continues to drive economic growth and development across the region.

[7] Government of Singapore, Ministry of Trade and Industry, Digital Economy Agreements, https://www.mti.gov.sg/Trade/Digital-Economy-Agreements

8. The Future of the Digital Economy and its Regulation in the Indo-Pacific

The digital economy plays a significant role in driving economic growth in the Indo-Pacific region. The above analysis highlights three design principles for the future of the digital economy and its regulation in the Indo-Pacific: a focus on intraregional coordination, infrastructure development, and interoperability.

Effective coordination and collaboration – both within the region and with external partners – are necessary to maximise the potential of the digital economy. Establishing consistent regulatory standards – particularly in data protection, cybersecurity, and intellectual property – can create an environment conducive to investment and innovation. Prioritising intraregional coordination amongst Indo-Pacific nations aligns with both economic interests and geopolitical considerations.

Intraregional collaboration amongst Indo-Pacific countries will leverage collective strengths to accelerate technological progress, enhance regulatory frameworks, and promote inclusive growth. Agreements on digital trade, cross-border data flow, competition, and digital payments are projected to contribute up to US$2 trillion to the regional digital economy by 2030, strengthening the region's competitiveness in the global market (Rohman, Gunawan, Johanes, 2024). The *Digital Economy Framework Agreement* provides ASEAN with an opportunity to develop region-specific regulations for digital trade governance, advancing its digital transformation agenda. Advanced economies can share expertise in building resilient digital infrastructure and fostering digital literacy, while emerging digital markets, such as India and Indonesia, can offer valuable insights into scaling digital services and driving widespread adoption. This exchange of knowledge will enable nations to avoid common pitfalls, implement effective strategies, and accelerate their digital transformation efforts. Collaborative research and development initiatives can further enhance this process by pooling resources and expertise, leading to advancements in cutting-edge technologies.

Geopolitical factors, however, are significantly impacting the expansion and integration of the digital economy in the Indo-Pacific. Trade disagreements, territorial disputes, and differing political ideologies present substantial obstacles to collaboration, often leading to fragmentation through divergent technological standards and ecosystems. This fragmentation hinders the seamless exchange of data, capital, and digital services (Bradford, 2023). Regional cooperation is thus essential to mitigate these disruptive effects. Organisations like APEC and ASEAN are important to facilitate dialogue, foster trust, and develop mechanisms to address conflicts. Enhancing collective efforts in areas such as cybersecurity, data protection, and digital trade facilitation can assist the region in addressing geopolitical complexities while advancing an integrated and competitive digital economy.

In the current geopolitical landscape, softer forms of cooperation and plurilateral agreements may be the most effective way forward. Frameworks like the CBPR system aim to coordinate data protection standards and to facilitate smoother data flow without

imposing uniform standards, thereby building trust amongst trading partners. Similarly, DEAs, like the *Digital Economy Partnership Agreement,* allow members to selectively engage in areas of closer collaboration. The Centre for Digital Innovation and Sustainable Economy, established by ERIA, also exemplifies soft intraregional collaboration, supporting digital transformation across ASEAN and East Asia. The centre aims to modernise traditional business models by offering technical support for digital trade, developing unified rules on digital governance and cybersecurity, and fostering innovation amongst startups, thereby supporting digital development in the region.

Beyond intraregional coordination, investing in digital infrastructure is essential for enhancing connectivity and expanding participation in the digital economy. While digital intraregional integration in the Indo-Pacific is relatively advanced compared to other regions, further investment in digital infrastructure is necessary. Public-private partnerships could help bridge investment gaps, boost connectivity, and enhance economic resilience and inclusivity. Initiatives, like Made in China 2025 and Digital India that integrate public-private partnerships to enhance domestic digital technology development, illustrate how such collaborations can accelerate infrastructure development.

Creating a supportive environment for digital infrastructure development also requires addressing regulatory, legal, and policy issues. Policies that incentivise investments in digital infrastructure are integral to a comprehensive strategy for digital transformation. Tax relief for broadband investments in the United States and regulations on spectrum allocation for 5G deployment in the European Union provide good examples. Many Indo-Pacific countries are developing infrastructure laws focussed on supporting the creation, regulation, and management of both existing and new infrastructure (e.g. Government of Australia, 2008; Government of the Philippines, 2016). Ensuring cybersecurity and mitigating associated risks, as demonstrated by coordinated global efforts like the *Cybersecurity Tech Accord*, is also crucial for facilitating the secure implementation of digital infrastructure.

Investing in digital infrastructure is crucial to bridging the digital divide both within and across nations. Approximately one-third of the world's population – including in the Indo-Pacific – lacks internet access, primarily in low-income and rural areas (ITU, 2023). Targeted investments towards bridging this divide are thus necessary, especially in underserved regions where connectivity is limited or unstable. Initiatives, like the World Economic Forum's Internet for All, emphasise the need for financial and technical assistance to develop resilient digital infrastructure in emerging economies. Moreover, the World Economic Forum highlighted that regulatory and supervisory fragmentation can raise costs for digital businesses by up to 30%, especially in data-driven sectors like fintech and e-commerce, where seamless cross-border data flow is essential (WEF, 2024).

Fostering the interoperability of digital systems in e-commerce, digital payments, and cybersecurity would enable Indo-Pacific countries to establish more predictable and

stable conditions for digital trade and investment in the region. An interoperable regulatory framework in the region would encourage businesses to expand into new markets by reducing risks associated with regulatory disparities.

There are multiple ways to achieve interoperability. One strategy would be adopting international best practice standards, such as the UNCITRAL Model Law on Electronic Commerce, which would enable cross-border recognition of electronic contracts and signatures (UNCITRAL, 1996). Building on the first design principle presented above, regional agreements may prove instrumental in promoting system interoperability. The CBPR system provides a mechanism for the mutual recognition of data protection standards across economies, facilitating smoother cross-border data transfers while maintaining compliance with local requirements. Japan's participation in the CBPR system highlights this. Its participation in the CBPR, as well as its alignment with similar international norms like the European Union-Japan Adequacy Agreement, have enabled more seamless data exchanges with both APEC and non-APEC economies. Achieving interoperability and interconnectivity within the Indo-Pacific digital economy may also require a comprehensive legal and policy approach that goes beyond current frameworks. Establishing regional agreements on intellectual property rights and mutual recognition agreements would protect digital assets and minimise legal obstacles to trade. Finally, forming joint oversight entities to monitor compliance and to resolve disputes would enhance legal clarity for businesses operating on a regional scale.

9. Conclusion

The Indo-Pacific stands at the forefront of the digital revolution, with a unique opportunity to redefine the role of law in enabling and governing digitalisation. This transformation calls for reimagining law as a dynamic, forward-looking instrument that addresses the convergence of economic innovation, geopolitical complexity, and technological disruption. In this context, the law must serve three interconnected functions: stabilisation, facilitation, and norm creation. As a stabiliser, the law builds trust by ensuring the integrity of cross-border data flow, strengthening cybersecurity, and providing effective mechanisms for dispute resolution. As a facilitator, it unlocks the region's economic potential by enabling seamless digital trade, attracting investment, and promoting equitable access to digital technologies. As a norm creator, it positions the Indo-Pacific as a leader in establishing global rules for digitalisation, reconciling the imperatives of sovereignty, interdependence, and inclusivity. This vision recognises the law as the foundation for resilience and equity.

Cybersecurity legislation must secure digital infrastructure to underpin trust in trade and investment. Digital trade regulations should remain agile enough to govern emerging technologies like AI and blockchain. Taxation policies need to address the complexities of mobile labour, digital platforms, and global supply chains, ensuring fairness and fiscal sustainability. Inclusivity is essential, requiring legal initiatives to address capacity

disparities across the region and to enable smaller, emerging economies to participate fully in the digital economy.

Australia, Japan, and Singapore will play key roles in this endeavour. Their leadership in shaping interoperable norms reflects the Indo-Pacific's potential to bridge regional and global divides, offering a model for other regions to follow. Their efforts should focus not only on governance but also on embedding ethical and sustainable principles into the framework of digital law.

In this setting, the law becomes more than a set of rules; it forms the architecture that defines and directs the digital economy. It aligns innovation with accountability, competition with collaboration, and national interests with regional integration. The Indo-Pacific's diversity and dynamism make it an ideal environment for crafting this legal architecture. The region's success will depend on its ability to design regulations that anticipate rapid technological change, coordinate fragmented governance, and embody values of fairness and inclusivity. By doing so, the Indo-Pacific will not only secure its leadership in the digital economy but also influence the future of global digital governance, ensuring that the transformative power of digitalisation benefits all.

This book expands on these themes by examining the Indo-Pacific's rise as a digital and economic hub, focussing on the regulatory, legal, and infrastructural elements necessary for regional digital integration. The individual chapters analyse how advancements in digital platforms, AI, blockchain, and e-commerce affect trade and investment laws, as well as broader regulatory alignment. The contributions aim at deepening the understanding of critical issues such as privacy, cross-border data transfer, cybersecurity, and intellectual property protection, offering structured approaches to overcoming barriers to economic integration. They collectively advocate for resilient digital infrastructure, interoperability, and regional cooperation to build a unified digital economy and to drive the Indo-Pacific's digital evolution.

This collective work, initiated in 2023 with the support of ERIA, culminated in two key events: an online workshop on 18 October 2024, and a (hybrid) conference in November 2024 at Leiden University in the Netherlands. The authors and contributors express sincere gratitude to ERIA for its support and to the participants who provided valuable feedback that enhanced these chapters.

The Indo-Pacific's digital transformation underscores a fundamental reality – the law must not only respond to technological change but also anticipate and guide its trajectory. This transition demands a rethinking of legal systems, which must evolve from static structures into dynamic frameworks capable of addressing complex issues while promoting resilience. In a region marked by diversity, rapid development, and interconnectedness, the law emerges as the central mechanism mediating innovation and governance as well as national sovereignty and international cooperation. The task involves crafting a shared legal foundation that adapts swiftly to economic, geopolitical, and technological developments while embedding principles of fairness and

sustainability. This book emphasises that the future of the digital economy – in the Indo-Pacific and beyond – will be shaped as much by its law as by its technologies.

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Chapter 2

Policy and Economic Imperatives for Participation in and Expansion of the Digital Economy in the Indo-Pacific

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ERIA

1. Introduction

The evolving economic architecture in the Indo-Pacific region begins with the post-World War II construct of Asia and the Pacific, which has been in existence for 6 decades but is undergoing changes in its established patterns of economic integration and supply chain linkages. There are, without a doubt, opportunities and challenges in new policy alignments and various levels of willingness amongst governments to fortify changes in supply chain linkages and investments – both in Asia and outside of Asia – towards a newer construct of trade and economic cooperation (Prakash, 2023).

The unravelling of globalisation since 2016, as Brexit and America First populist ideologies echo throughout the world, has affected policy sentiment in most countries. Trade tensions between the United States (US) and China, which were initially confined to tariffs, have escalated to control of technologies that underlie manufacturing value chains. This narrative has been compounded in recent years by the onset of the COVID-19 pandemic, which originated in China. It created severe supply chain disruptions, at least in the initial few months of the pandemic in 2020, and then social and health measures in most countries sustained these disruptions for longer.

Existing supply chain dependency and efficiency are therefore being re-examined and sometimes rebuilt with bilateral and trusted partners. New policy watch words, such as 're-shoring' and 'friend-shoring', are being used extensively, and bilateral and trilateral relations are being explored to alter supply chains and investments in favour of friendly countries. In its inception phase, the emergent economic architecture of the Indo-Pacific reflects some or all of these phenomena in varying measures.

The reality, however, is that the Indo-Pacific region is an economic construct along the Indian Ocean, in which several groups of countries are working on their mutual relations and combined strengths. Their new plans aim to create new or alternative supply chains or to strengthen existing ones to address changing political and economic needs in Asia, incorporate the opportunities arising from the digital economy and Industry 4.0, expand the location of global value chains (GVCs) and new markets, ensure inclusive growth,

bridge the fault lines in supply chains exposed during the pandemic, and accommodate partners' interests from within and outside of Asia. The presence of the US as the largest economic and strategic partner is meant to be a guarantor of these objectives and consensus-based changes in the region.

2. Developing Asia: State of Preparation for Participation in Global Value Chains in the Digital Economy

The Association of Southeast Asian Nations (ASEAN) and East Asia are manufacturing hubs with close trade relations within the region as well as with important markets in the European Union (EU) and US. Such trade integration has been achieved through supply chain efficiencies and market demands in which connectivity – both infrastructure and institutional – plays a key role. Supply chains in ASEAN and East Asia rest on a stable foundation of trade and investment links. Despite the ongoing trade tensions between the US and China, the extent of risks so far is only at a micro level.

International value chains for manufacturing function around a regional hub. The potential of developing Asia (and Africa) to connect to regional or global markets greatly depends on the extent of value chain activity within the region. Policies, institutions, and private sector activity in neighbouring countries are therefore relevant. Together, these determine the capacity of a region or sub-region to attract lead firms, establish regional value chains, or link suppliers to lead firms in other regions.[1]

Asia's competitiveness comes from manufacturing, which is at the core of industries integrated into the GVCs in the Indo-Pacific; yet in the context of, for example, resource-rich Africa and some parts of developing Asia, industrial activities around the processing and refining of raw commodities would be a significant aspect of industrialisation-led growth. This aspect is now central to the supply chains of critical minerals where like-minded countries in the G7 and G20 are coming together to establish more resilient and transparent supply chains. Critical minerals are also at the heart of industries and applications in the digital economy and for goods of the future.

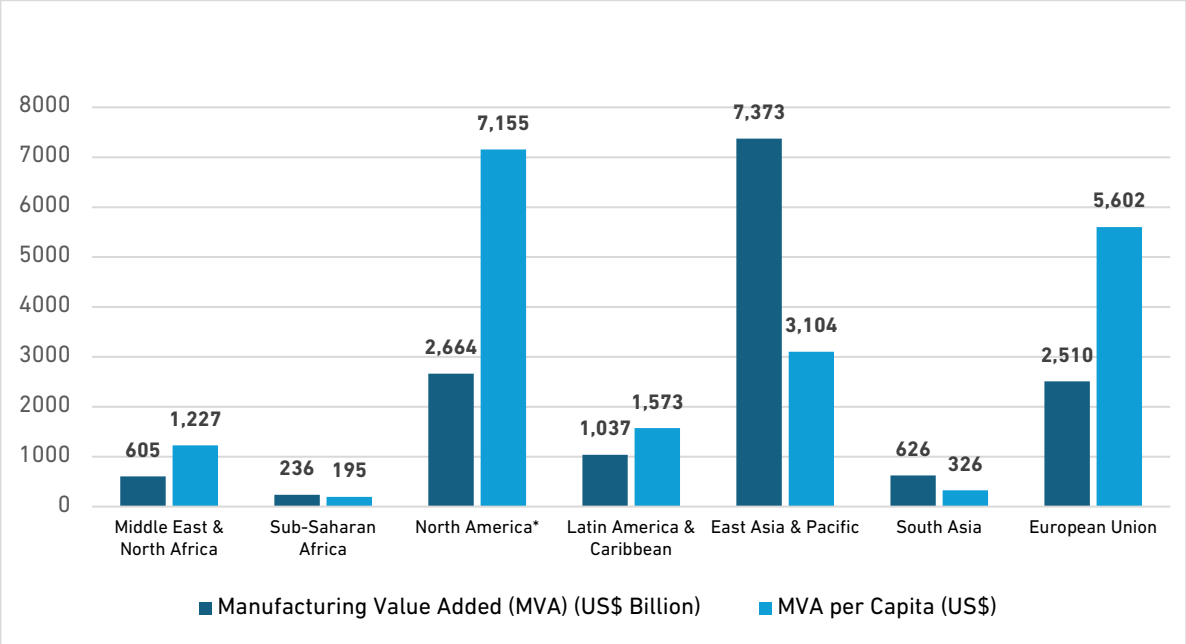
Indeed, manufacturing will not diminish with the onset of the digital economy. It will still provide most of the volume to international trade and will be a source of employment and growth in both the developing and developed world. However, the nature of manufacturing and the value chains of production and consumption will be affected. Changes in the location of production and consumption requires developing Asia to prepare for the changing nature of GVCs.

There is still wide divergence in manufacturing capacities and GVC participation amongst the different regions of the world. Two important indicators of industrial development –

[1] ITC, Trade Map, https://www.trademap.org/Index.aspx

manufacturing value added[2] and manufacturing exports – require policy attention for inclusive GVCs (Figure 2.1). Despite several developing countries in East Asia, this region is far ahead of others and nearing the manufacturing value added of Organisation for Economic Co-operation and Development (OECD) members.

Figure 2.1: Manufacturing Value Added and Manufacturing Value Added Per Capita, 2022 (US$)



Notes:

1. Manufacturing refers to industries belonging to International Standard Industrial Classification (ISIC) divisions 15–37. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for the depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by ISIC, revision 3.
2. Data for North America are from 2021. The rest are data from 2022.

Source: World Bank, World Development Indicators, https://databank.worldbank.org/source/world-development-indicators [accessed 20 October 2023].

[2] Manufacturing value added per capita, especially in the developing world, presents a more realistic picture of a region's employment-led growth through industrial production, exports, and trade integration. It also signifies the level of participation in value chains (ERIA, 2022).

3. Inclusive and Non-hegemonic Global Value Chain Linkages for the Digital Economy in the Indo-Pacific

Four important events have brought the focus to existing GVCs in both developing and developed Asia.

One, repeated disasters and the COVID-19 pandemic reminded the world of the vulnerability of supply chains and accompanied risks to connectivity. In this context, the potential of new, alternate, and/or diversified supply chains are being sought in road networks (e.g. the Greater Mekong Subregion economic corridors) and other modes of transport (e.g. railways, waterways, maritime, and air).

Two, the US–China trade tensions were forecast to affect supply chains, investments, and production locations in the region. Although international suppliers from the ASEAN region have remained resilient to such tensions, the China centrality of the supply chains in East Asia is driving new GVCs or supply chain initiatives amongst Australia, Japan, India, and the US in the Quadrilateral Security Dialogue. Similar supply chain-led connectivity plans are also seen in South Asia. The Asia–Africa Growth Corridor (AAGC) has been planned partly to provide alternative supply chain linkages in Asia. More recently, the India–Australia–Japan Supply Chain Resilience Initiative, signed on 27 April 2021, was launched to minimise supply chain disruptions and to diversify trade and investments, with a provision to expand the initiative to other regions (MOCI, 2021). The renewed emphasis on the Greater Mekong Subregion in these new supply chain initiatives is leading to new connectivity drives in Asia that have trade integration at the core. Moreover, the announcement of the India–Middle East–Europe Economic Corridor on the sidelines of the G20 summit in New Delhi in September 2023 is part of the quest for new and diversified supply chains in Asia and Europe (MEA, 2023).

Third, the advent of the digital economy has brought an urgency to digital connectivity plans and the GVCs of the digital economy in Asia. Investments in infrastructure for the digital economy and cybersecurity are the two most pressing needs in the ASEAN region and other parts of developing Asia for them to grow as digital economy hubs. The development of information and communications technology (ICT)-related infrastructure in individual Asian countries is uneven; gaps remain across and within countries (Chen, 2020). The digital economy could also allow less-developed countries/regions to skip certain stages and to leapfrog to a higher level of development. With an appropriate set of skills, the pre-globalised world could jump to active participation in trade through technology and connectivity. Digital connectivity plans with trusted partners in the Indo-Pacific are crucial; as an example, the EU–Asia connectivity strategy has a strong focus on connectivity designed for the digital economy.

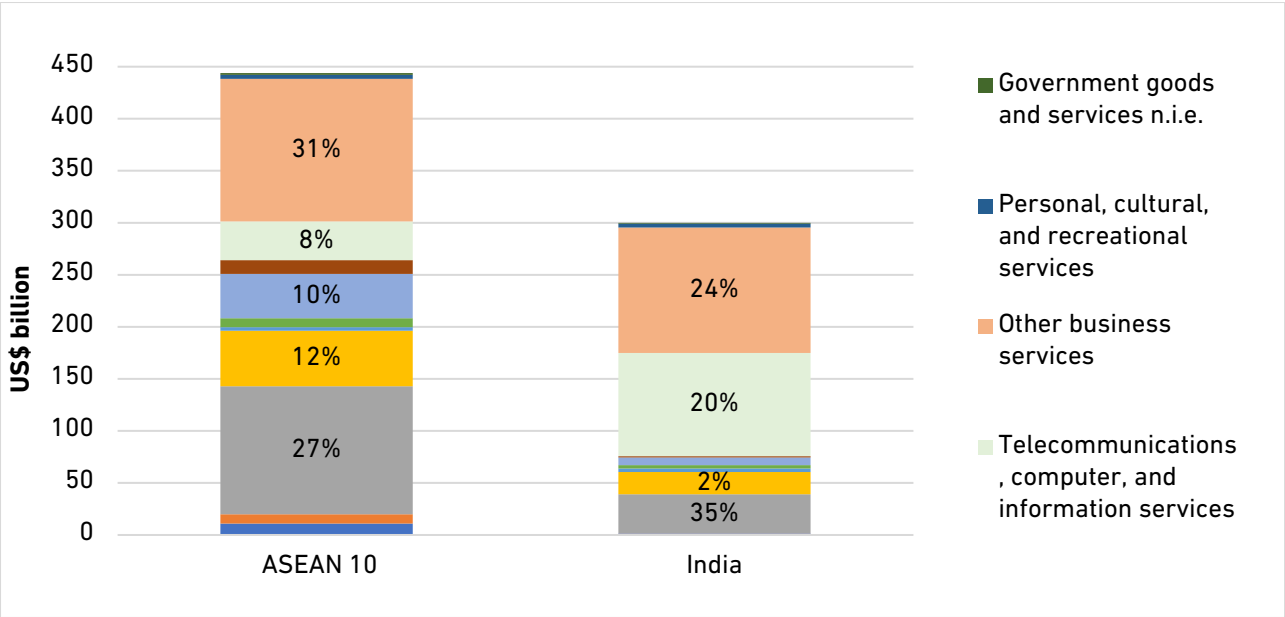
Fourth, a slowdown in trade in goods is reflecting capacity overhangs in investment and production. However, growth in trade in services remains high. There is a pressing need

to create new supply chains that can utilise the region's young demography and labour force and cater to new markets. Moreover, in the digital economy, the geographic span of GVCs will expand, and their concentration may also shift from current locations; the production and consumption of goods and services will occur in new locations and platforms (Prakash, 2019). The AAGC is a good example in this regard. Similarly, cooperation between ASEAN and the United Kingdom and the ASEAN–EU connectivity help address new supply chains for trade in services. Connectivity and cooperation – through market access, facilitation, and rules – can upgrade existing value chains for trade in goods and services and create new ones.

4. Assessing the State of Trade in Services in ASEAN and India

Amongst developing Asia, ASEAN and India are the leading economies providing competitive services to the rest of the world. ASEAN's trade in services relies on the travel and tourism sector. In 2022, 12% of ASEAN's gross domestic product (GDP) came from this sector. Travel and transport accounted for 39% of ASEAN's total services exports in 2022. Apart from Singapore, which has diversified into financial services and transport, most ASEAN Member States (AMS) need greater penetration in other sectors of services trade (Figure 2.2). India is a global player in the services sector, especially in ICT and research and development, which have important roles in the digital economy as well as being components of trade in goods.

Figure 2.2: Services Exports in ASEAN and India, 2022



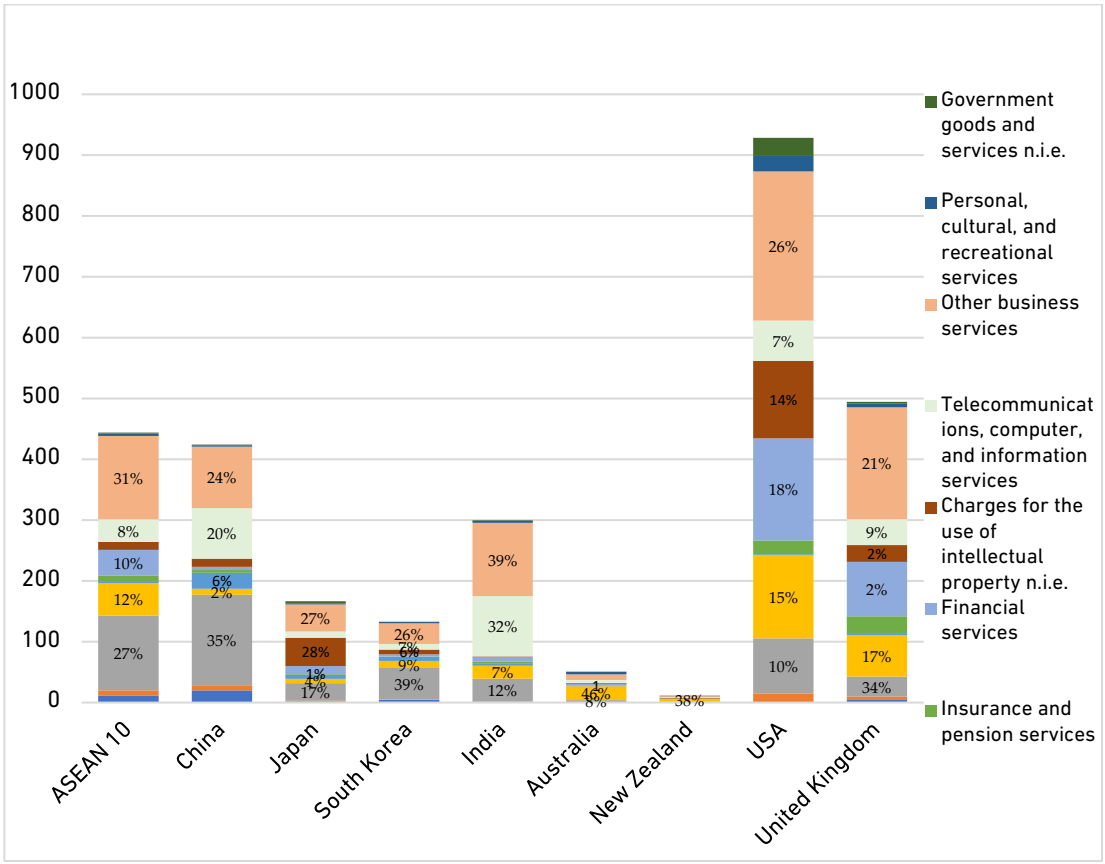
ASEAN = Association of Southeast Asian Nations.
Notes:
1. Data for the Lao People's Democratic Republic and Myanmar are from 2021 and 2020, respectively.

2. The International Trade Center defines 'Other Business Services' as (i) research and development; (ii) professional and management consulting services; and (iii) technical, trade-related, and other business services.

Source: ITC, Trade Map, https://www.trademap.org/Index.aspx

The Indo-Pacific region has deep integration into the value chains of trade in services. Together with ASEAN and India, the Indo-Pacific economies are well qualified for setting up and participating in value chains in the digital economy (Figure 2.3). The real challenge before the Indo-Pacific is to create an inclusive model of GVC participation that will include geographical inclusiveness, infrastructure development, and capacity preparations.

Figure 2.3: Services Exports in Key Economies in the Indo-Pacific, 2022



ASEAN = Association of Southeast Asian Nations, USA = United States.

Source: ITC, Trade Map, https://www.trademap.org/Index.aspx

5. Evolving Global Value Chains in the Indo-Pacific: Digitalisation and Servicification

Digitalisation is key to 21st-century GVCs. The figure below shows how technological progress and economic globalisation spurred international trade and nurtured its development. One way that technological progress affects the international economy is via reduced trade costs, including those of transport, communications, and people-to-people connections. Throughout the process, one can see how technological progress works to reduce costs and to push economic specialisation. In addition, with the deeper unbundlings of globalisation come the continuous effort of new technologies on finer international divisions of labour (Table 2.1). This evolutionary process has been classified into three main episodes of unbundling: (i) the separation between production and consumption, (ii) international fragmentation of production, and (iii) further fragmentation within the tasks of production (Baldwin, 2016; Kimura and Chen, 2018; Chen, 2021)

Table 2.1: Technological Progress in Global Value Chain Evolution

	Pre-globalised world	The 1st unbundling	The 2nd unbundling	The 3rd unbundling
Costs of transportation Costs of communication Face-to-face costs	High High High	Lower High High	Lower Lower High	Lower Lower Lower
What to move	None	Goods	Production factors, know-how	Skills, Services Data and information
Int'l division of labor	Autarky	Industry-wise	Task-wise (production fragmentation)	Person-wise (task fragmentation)
Technology		Automation, Transport	CT& IT	SMACI

CT = communications technology; IT = information technology; SMACI = social media, mobile phone, artificial intelligence, cloud computing, and internet of things.
Sources: Baldwin (2016), Kimura (2018), Kimura and Chen (2018).

Pre-globalisation, production activities and consumption had to be geographically close to each other due to the high cost of doing business remotely. This changed when new technologies reduced the time and cost of long-distance transport, which allowed the separation of production and consumption activities. Consequently, technological progress managed to promote an industry-wise division of labour and to make mass production and economies of scale feasible.

When the Information Revolution further drove down the cost of transport and communications, a new way of organising international economic activities emerged, enabling production to be fragmented internationally and organised via GVCs. The idea of trade and investment liberalisation became widely accepted as a way to facilitate a country's involvement in GVCs. To meet the needs of coordinating GVCs, service links – especially those of business and financial services – were making great strides as well. As a result, the global economy became further interconnected via GVCs.

In the new millennium, digital technologies have significantly reduced the cost of people-to-people connections, particularly via enhancing connectivity in cyberspace. It is not that much different to communicate and to exchange ideas with people thousands of miles away than to do so with those next door. Digitalisation also blurs boundaries between the different links of value chains and increases information transparency for all participants. As for GVCs, services links – either digitally enabled or digitally created – can improve the capacity of network coordination and drive GVCs towards an ecosystem that is better connected, smarter, and more efficient. Finally, the economic consequence of digitalisation can only be underestimated, as embracing digital technologies into businesses unquestionably creates new products, services, and markets. More and more, digital technologies are being combined with new materials and energies to create new market opportunities for development (Chen, 2022).

6. Human Capital Development for Participation in the Digital Economy

Digitalisation has changed not only the production process but also the mode of interactions between consumers and producers and between employers and employees. By affecting both traditional sectors (e.g. agriculture) and creating new economic activities (e.g. data science), the process has created new job opportunities while eliminating others, thus fundamentally changing the characteristics of labour demand.

In the 2010s, the major focus was on the substitution of human labour by automation technology. The Asian Development Bank (2018) noted that jobs that mainly comprise tasks that can be automated would soon no longer be available for humans. To benefit from technological change, therefore, it and other multilateral institutions recommended that workers acquire technical, cognitive, and non-cognitive skills (World Bank, 2018). However, technology has continued to evolve rapidly over the past few years, with the enhanced capability of artificial intelligence (AI) to carry out some cognitive tasks (e.g. research) (Korinek, 2024).

Today, participation in the digital economy still requires the availability of a sufficient number of workers with the requisite skills. This is contrast to globalisation in previous decades, when the proliferation of manufacturing supply chains in developing countries was due to the availability of low-cost labour that could be easily trained to do simple

manufacturing tasks. This was one reason that the previous era of globalisation supported rapid economic growth and improved living standards in the Indo-Pacific.

Reaping similar benefits from participation in digital value chains is less likely unless human capital with the requisite skills can be quickly increased. Countries with sufficiently large supplies of workers who can harness and complement digital technology will benefit from current trends, but those that do not have such stocks will be left behind by economic progress, creating challenges for inclusive growth. Such human capital will also be a key factor in attracting investments in a digital economy.

Digital technology has also changed the way many firms are structured, which has implications for the relationship between workers and employers. The rise of the gig economy is one of the most visible consequences of this technology, which adds to labour market flexibility but also creates challenges for employment regulations that are still being debated even in advanced economies (Datta, 2024; Erlich, 2021). The rise of flexible work arrangements also affects how workers' socio-economic conditions change over their career. Economic theory posits that, in traditional employment, accumulation of experience and firm-specific human capital leads to wage increases, as workers become better at their jobs (Brown, 1989). Yet in the digital age, self-employment and part-time and temporary work are on the rise in many economies, and algorithms and star ratings dictate the assessment of job performance rather than direct observation by a manager. Traditional job ladders and career progression may no longer be relevant, possibly weakening the impact of employment on improving the socio-economic status of the poor, a salient feature of progress.

The greater feasibility of remote work is another characteristic of the digital economy. The COVID-19 pandemic accelerated the adoption of remote work and associated investment in the underlying technology to enhance the capabilities of remote work infrastructure (Sahut and Lissillour, 2023). Widespread adoption of such work arrangements increased flexibility, including a greater possibility of cross-border services provision without physical movement of natural persons. It also, however, poses challenges for job creation in developing countries. The feasibility of remote work varies greatly across industries and mostly favours white-collar jobs. Even in a developed country like the US, researchers estimate that only 37% of the work can be done remotely; this proportion is much lower in developing countries. Moreover, jobs with a remote work possibility tend to cluster within a firm, which means that the proportion of businesses that can operate remotely is even smaller. Since cognitive tasks are more amenable to being performed remotely, educated and high-income workers benefit from such arrangement disproportionally.

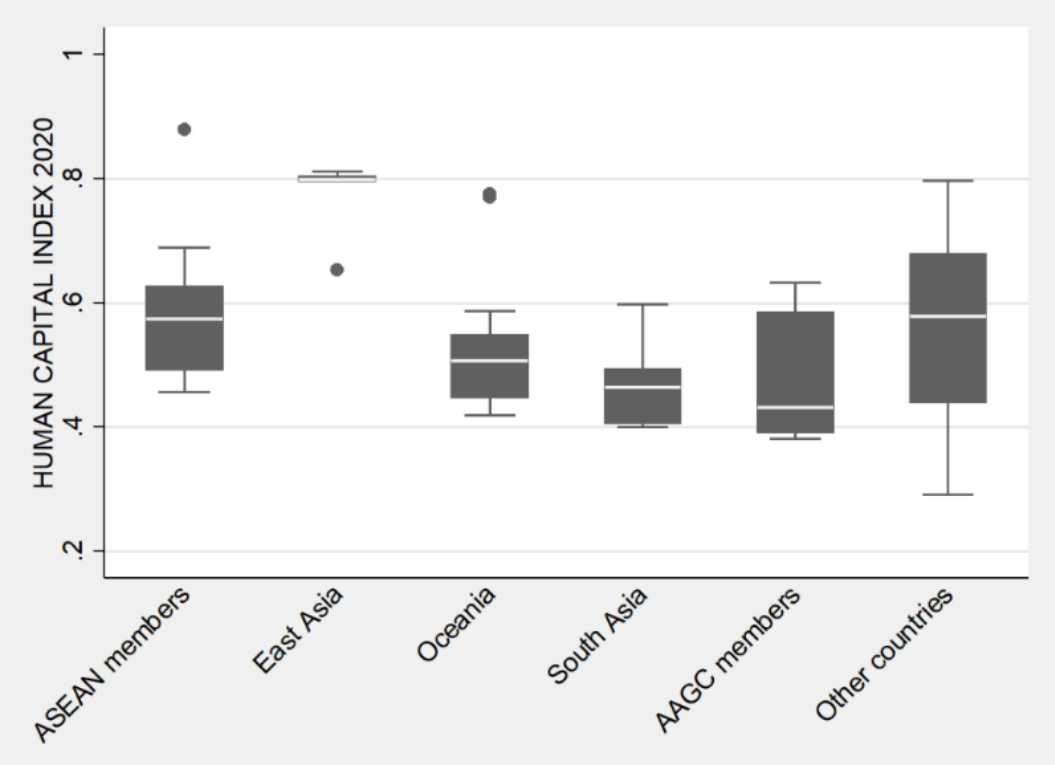
The availability of sufficient human capital is also needed for small and medium-sized enterprises (SMEs) to participate in the digital economy. One of the disadvantages that SMEs have compared to their larger counterparts is that they do not have many employees who specialise in jobs in the digital economy. Therefore, SMEs cannot usually benefit from the productivity improvements that come from hiring workers in specialised

roles. The only possibility is for such services to be provided to SMEs in the market at the lowest possible cost, which in turn requires a large pool of individuals with those skills.

6.1. State of Human Capital in the Indo-Pacific

The range of skills needed for the digital economy varies from basic digital literacy to highly technical programming capabilities (WEF, 2024). The basic level of human capital varies across the Indo-Pacific. Figure 2.4 shows the distribution of human capital in the Indo-Pacific after grouping countries into five categories based on geographic location; the figure also includes the rest of the world for comparison. East Asia has high levels of human capital in general, as do a few countries in ASEAN and Oceania. The average level of human capital in ASEAN is similar to rest of the world, but those in Oceania, South Asia, and Africa are below average.

Figure 2.4: Human Development Index, Various Regions, 2020



AAGC = Asia–Africa Growth Corridor, ASEAN = Association of Southeast Asian Nations.
Source: Authors' illustration from World Bank, Human Capital Project, https://www.worldbank.org/en/publication/human-capital

Another indicator of the level of human capital is the rate of tertiary educational enrolment (Table 2.2). Such enrolment varies widely amongst Indo-Pacific countries, ranging from 1.8% in Papua New Guinea to 114.0% in Australia. On average, East Asia has the highest rate of tertiary enrolment, followed by ASEAN, South Asia, Oceania, and AAGC members.

Much variation exists within these sub-regions themselves, which indicates that Indo-Pacific countries are at different levels of readiness to participate in digital GVCs.

Table 2.2: Tertiary Gross Enrolment Rates in the Indo-Pacific (%)

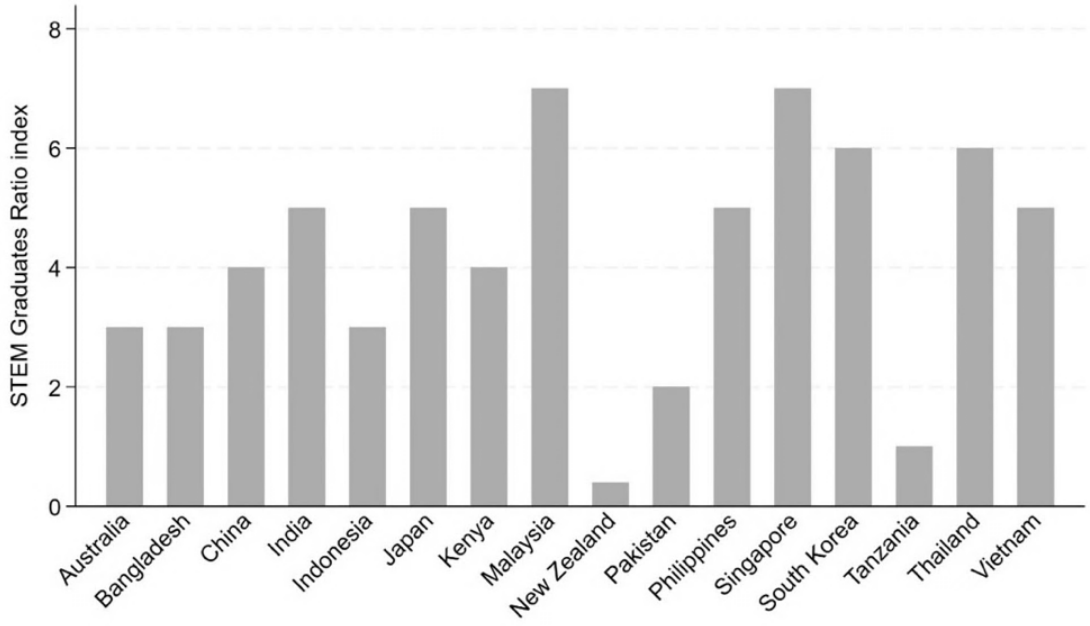
	Minimum	Median	Maximum	Obs.
ASEAN Members	13.48	33.76	91.09	10
East Asia	26.83	71.41	113.09	6
Oceania	1.78	19.48	114.19	11
South Asia	10.56	22.22	34.12	6
AAGC members	4.12	8.88	44.26	7
Other countries	0.75	36.58	148.53	158

AAGC = Asia–Africa Growth Corridor, ASEAN = Association of Southeast Asian Nations.
Source: World Bank, Human Capital Project, https://www.worldbank.org/en/publication/human-capital

Years of education do not always translate into human capital improvement, however, due to the low quality of education in a specific country. OECD's Programme for Student Assessment (PISA) test scores reveal wide variation in student performance across countries, with many developing country students lagging behind their developed country counterparts (OECD, 2023). There are some outliers – like Viet Nam – that perform much better and are thus in a better position to benefit from the digital economy. To prepare workers for the digital economy, both the quantity of time invested in and the quality of the education system need to be upgraded.

Fewer estimates are available on more direct measures of technical human capital needed for the digital economy. One source is the ratio of graduates in science, technology, engineering, and math (STEM), which has been compiled by Huawei to measure and benchmark the progress of digital transformation across various countries. Figure 2.5 shows the difference in this ratio across selected countries of the Indo-Pacific.

Figure 2.5: Graduates in STEM, Ratio for Selected Countries in the Indo-Pacific



STEM = science, technology, engineering, and math.
Source: Huawei (2024).

6.2. Cooperation Areas and Mechanisms for Human Capital Development

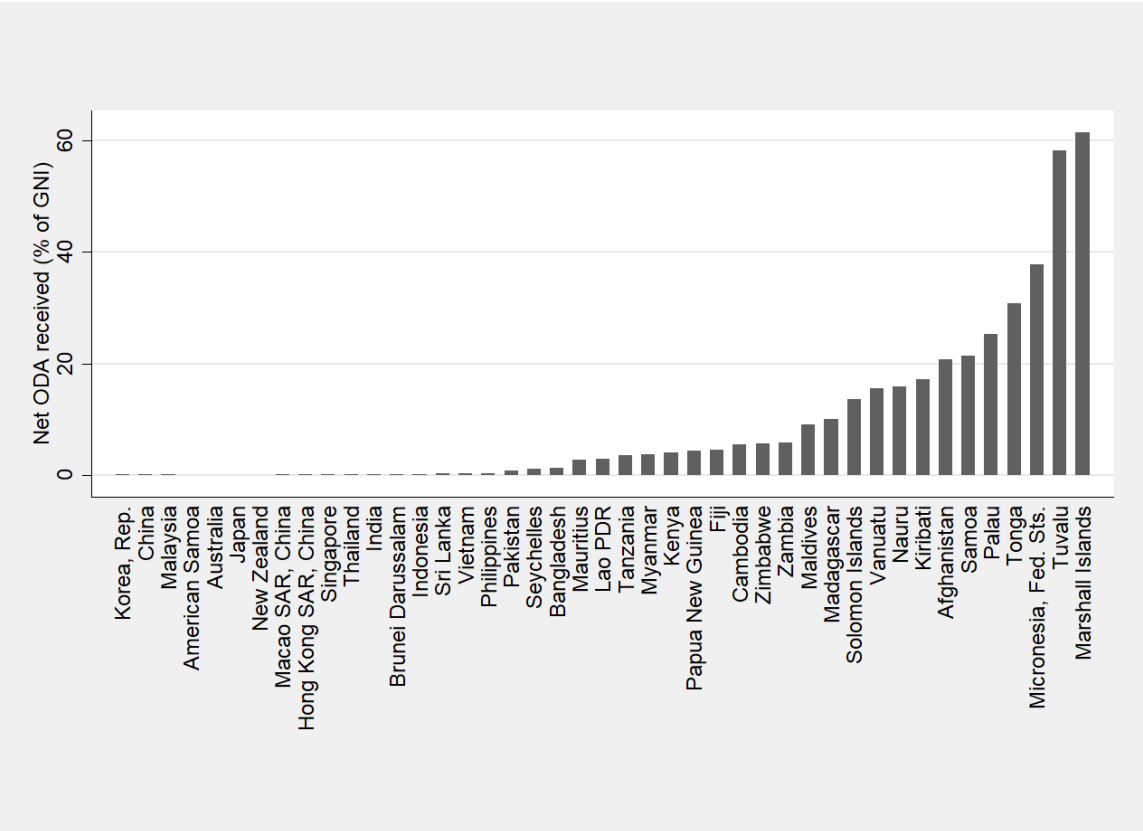
The ability of workers to gain the skills required for the digital economy largely depends on their access to skills development systems. A skills ecosystem comprises various policies, programmes, and institutions that support the development of skills that are consistent with the emerging skills demand (ILO, 2023). It is an 'ecosystem' because the various policies, programmes, and institutions must be interlinked and coordinated to be effective. The effectiveness of the skills ecosystem determines the degree of skills match in the economy (i.e. how well the demand for and supply of skills are equalised).

The skills ecosystem comprises three major parts: (i) the education and training system, (ii) labour market information system, and (iii) employment services system. Although the education and training system receives the most attention regarding human resources development, the other two systems are equally important in ensuring the timely flow of information from the demand side of the labour market to workers and training providers. A labour market information system is necessary to understand the evolving nature of skills demanded by firms, and a skills and qualification framework outlines common definitions and understanding of the skills and qualifications needed for various jobs. An employment services system allows workers to navigate the rapidly changing labour market. The current states of skills ecosystems vary greatly across Indo-Pacific economies and need to be enhanced quickly to meet needs of the digital economy.

Ways that the Indo-Pacific can cooperate on human capital development include the following.

(i) **Financial support.** An education and training system is a key component of the skills ecosystem where digital literacy can be imparted. Investments are needed in training teachers and upgrading infrastructure towards this goal. For many developing countries, education budgets are supported by international development aid. For many Indo-Pacific countries, such aid still represents a substantial fraction of their national incomes (Figure 2.6). Building human capital in these countries will thus require further investment into their budgets in education, vocational training, skills development, and associated programmes. While many bilateral and multilateral aid programmes have focussed on skills development in isolation, greater success may be found in pooling resources and coordinating programmes.

Figure 2.6: Aid Dependence in the Indo-Pacific



GNI = gross national income, Lao PDR = Lao People's Democratic Republic, ODA = official development assistance.
Source: Authors' illustration from World Bank data.

(ii) **Knowledge support.** Many countries in the Indo-Pacific have begun developing targeted policies and programmes to support the transition to the digital economy, including strategies aimed at developing skilled human resources. Examples include Indonesia's *Kartu Prakerja* programme

(Purbasari, Satriawan, Sitorus, 2023) and Singapore's SkillsFuture programme (Kim et al., 2021). As the digital economy evolves, the effectiveness of these programmes in ensuring the formation of required human capital has yet to be determined, however. Indo-Pacific countries can learn from one another's experiences in implementing policies and programmes aimed at increasing human capital.

(iii) Movement of the digital workforce. Fostering cooperation around the movement of workers can be another important tool for greater GVC participation. The distribution of digital talent is uneven across the Indo-Pacific, with less-developed countries lagging. Regions with more advanced integration architecture do have cooperation in human resources built in – but with varying degrees of implementation. The EU is perhaps the most advanced in this regard, with free movement of people and student-exchange programmes, which can be adapted for the needs of the digital economy. ASEAN has also developed mechanisms for the movement of skilled workers through mutual recognition agreements, but these are limited to only a handful of occupations.[3]

The Indo-Pacific region already has some elements of labour mobility through bilateral agreements. In particular, the movement of low- and medium-skilled workers is usually handled through government–government agreements. It is not uncommon for countries in the region to sign bilateral labour agreements, which specify conditions under which one party to the agreement (i.e. the 'source' country) sends temporary workers to the other party (i.e. the 'host' country) (Chilton and Posner, 2018). These agreements often contain legal protections for migrants in the host country as well as obligations for the source country. The University of Chicago Law School catalogued as many as 582 bilateral labour agreements between 1945 and 2015, with over half ratified between 1990 and 2015.[4]

Table 2.3 presents the number of bilateral labour agreements amongst the various sub-regions comprising the Indo-Pacific. Within the Indo-Pacific, six bilateral labour agreements are found in which an East Asian country is the host country and an AMS is the source country. East Asian countries also have five bilateral labour agreements with South Asian countries. Oceania has as many as 26 bilateral labour agreements but with only 3 countries in East Asia as source countries.

[3] The ongoing Digital Economy Framework Agreement negotiations amongst AMS aim to inspire cooperation on digital talent mobility.

[4] The University of Chicago, The Law School, Bilateral Work Agreements Dataset, https://www.law.uchicago.edu/bilateral-labor-agreements-dataset

Table 2.3: Bilateral Labour Agreements between Indo-Pacific Countries

		Source Country					
		ASEAN	East Asia	Oceania	South Asia	AAGC	Other Countries
Host Country	ASEAN	10	0	0	3	0	0
	East Asia	6	2	0	5	0	2
	Oceania	0	3	0	0	0	26
	South Asia	0	0	0	0	0	0
	AAGC	0	0	0	0	0	0
	Other Countries	25	9	1	19	1	175

AAGC = Asia–Africa Growth Corridor, ASEAN = Association of Southeast Asian Nations.
Source: Authors.

Further opening the labour markets in the Indo-Pacific could accelerate the generation of digital skills. One of the greatest incentives in acquiring skills is the ability to obtain jobs that will utilise those skills. The prospect of moving to another country may encourage individuals to gain skills that may not be immediately employable domestically but may open up job possibilities elsewhere. This is the essence of 'brain gain' that arises due to increased opportunities abroad. Thus, greater skills mobility will not only help reduce the current skills gap but also encourage new skills. Skills and experience can also be gained in more developed host countries, which can then be applied in the source country upon return – known as 'brain circulation'.

Making skills more transferable across the Indo-Pacific will lead to efficiency gains. Mutual recognition is one mechanism for supporting labour mobility in digital skills. Coordination would allow greater mobility of skills across the region by having common frameworks, understandings, and standards for the requisite skills, which could allow the transfer of skills across countries. Likewise, it may also be beneficial to have similar policies, programmes, and services to afford predictability and to reduce mobility costs.

7. New Frontiers in the Digital Economy: Developing Asia Takes the Lead in Digital Public Infrastructure

Digitalisation has significantly influenced economic cooperation by revolutionising trade and investment patterns worldwide. Recent studies (e.g. Castro, Fernandez, Colsa [2021]; Brenner and Hartil [2021]) in the field of innovation and strategic management have argued that digitalisation can be considered a promising approach to support the process of sustainable economic transformation.

Digital trade can improve trade flows by reducing the costs of searching for, matching with, and communicating with international stakeholders (Hagsten and Kotnik, 2017).

Second, it provides additional channels for marketing and sales, allowing companies to reach a broader base of customers and suppliers. Moreover, digital trade allows firms to source inputs and to organise production more efficiently, thus improving their productivity and becoming more competitive (Añón Higón and Bonvin, 2022; Fernandes et al., 2019). Advances in digitalisation can be leveraged to facilitate the outsourcing of non-core activities and to support their integration into GVCs.

One of the primary effects of digitalisation on economic cooperation is the expansion of cross-border trade. The proliferation of e-commerce platforms and digital marketplaces has enabled businesses to connect with consumers and suppliers globally, transcending geographical barriers. According to the World Bank (2018), worldwide e-commerce sales business to business have been steadily rising year over year for the last decade, with the global business-to-business e-commerce market valued at US$36 trillion by 2026. Heavy industries, advanced manufacturing, energy, health care, and professional business services segments drive the majority of this sales value.

India and ASEAN have created an extensive ecosystem of digital public infrastructure in their respective domestic markets, enabling their respective participation in domestic markets and global trade. The digital public infrastructure ecosystem has especially enabled their micro and SMEs to participate in GVCs of the digital economy including e-commerce. To facilitate digital transactions, India has established impressive low-cost infrastructure, largely supported by the Aadhaar biometric identity system. Table 2.4 provides a comprehensive overview of the critical elements that have contributed to India's success in implementing robust, scalable digital public infrastructure systems.

Table 2.4. Summary of India's Digital Public Infrastructure Capacity

Name	Definition	Launch	Impact
Identity Layer			
Aadhaar	A 12-digit unique identification number that is linked to biometrics (i.e. fingerprints, iris, face), demographics (i.e. name, age, gender, address), and optional contact details (i.e. e-mail, phone number)	2009	1.38 billion holders 1.96 billion authentications per month
eKYC	Electronic authentication of customer identity using Aadhaar details	2013	250 million per month 18.8 billion cumulative

eSign	Service enabling Aadhaar holders to digitally and remotely sign documents with a legally valid electronic signature	2016	
GSTN	A unique 15-digit identifier assigned to businesses and individuals who are registered under the GST regime in India, used to track and to manage the tax liabilities and compliance of registered taxpayers under the GST system	2017	14 million tax-paying businesses
Payments Layer			
AePS	An interoperable financial system allowing customers to access their bank accounts by authenticating their Aadhaar details	2010	200 million tonnes of goods exchanged per month
APB	System for electronically channelling government benefits and subsidies in the Aadhaar-enabled bank accounts of the intended beneficiaries	2011	88% of government benefits are delivered via APB
UPI	An instant real-time payments system	2016	Goods worth US$225 billion per month exchanged
BBPS	Integrated bill payment system providing a centralised platform for the payment of telephone bills, utility bills, etc.	2016	250 million transactions per quarter US$7.5 billion in value
Data Layer			
DigiLocker	Digitalisation service that provides an account in the cloud to every Aadhaar holder to access authenticated documents	2015	263 million users 6.7 billion documents issued
Account Aggregator	Enables consented access and sharing of any person's digital financial information securely amongst financial institutions regulated by financial sector regulators, such as the Reserve Bank of India, Securities and	2021	63 million accounts linked

	Exchange Board of India, Insurance Regulatory and Development Authority of India, and Pension Fund Regulatory and Development Authority		64 million data-sharing requests

Source: ERIA (2024).

There are five technology architecture principles that illustrate how digital public infrastructure efforts can be constructed to be distinct from traditional digitisation efforts: (i) interoperability; (ii) minimalist, reusable building blocks; (iii) diverse, inclusive innovation by the ecosystem; (iv) preference for remaining federated and decentralised; and (v) security and privacy by design. When implemented in different developing economies, these technical principles help digital public infrastructure achieve outcomes such as inclusion, user choice, innovation, scale of delivery, speed of service, public trust, and competition in markets.

8. A Rules-based Playing Field for Digital Trade and Global Value Chain Participation

The rapid growth of digital trade and its rising importance in the global economy have urged the development of international common rules to level the playing field. These should consist of content covered by the current World Trade Organization (WTO) rule sets as well as topics that are WTO-plus (i.e. topics that call for the extension of member *déjà fait* commitments at the multilateral level) or WTO-extra (i.e. new issues that have not been yet covered by WTO) (Chen and Kimura, 2019). Both can help determine the long-term development of the digital economy; no rules or too-loose regulations may lead to market disorder, while too-restrictive policies may erect barriers to market access in digital trade.

As Chen (2022) summarised, there are at least four common understandings of digital trade. First, digital trade involves both trade in goods and trade in services. Digitalisation has introduced new services and turned more non-tradable sectors into tradable sectors. By doing so, digital solutions have expanded the territory of services in economic activities. In particular, digitalisation has sharpened the edge of competitiveness of data-driven business models such as servicification, with which the delivery of end-products is no longer the end of sale but merely a milestone that is followed by more producer–consumer interactions, including consumer feedback to the producer and a producer's customised service to the consumer.

Second, digital trade includes the trade of final products as well as that of intermediate goods and services. In international trade, the use of telecommunications tools has led to

a new pattern of international division of labour by lowering the cost of services links to enable and to sustain international fragmentation of production (Jones and Kierzkowski, 1990). This contributed to the birth of GVCs and, today, fuels their rapid growth. New digitally enabled means of communications, such as social media, instant messaging, and videotelephony, are currently helping extend the coverage of GVCs and enrich their content. With this understanding, rules on digital trade should aim to govern the entire GVC, including trade of intermediate products and those services activities that are woven throughout the production network.

Third, cross-border data flows are vital to digital trade. These can facilitate other trade flows – from those of goods and services to international factor mobility – and turn some of these flows into other forms of international trade once new technology is ready. For instance, videotelephony supported online meetings during the COVID-19 pandemic when social distancing and travelling restrictions were necessary. In the future, with the advance of related technology such as holographic displays, virtual events in cyberspace may further aid human mobility.

Finally, the internet was developed to be borderless; rules and regulations on digital trade should thus work on preventing cyberspace from fragmentation due to various barriers. Since the GVCs behind digital trade cover both the physical world and cyberspace, rules, regulations, and legislation must exist in both spaces of the market (Chen, 2019; Chen and Kimura, 2019).

Setting international rules on digital trade should consider these common understandings and include provisions to deal with both tariff and non-tariff measures (NTMs). NTMs are often laws or red tape that hamper free trade or discriminate against foreign suppliers regarding market access, such as discriminatory regulations or local content rules (Fefer, Akhtar, Morrison, 2019).

As for tariff barriers, non-duty practices on electronic transmissions and those of *de minimis* on cross-border e-commerce should be promoted. Pulling up the amount of *de minimis* can accelerate the growth of digital trade. Driven by the growth of international business-to-consumer activities, there are more low-value parcels in cross-border e-commerce; exempting these low-value parcels from tariffs and other taxes can help cross-border e-commerce transactions expand, benefitting both individuals and SMEs (Hufbauer and Wong, 2011). Binding one-sided international standards would also be helpful, as members would be required to set a floor on the maximum amount of *de minimis* but free to choose a higher amount under the non-discrimination principle (Chen, 2019; 2022).

In comparison, NTMs are numerous and varied. They contain policy interventions that affect international trade other than tariffs. Concerns on traditional trade-related measures need to extend into the digital sphere (Wu, 2017). Rules setting for digital trade in this regard can build upon the latest progress in NTM reduction and refer to existing principles on NTM regulations.

Promoting the free flow of data should be the top priority. Accordingly, rules setting on digital trade must seek to ban new barriers on the free flow of data, such as localisation requirements, restrictions on cross-border data flows, intellectual property right (IPR) infringement, forced technology transfer, web filtering or blocking, cybertheft, requirements for source code or algorithm disclosure, or forced technology transfer (Fefer, Akhtar, Morrison, 2019). Rules on digital trade must include explicit provisions for non-discrimination and national treatment, applicable to cross-border data flows as well as payments, investments, and labour movements related to the internet of things (IoT).

9. The Indo-Pacific Partnership in International Rules Setting on Digital Trade

The Indo-Pacific Economic Framework for Prosperity (IPEF) is an opportunity to deepen US ties with Indo-Pacific countries, but it will be challenging to 'find a path to achieve a high-standard IPEF agreement, consistent with US domestic constraints, while providing sufficient benefits to attract US Indo-Pacific partners' (Meltzer, 2022).

Despite IPEF members' common interest in accelerating digital transformation, there are fundamental disagreements on the global regime for digital trade even amongst major trading nations, who desire embracing digital technologies to facilitate trade (Pomfret, 2022). Amongst IPEF members, there are divisions over digital trade governance. The US and Japan prefer to leave more space for the market and industry to take the lead in regulations; countries like Indonesia tend to favour sovereign control over cyberspace; and Australia seems to emphasise more regulation on issues such as privacy, cybersecurity, and online consumer protection while promoting the free flow of data and digital services liberalisation (Mitchell and Mishra, 2018; O'Hara and Hall, 2018; Pomfret, 2022). Facing such gaps, negotiations on issues related to digital trade will be helpful – even before reaching an agreement – to build trust amongst participating countries, reduce market uncertainty, and facilitate doing business internationally (Chen, 2022; Chen and Rillo, 2024)

9.1. No Customs Duty on Electronic Transmissions and *De Minimis*

No duties on electronic transmissions – and tariff waivers on low-value cross-border e-commerce – should be formalised in an agreement. Some developing countries worry that such a binding commitment could lead to potential loss of tariff revenue. However, OECD (2019) argued that the overall benefits of duty-free electronic transmissions outweigh the potential losses. Indeed, even for Thailand and India, the potential losses in tariff revenue may only account for 0.7% and 0.2% of their export revenues, respectively.

No customs duties on electronic transmissions is a good practice that has contributed to a free trading environment for the growth of digital trade globally. It will be easier for

countries that are reluctant to commit to binding rules multilaterally to start with an agreement composed of a smaller group of important trading partners, like the IPEF. According to Banga (2019), India may have given up US$500 million in tariff revenue due the WTO moratorium on customs duties on electronic transmissions. In comparison, India's exports to other IPEF countries generated over US$90 billion revenue in 2020. It could be in India's best interest, therefore, to have an agreement with other IPEF members on the moratorium to consolidate one-third of its total exports.

9.2. Trust Building for the Free Flow of Data

GVCs need free trade, free factor movement, as well as the free flow of data. However, the 'ability to generate, collect, analyse and monetise data is surpassing our ability to consider the consequences that such advances hold for our economy, privacy or even national security' (Bolton et al., 2021). Technologies such as big data, cloud computing, machine learning, AI, and IoT are now the reality; very likely, these will turn today's musings into tomorrow's reality.

The gains from imposing restrictions on data – such as regulations limiting cross-border data flows and requiring local storage to deal with data security and related problems – cannot make up for losses in economic efficiency (Chen et al., 2019, Chen, 2021). For instance, data localisation imposes barriers on firms for big data and cloud computing in decision-making and lowers the efficiency of their operations, while policy measures for filtering, blocking, or impeding internet access distort the market and increase the cost of cross-border transactions – similar to how NTMs can affect international trade. Indeed, many regulations that hinder the free flow of data can be seen as hidden industrial policies and protectionism; in a rules-based regime, their purpose mustbe clarified to avoid overprotection (Chen et. al., 2019).

As Chen (2019; 2021; 2022) pointed out, setting a common floor for data security and privacy legislation can help build trust amongst IPEF members and facilitate cross-border data flow. There are two priorities: (i) increasing transparency to improve mutual understanding amongst countries and to pave the way for formal negotiations; and (ii) setting the boundaries of data use to make the free flow of data practicable.

9.3. Cybersecurity

The advance of technology in data storage, processing, transition, and monetisation can increase the likelihood of data being leaked, stolen, or misused. Cybersecurity has thus become one of the prime concerns in the digital economy for both governments and the private sector. Cyber threats have expanded from targeting digital devices and networks to infrastructure, services, and IoT.

Over time, cyber threats have increased in frequency, size, sophistication, and impact. Perpetrators range from individuals to nation states. Increasingly, cyberattacks are organised transnationally. Even big countries or organisations with ample resources and expertise see cybersecurity as an enduring challenge (Bolton et al., 2021). Economically, business operations and supply chains can be disrupted, and targets of large-scale internet attacks face the risk of reputational damage. Cybercrime cost US$6.0 trillion globally in 2021, and this figure is expected to reach US$10.5 trillion in 2025 (Morgan, 2020).

IPEF cooperation in cybersecurity could be an initial goal for international security standards or cross-compliance recognition frameworks of design, testing, and certification to ensure the safety, reliability, and trust of critical infrastructure and improved security around digital technologies. Furthermore, IPEF negotiations should focus on promoting the concept of international norms of behaviour in cyberspace and a higher degree of policy harmonisation in strengthening data security and fighting cybercrime (OECD, 2012). Imposing a common security floor can strengthen data security and the privacy regime. Negotiations should respect each member's fundamental values but be consistent with the need for an open and safe cyberspace with balanced concerns for the free flow of data, personal privacy, business interests, and national security (Chen, 2022). With this, the goal is not a risk-free but a resilient digital ecosystem in the Indo-Pacific.

9.4. Intellectual Property Rights Protection

Digital trade intensifies the cross-border exchange of intellectual property and increases the prominence of IPR protection to endorsing cross-border technology transfer and innovation in GVCs. Improving international cooperation in IPR protection has been a common issue for both technology-rich and -scared countries. However, countries' interests in IPR protection vary greatly, depending on their development stage and position in GVCs, making IPR protection one of the most controversial issues in international trade negotiations (Chen and Kimura, 2021). Within the IPEF, it is likely that intellectual property-exporting countries – like the US and Japan – will promote higher global standards, and intellectual property-importing countries – like India or those in ASEAN – will negotiate for terms that give them more space for technology substitution and incremental innovation (Chen and Kimura, 2021).

In general, the IPEF must think about robust IPR standards that are higher than those of the *WTO Agreement on Trade-Related Aspects of Intellectual Property Rights* (TRIPS) or other multilateral treaties, coupled with effective enforcement mechanisms. Since the late 1990s, the US has consistently promoted high-standard rules and regulations on intellectual property and related issues at the international level; the IPEF will not deviate from this strategy. In principle, international rules on IPR protection should ensure that both producers and consumers benefit from intellectual property protection while such protection contributes to technology transfer and innovation.

Two precedents are useful for the IPEF when negotiating terms on IPR protection. Chapter 18 of the *Comprehensive and Progressive Agreement for Trans-Pacific Partnership* introduces provisions that go beyond countries' commitments in multilateralism and surpass the level under TRIPS as well as the detailed obligations enforcing TRIPS-plus protection. *The Regional Comprehensive Economic Partnership* agreement has also taken into account the development gaps across countries and details country-specific schedules and technical assistance requests to smoothen the transition period.

10. A Rules-based Ecosystem for Global Value Chains in the Digital Economy

The US and Asia are highly interdependent, and economic digitalisation tends to deepen their ties. The sustained development of digitalisation needs a rules-based ecosystem to support market openness, innovation, and fair competition for the GVCs of the digital economy.

To the US, Asia represents a large market – therefore, a main source of job creation and economic growth. US firms believe that cooperation under the IPEF can strengthen their links with Asia by securing the GVCs of their businesses with better access to foreign markets and supply bases. Other advanced economies, such as Japan and Australia, have similar economic interests.

On the other side, developing countries in the region are motivated to prioritise their partnerships with the US not only because of the US market, capital, and technology but also due to their need for the US to be an external auditor in promoting domestic regulatory reforms. For instance, the global consensus on regulating digital trade will require more beyond-the-border measures (i.e. modification of domestic laws and regulations to meet international commitments). The consequent social and economic adjustment and policy interventions in response call for collaboration between administrative and legislative agencies as well as cooperation amongst government branches, particularly between foreign affairs departments and those in charge of domestic market regulations (Kimura and Chen, 2016).

The IPEF needs to ensure that members' commitments to high-standard trade rules will contribute to their digital transformation and facilitate their integration into the global economy. New global rules on free digital trade are a policy priority, which cover the IPEF's four pillars: a connected economy, resilient economy, clean economy, and fair economy.

The process of setting high-standard trade rules will involve complementary and competing interests amongst stakeholders. Above all, trust building is the top priority for an open, resilient, development-friendly ecosystem for the global digital economy. It is important to consider privacy; cybersecurity and trade secrets; the trade-off amongst market openness, free flow of data, and policies with other socio-economic goals (e.g. protecting privacy, supporting law enforcement, improving safety, and ensuring national security); and inclusion of different standards-setting practices that may have a global reach. The different practices could be due to countries' various stages of development, legal frameworks, and political systems.

There are four policy areas fundamental to the regulatory system that the digital economy needs to support its long-term development – trade liberalisation of electronic transmissions, free flow of data with trust, cybersecurity, and IPR protection.

11. G20 and G7: Leading the Global Dialogue on the Global Value Chains in the Digital Economy for Economic Resilience and Security

In 2023, the year in which the world emerged fully from the COVID-19 pandemic, G7 and G20 meetings were hosted by a developed and an emerging economy of Asia – Japan and India, respectively. Both hosts underlined the importance of the Indo-Pacific region in global trade as well as trade-led development and prosperity. Japan, as a key player in global supply chains, and India, as an important market as well as an emerging production base, were ideal to showcase the converging demands for more equitable and inclusive value chains where the conditions of transparency, reliability, and resilience are met. Both countries are followers of rules-based trading systems, with fair and transparent domestic markets and the capacity to fulfil the drive for resilient and trustworthy supply chains amongst G7 and non-G7 members.

The Hiroshima G7 Leaders' Communiqué stressed the need for economic resilience and economic security. Leaders emphasised that economic resilience and economic security globally are the 'best protection against the weaponization of economic vulnerabilities' (G7, 2023a). The consensus amongst the major global economies was that efficiencies and returns on investment have created a global dependence on exports from China, including exports of critical minerals, environmental goods, and electric vehicles and batteries. This dependence is likely seen as a vulnerability, which could be subject to exploitation or weaponisation at appropriate times. The global crisis regarding the supply of medical equipment and essential medical kits during the pandemic, which were mostly produced in China, reinforced the global concern of market distortion and supply chain

dependency. The decade-long experiences and supply chain shocks during the pandemic have expedited the policy consensus on securing GVCs from such vulnerabilities; the G7 is extending partnerships to other countries – including developing economies – to secure resilient and transparent supply chains (G7, 2023a).

It is important to note that trust and security are the implicit or stated terms in the new supply chain dialogues. The G7 trade ministers, in their statement from Osaka in April 2023, highlighted the importance of resilient supply chains amongst trusted partner countries. The G7's key principles for achieving such resilience and trust are through transparency, diversification, security, sustainability, and reliability on which to build and to strengthen resilient supply chain networks amongst trusted partner countries both within and outside of the G7 (G7, 2023b). The statement emphasised that the G7 will continue to discuss how to strengthen and enhance supply chain resiliency based on these principles, which encompass honouring international norms and obligations, not weaponizing economic interdependence for illegitimate political gains, committing to free, fair and mutually beneficial economic and trade relationships, and refraining from taking measures that undermine these efforts. [The G7] also acknowledge[s] the importance of outreach to non-G7 partners, especially emerging and developing countries, as key suppliers, producers and purchasers in global supply chains, and will discuss ways to deepen cooperation with these partners. [It] will also discuss specific areas for further cooperation among the G7, notably critical minerals (G7, 2023b).

In a similar measure, the G20 trade ministers in Jaipur also adopted a framework for keeping critical GVCs resilient and robust. Analysis of data, collaboration, coordination, preparedness, and inclusion and sustainability are some of the high-level principles adopted in the G20 that can guide like-minded countries towards resilient and reliable supply chains (G20, 2023).

On the digital economy, the G7 has taken the global governance issue seriously with a view to regulate the emergent technologies in AI and their usage and application. The G7 in 2023 maintained that the international governance of new digital technologies has not kept pace with rapid technological changes. It acknowledged the importance of addressing common governance challenges and identifying potential gaps and fragmentation in global technology governance, especially in areas such as AI, immersive technologies like the metaverses and quantum information science and technology, and other emerging technologies. More importantly, the G7 linked 'the governance of the digital economy … with shared democratic values.' These include fairness; accountability; transparency; safety; protection from online harassment, hate, and abuse; and respect for privacy and human rights, fundamental freedoms, and the protection of personal data (G7, 2023a). The OECD Global Forum on Technology has been identified as an important forum for an inclusive, multistakeholder dialogue on digital issues, including internet governance, development of standards for AI, and AI governance.

From a GVC perspective, cross-border data flows remain close to the G7 agenda. When viewed from Asia's perspective, with Japan as the originator of the concept, the importance of 'facilitating Data Free Flow with Trust to enable trustworthy cross-border data flows and invigorate the digital economy as a whole' remains a G7 priority for the digital economy (G7, 2023a).

Similarly, the G20 addressed the supply chains of the digital economy as an instrument for inclusive and resilient growth and a means for economic security. In 2023, the G20 entrusted itself towards 'building safety, security, resilience, and trust in the digital economy' (G20, 2023b). G20 members have recognised that an 'enabling, inclusive, open, fair, non-discriminatory and secure digital economy is increasingly important for all countries and stakeholders' (G20, 2023a). Fostering safe and resilient digital ecosystems; ensuring financial inclusion; and promoting the responsible, sustainable, and inclusive use of digital technology by farmers, an ecosystem of agri-tech start-ups, and micro and SMEs were identified by the G20 as important mechanisms for an inclusive and resilient digital economy.

12. Conclusion

Opportunities and disruptions arising from the digital economy in the Indo-Pacific region can be addressed through economic cooperation strategies that can recognise and include the different stages of industrial development in countries in Asia, the Pacific, Africa, Europe, as well as the US. The Indo-Pacific economic architecture can respond to the various policy and planning needs of developing and developed parts of Asia and the Pacific. Along with the need for achieving high and sustained growth in developing countries and least-developed countries in the region, there is greater recognition of ensuring equitable, spatially even, and inclusive economic growth amongst all stakeholders (Prakash and Hawke, 2023).

The Indo-Pacific is preparing for new economic demands. Structural transformation and employment generation policies in developing Asia and the Pacific must understand, prepare, and respond to the new digital economy, as the latter will affect the patterns and geographical location of industries, employment, trade, and economic growth. Increased industrialisation and participation in GVCs are important for growth and employment generation in several less-developed countries. The future of work is vulnerable to decreased investments in manufacturing and jobs being replaced by automation, robotics, and AI, especially in countries that are not deeply integrated in regional or GVCs (Prakash and Hawke, 2023).

Developing countries, which are new entrants to regional supply chains and are developing their capacities to participate in the digital economy at the same time, are indispensable for constructing resilient and diversified supply chains. In this regard, cooperation in human resources development is one way for the Indo-Pacific to

demonstrate its commitment to shared prosperity. The issue of human capital development fits neatly within the vision of the Indo-Pacific, because integration and interconnection amongst countries and areas in the Indian Ocean and Pacific Ocean require investments to build connectivity infrastructure, including physical, institutional, and people-to-people links (ASEAN, 2020). Moreover, such cooperation will help prepare for Industry 4.0 by facilitating the sharing of experiences and expertise on ways to benefit from – and address the challenges of – the digital revolution (ASEAN, 2020). Further study should identify a suitable mechanism for this cooperation that benefits both developed and developing countries of the Indo-Pacific.

Participation in international GVCs of goods and services will continue to change under the influence of digitalisation, and the Indo-Pacific region must reap the benefits of this progress. It must ensure that digitalisation promotes inclusiveness amongst countries, especially for youth and women. Cooperation for the development of services, human capital, regulations for data protection, e-commerce, and taxation require greater institutional linkages amongst all stakeholders. Emergent supply chains and cooperation frameworks will bridge these needs in the Indo-Pacific. Cooperation for expanding the infrastructure, GVC integration, development cooperation, human resources, and movement of people will create the necessary conditions for developing economies to provide the resilience, trust, and diversity in GVCs in the digital economy in the Indo-Pacific.

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Chapter 3

Digital Economy Innovation and Implementation in the Indo-Pacific: Towards a 'Singapore Effect'?

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1. Introduction

The 21st-century economic landscape is witnessing a fundamental shift away from traditional globalisation frameworks that dominated the last century. China is rising in geo-economic power, and the United States (US) is embracing a more Hamiltonian approach to international relations and trade, emphasising pragmatism and national (self) interest to a greater extent than its foreign policy doctrines of the post-World War II era (Mead, 2024). Increasingly, the institutions of the rules-based international order appear frayed. While the challenges of a new, more complex, and dynamic landscape are obvious, that very dynamism provides space for other actors – including middle powers, to promote their own vision of the global digital economy.

Against this background, this chapter explores the recent trend towards digital economy agreements (DEAs) in the Indo-Pacific region. Building on prior work (e.g. Burri, 2023b; 2024; Jones, Kira, Tavengerwei, 2024), it posits that such agreements represent a new approach to international trade law, adopting novel approaches to digital trade issues, promoting interoperability between different regimes, and addressing various emerging digital technology issues. DEAs are characterised by 'minilateralism' (i.e. a plurilateral approach on a smaller scale), the tendency to address a wide variety of trade and economic issues under the framework of the digital economy, and a focus on regulatory interoperability and technological coordination rather than market access.

Just as DEAs are becoming an important trend within the Indo-Pacific, they are also becoming a major contribution of the region to global international economic law. This chapter showcases the leadership of Indo-Pacific countries on the crafting of such

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international instruments and the emerging international economic legal order, which is captured under the idea of the 'Singapore Effect' – a term that suggests an alternative (or response) to the 'Brussels Effect'. The posited effect is not due solely to the trade diplomacy of Singapore nor is it limited to Singapore's efforts; the moniker captures the combined impact of middle powers concentrated in the region – such as Australia, Singapore, and the Republic of Korea – that are not 'great powers' but are playing a significant role in international relations.

2. The Evolution of Digital Trade Governance

The evolution of digital trade governance reflects broader challenges in the modern multilateral trade system. The consensus-based rulemaking system of the World Trade Organization (WTO) – while ensuring broad representation – has struggled to address the challenges of the digital economy. This has been particularly evident in the Doha Round that began in 2001, which highlighted the tensions within the current international trade landscape. Indeed, new global economic superpowers are creating a more complex and dynamic geo-economic playing field. Many new economies from the Global South are protective of their post-colonial sovereignty; China and India, for example, do not want to cede their policy space to external experts (Drache and Froese, 2007). The Doha Round embodies the comparative weakness of WTO's single model of deal-making relative to other forms of international trade regulation. It has thus prompted a transformational shift away from trade multilateralism towards smaller negotiating platforms with like-minded jurisdictions.

At the same time, the involvement of technology in international trade has evolved significantly. Burri (2023a) noted a four-step framework – from 'Trade 1.0' to 'Trade 4.0' – illustrating how technology's role has evolved from simply facilitating e-commerce to becoming embedded within the very nature of the economy. This evolution demands frameworks that can address both traditional trade issues and novel challenges posed by emerging technologies.

2.1. The Rise of Digital Economy Agreements

DEAs are a legal innovation to promote the digital transformation of international trade law through enhanced regulatory cooperation. They move beyond traditional approaches to international trade law in several ways.

First, whereas many regional trade agreements focus on 'WTO-plus' provisions (i.e. provisions that aim for a standard higher than that agreed to at the multilateral level), DEAs concentrate on 'WTO-extra' provisions (i.e. addressing issues outside of those regulated at the WTO level). This allows DEAs to offer a balance between expanding the

scope of pre-existing digital trade policies while avoiding a radical departure from such policies.

Second, DEAs emphasise trade facilitation by aligning rules and standards and promoting interoperability between digital systems. This focus serves multiple purposes: (i) reducing regulatory burdens and delays through various technologies, like e-invoicing; (ii) promoting interoperability amongst different data systems; and (iii) levelling the playing field for emerging economies and micro, small, and medium-sized enterprises in the global digital market.

As Burri (2023b) observed, while digital trade has been on the international agenda since the 1996 WTO *Information Technology Agreement* and the 1998 WTO Work Programme on Electronic Commerce, recent DEAs represent a qualitatively new approach to governing the digital economy. The progression from early electronic commerce provisions in various trade agreements to modern DEAs reflects three distinct generations of digital trade governance (Table 3.1).

Table 3.1: Evolution of Digital Trade Agreements

Generation	Focus	Example	Key Features
First Generation (2000–2015)	E-commerce provisions in traditional trade agreements	*Singapore-Australia Free Trade Agreement* (2003)	Basic market access, non-discrimination
Second Generation (2015–2020)	Digital trade chapters in comprehensive agreements	*Comprehensive and Progressive Agreement for Trans-Pacific Partnership* (2018)	Data flow, consumer protection
Third Generation (2020–)	Specialised digital economy agreements	*Digital Economy Partnership Agreement* (2020)	Regulatory cooperation, emerging technologies

Source: Authors.

2.2. Analysis of Current Digital Economy Agreements

The Indo-Pacific region has pioneered several key agreements that demonstrate the evolution of approaches to digital trade governance. A detailed examination of their provisions reveals both common themes and distinctive approaches (Table 3.2).

Table 3.2: Key Provisions of Major Digital Economy Agreements

Provision Category	*Digital Economic Partnership Agreement*	*Singapore–Australia Digital Economy Partnership Agreement*	*United Kingdom–Singapore Digital Economy Partnership Agreement*	*Rep. of Korea–Singapore Digital Partnership Agreement*	*European Union-Singapore Digital Partnership*
Business and Trade Facilitation	Comprehensive	Strong focus	Strong focus	Strong focus	Emerging
Data Issues	Advanced	Comprehensive	Comprehensive	Advanced	Developing
Digital Identities	Present	Present	Present	Present	Planned
Emerging Technologies	Leading	Strong	Strong	Strong	Planned

Source: Authors.

The *Digital Economy Partnership Agreement* (DEPA) – amongst Chile, New Zealand, and Singapore – represents a qualitative shift in approach. As Burri (2023b) observed, it has a modular structure that allows for flexible implementation pathways, allowing parties the ability to join specific modules. This modular structure and 'living agreement' design, which is open to the accession of further members, allow ongoing regulatory cooperation across a suite of digital economy issues, generating both flexibility in implementation and potential for expansion over time. Crucially, this approach is underscored by a focus on regulatory cooperation instead of (conditional) market access. Its scope is also novel, encompassing emerging technologies such as artificial intelligence (AI), digital identity systems, and fintech cooperation. Moreover, its implementation approach is practically oriented with an emphasis on capacity building.

Burri (2023b) noted that the *Singapore-Australia Digital Economy Agreement* builds upon traditional trade agreement structures while incorporating innovative elements, including

a modular memorandum of understanding structure. It is supplemented by seven memoranda of understanding covering specific aspects of digital economy cooperation, demonstrating how DEAs can help generate practical frameworks for cooperation even in areas where broad international consensus remains elusive.

Drawing on Burri's analyses, several key innovations in DEA implementation can be identified:

(i) DEAs are hybrid legal instruments with a combination of hard and soft law provisions that utilise complementary agreements and flexible accession mechanisms.

(ii) DEAs leverage institutional frameworks with specialist committees and regular review mechanisms as well as consultative processes. They also focus on capacity building, including technical assistance provisions, knowledge sharing, and regulatory capabilities.

(iii) DEAs include forward-looking elements, including provisions for technological evolution and mechanisms for updating commitments to keep pace with emerging technologies and issues.

3. Implementation Challenges of Digital Economy Agreements

The implementation of DEAs does present complex challenges that mirror – and in some cases, go beyond – traditional trade agreement execution. Examining the implementation experience of DEAs to date reveals both their promise and limitations while highlighting crucial lessons for future digital trade governance. Three key areas of difficulty emerge: data governance, technical infrastructure and interoperability, and regulatory capacity.

3.1. Data Governance

Data governance represents perhaps the most significant challenge in implementing DEAs effectively. The relationship between data flow and digital trade is fundamental, as data flow enables the social, economic, and political benefits of digital trade (Mishra, 2024). However, finalising provisions for cross-border data flow remains one of the most intractable policy challenges.

The commonly accepted narrative suggests that developed countries face pushback from developing countries and least-developed countries against 'data colonialism'. This suggests that less-affluent countries resent and often protest having their digital data siphoned off to richer countries, allowing these wealthier countries to generate enormous profits thanks to data poverty in less-affluent countries. However, this narrative may require correction.

Due to various economic and strategic reasons, less-affluent countries are forced to align their policies on cross-border data flow to those of an economic superpower – the US, China, or the European Union (EU). However, these three choices for data flow policies often cannot effectively meet the diversity needed to develop data regulatory requirements suited to each country's domestic data needs. The issue may therefore be less one of unwillingness – and more one of inability– to comply with various cross-border data flow provisions, as the data flow policies that they have enacted cannot be implemented without significant problems. This suggests the need for a more nuanced approach to data governance in DEAs.

Singapore's Personal Data Protection Act is an example of how developing countries can build their capacity for cross-border data flow if richer countries can better accommodate their needs. The success of this approach is evidenced by its adoption as a model by other ASEAN Member States (AMS) and its role in facilitating regional data transfer agreements. Thailand's emulation of the act, as well as the development of the *ASEAN Model Contractual Clauses for Cross Border Data Flows* (ASEAN, 2021), demonstrates how accommodating diverse needs can encourage broader adoption of and participation in data governance frameworks.

Like the broader Indo-Pacific, ASEAN represents a region marked by diversity in digital infrastructure levels. Nevertheless, ASEAN has successfully implemented initiatives to enhance cross-border data flow. As an example, the Regulatory Policy Space programme, launched as the first digital innovation scheme in Asia and the Pacific, provides a platform for regulatory sandboxing amongst AMS. It allows them to enable cross-border data flow in a controlled environment while balancing their domestic concerns. The programme has achieved significant success, particularly in initiatives such as those in the self-driving vehicle space (ASEAN, 2023).

Two key lessons have emerged from the ASEAN experience. First, soft law commitments prove effective in the face of diversity. When the proposal from the Global System for Mobile Communications for the sandbox programme was first submitted, ASEAN recommended implementation under a non-binding memorandum of understanding rather than a formal binding treaty. This approach facilitated broader participation and experimentation. Second, the programme reiterates the importance of more affluent countries stepping forward to build the capacity of poorer countries. The success of regional workshops and capacity-building initiatives has depended significantly on support from developed partners, particularly Japan through the Japan Fund for Information and Communication Technology.

3.2. Technical Infrastructure and Interoperability

Beyond ensuring the interconnection of digital economies, a second major challenge concerns advancing the interoperability needed for digital trade to occur in a region. In a sense, the primary challenge is one of regulatory interoperability (Mishra, 2023) concerning treaty-based cross-border data flow and domestic data protection law. This is interconnected with technical and infrastructure interoperability as well. Successful implementation requires both technical standardisation and frameworks for mutual recognition of various national systems.

Singapore's experience in implementing digital identity and e-payment frameworks has witnessed some notable accomplishments. Its API Exchange (APEX) initiative successfully built technical infrastructure for cross-border cooperation. Launched in 2017 as part of Singapore's National Digital Identity system, APEX acts as a gateway for the use of application programming interfaces between Singapore and other governments to enable secure and seamless access to data across these governments. The initiative enables cross-border interoperability of electronic invoicing and digital payment systems, such as between Singapore's PayNow with Thailand's PromptPay. Both systems utilise personal data, such as mobile numbers and national identification numbers, showing how technical standards can enable integration while protecting privacy.

Yet the case of electronic bills of lading (EBLs) in Singapore also illustrates challenges inherent in implementing new technical standards. Singapore amended its Electronic Transactions Act to formalise EBLs acting as legally effective bills of lading. In tandem, it also developed the TradeTrust initiative, a market-facing solution for EBL and digital trade facilitation using blockchain technology. However, while the reasons for adopting EBLs are commendable, making them mainstream is proving to be a greater challenge. The planned use of blockchain technologies for TradeTrust raises questions about technological readiness and industry acceptance. Indeed, the maritime industry's conservative nature and varying levels of technical capability across the region may suggest the need for more incremental approaches.

This example highlights a key principle: having the latest technologies in mind when implementing DEAs may not be the best option. Many countries in the Indo-Pacific still lag in their digital infrastructure. Adopting emerging technologies must be subject to the readiness of industries concerned.

3.3. Regulatory Capacity and Coordination

To ensure their successful implementation, DEAs must help develop regulatory capacity and coordination. Even where technical solutions exist, implementing them requires sophisticated regulatory frameworks and coordination mechanisms. This challenge is particularly acute in the Indo-Pacific region, where jurisdictions have varying levels of regulatory capacity.

If DEAs are to be effective instruments in the Indo-Pacific, countries must be willing to extend their capacity-building opportunities beyond their respective national borders. This is especially true of more developed, affluent jurisdictions such as Singapore. Most Indo-Pacific countries do have capacity-building initiatives – but mainly limit them to their own jurisdictions. For instance, Singapore's public sector actively supports the Singaporean private sector through initiatives such as the SG Digital Leadership Accelerator and SMEs Go Digital programme. Evidence suggests that less-affluent countries are willing and able to join these programmes when given the opportunity. Only when countries help build each other's capacity can the Indo-Pacific truly achieve the interconnection and interoperability needed to implement DEA provisions effectively.

In addition, as DEAs are mainly governed by soft law commitments, a leader is needed to motivate other countries towards implementing their provisions. Such a leader should have sufficient financial capabilities to help build the capacities of its partners while maintaining neutrality with respect to the major powers. Japan's involvement in promoting capacity building for cross-border data flow in AMS, like Viet Nam, shows how developed economies can support regional implementation.

4. The Singapore Effect and Middle Power Leadership

Beyond the immediate context, Singapore's distinctive role in developing and implementing DEAs suggests an alternative pathway for regulatory influence in the international economic order, one that operates through demonstrated technical excellence and trusted facilitation rather than market access leverage.

'Norm entrepreneurship' in international trade law refers to actors that actively and purposefully promote the establishment, diffusion, and institutionalisation of norms. As Wunderlich (2020) explained, successful norm entrepreneurs invest considerable time, energy, and resources in promoting their cause, typically employing both persuasive and coercive strategies. They aim to raise awareness of issues, shape public debates, build coalitions, and ultimately convince others to redefine their interests and preferences in line with the advocated norm.

In a recent systematic analysis of digital trade provisions in agreements concluded between 2018 and 2023, Jones, Kira, and Tavengerwei (2024) identified Singapore as a key norm entrepreneur in digital trade. Through detailed coding methodology examining both the legal nature of commitments and public policy flexibilities, they noted a 'Singapore-led wave' of agreements that have substantially expanded the scope of digital trade governance beyond earlier US-led approaches. Their evidence showed that Singapore, particularly through the DEPA and *Singapore-Australia Digital Economy Agreement*, introduced 12 new areas into digital trade agreements: digital identities, e-invoicing, e-payments, logistics, data innovation, standards and conformity assessment, governance of AI, regtech, safety and security online, competition in digital markets,

stakeholder engagement, and digital inclusion. Subsequent agreements have added further innovations, such as lawtech protections and safeguards for source code. This style of this norm entrepreneurship stands in marked contrast both to traditional US approaches that rely on conditional market access as well as the famed Brussels Effect (Bradford, 2020) and 'Beijing Effect' (Erie and Streinz, 2022) typified in the Digital Silk Road approach.

4.1. Mechanisms and Operation

Unlike the EU's ability to export regulations through market access conditions (i.e. the Brussels Effect), Singapore's influence stems from its position as a trusted interlocutor and its demonstrated technical advancements. Its authority is taking shape through three key mechanisms that warrant closer examination.

The first mechanism is its demonstrated technical and regulatory capability rather than market size. Singapore's success in implementing sophisticated frameworks for digital trade, data governance, and regulatory cooperation makes it a credible architect of new international rules that other states may wish to endorse. This differs fundamentally from how the Brussels Effect relies on market access conditionality. Again, Singapore's Personal Data Protection Act provides a clear example. The act is compatible with both the EU's General Data Protection Regulation and Cross-border Privacy Rules standards of the Asia- Pacific Economic Cooperation (APEC) while enabling cross-border data flow. Its success in balancing different regulatory requirements while maintaining practical effectiveness has led other jurisdictions to emulate its approach voluntarily rather than through market pressure.

The second mechanism leverages Singapore's position as a trusted interlocutor between competing digital regulatory systems. Rather than imposing standards, Singapore is developing frameworks that enable practical interoperability between various approaches. This is evident in the manner that DEAs signed by Singapore incorporate elements that bridge the US's emphasis on data flow, the EU's focus on data protection, China's emphasis on data localisation and national security, and Asia's approaches to digital development. This bridge-building function is increasingly important as digital trade moves from Trade 2.0 (i.e. online commerce) to Trade 4.0 (i.e. a data-driven economy). Today, frameworks are required that address novel issues like AI governance, digital identities, and cross-border data flow. Singapore's approach helps create practical solutions while respecting different regulatory traditions.

The third mechanism operates through minilateral agreements focussed on specific issues between smaller groups of like-minded partners rather than comprehensive harmonisation. This approach is particularly suited to the rapidly evolving digital economy, where flexibility and iterative development are crucial. Singapore's DEAs exemplify this by embodying modular frameworks that can adapt to technological change while maintaining interoperability. Under them, jurisdictions have the flexibility to engage in

closer digital trade coordination without needing to ascribe to a one-size-fits-all approach, most likely reflective of major power preferences and interests. This modular approach may, over time, allow incremental growth in cooperation and harmonisation with less chance of impasse. It has already influenced broader international discussions; the WTO Joint Statement Initiative, for example, has incorporated several innovations first tested in DEAs, suggesting that larger multilateral frameworks can be influenced by demonstrated successes rather than power politics. However, a more complex international trade law ecosystem may also result.

4.2. Comparing Regulatory Influence Models

The contrast between the Singapore Effect and Brussels Effect reveals important insights about different modes of regulatory influence in the digital age (Table 3.3).

Table 3.3: Comparing Regulatory Influence Models

Aspect	Brussels Effect	Singapore Effect
Primary Leverage	Market Access	Technical Capability
Approach	Regulatory Export	Trust-based Facilitation
Implementation	Mandatory Compliance	Flexible Adoption
Scope	Comprehensive Standards	Interoperability Frameworks
Geographic Focus	Global	Regional/Selective
Policy Tools	Market Access Requirements	Technical Cooperation
Innovation Model	Top-down Standardisation	Bottom-up Experimentation
Adaptability	Limited by Institutional Processes, Unilateral	High through Modular Design
Cost of Adoption	High Compliance Costs	Variable Based on Capacity
Focus	Rule Harmonisation	Technical and Regulatory Interoperability

Source: Authors.

Singapore's approach also contrasts with the Beijing Effect, which operates by providing physical digital infrastructure to developing nations while promoting concepts of cyber sovereignty and data sovereignty. It combines infrastructure development with state-centric governance principles that appeal to developing countries seeking greater control over their digital domains. However, it risks creating dependency, as Chinese companies

building the infrastructure remain closely tied to the Chinese party-state (Erie and Streinz, 2022). While Singapore positions itself as a neutral digital hub promoting interconnectivity, China's model potentially undermines the very sovereignty that it champions by creating technological reliance on Chinese systems and companies. The key distinction is that Singapore acts primarily as a normative bridge-builder through diplomatic and technical cooperation while China's influence flows from its role as an infrastructure provider combined with an alternative vision of state-centric digital governance.

Singapore is promoting an open, interoperable digital economy focussed on building bridges between different regulatory approaches and fostering practical cooperation through technical standards and regulatory alignment. In contrast, China's vision, articulated through plans like the Global Development Initiative, seeks more institutional and normative changes to global governance. Where Singapore's DEAs aim to facilitate cross-border data flow with appropriate safeguards while maintaining political neutrality, China's initiatives are explicitly aimed at reshaping key norms in what Kewalramani (2024) described as a 'fundamentally illiberal direction', emphasising state sovereignty over individual rights and promoting Chinese governance practices in emerging domains like AI and data security.

4.3. Implications for International Economic Law

The emergence of the Singapore Effect alongside the Brussels Effect suggests the need to develop richer theories of how regulatory influence operates in the digital age. While market power remains important, technical capability and trusted facilitation may prove equally significant in shaping how international economic law evolves. The Singapore Effect suggests that future regulatory influence can operate through networks of demonstrated capability rather than traditional power dynamics, which has important implications for how the development of international economic law is understood.

First, it suggests that technical excellence and practical implementation experience are becoming increasingly important sources of regulatory influence, particularly in complex technical domains. Second, it indicates that trusted facilitation and bridge-building between different regulatory approaches are as important as traditional rule-setting in shaping international economic law. Third, it proposes that regulatory experimentation through focussed agreements increasingly influence broader international frameworks through demonstrated success rather than power politics.

All of this also offers important lessons for how middle powers can shape international economic law through norm entrepreneurship. It shows that technical capability and trusted facilitation can provide alternative sources of influence beyond market power or military might. It also suggests that middle powers can help construct more inclusive frameworks for international economic cooperation by bridging different regulatory approaches. Finally, it indicates that focussed expertise in specific domains can allow middle powers to shape international norms, even without broader power resources.

The Singapore Effect may also be indicative of several important trends in the evolution of international economic law. The success of modular, flexible approaches to digital trade governance influence how international economic law addresses other complex regulatory challenges. The emphasis on practical interoperability over harmonisation is becoming increasingly important as technological complexity increases. Moreover, the role of demonstrated capability and trusted facilitation in shaping international norms will grow relative to traditional sources of power.

5. Policy Recommendations for Digital Economy Integration

The emergence of DEAs in the Indo-Pacific represents a significant innovation in international economic law. Their distinctive features – from a modular structure to a focus on regulatory interoperability and departure from harmonisation – are creating new directions for international economic cooperation in the digital age. Their approach to developing frameworks for interoperability while respecting regulatory diversity may prove instructive for other complex governance challenges and suggest an evolution of how regulatory influence operates in the digital domain. While market power remains important, DEAs show that technical capability and trusted facilitation can also shape international norms.

The Singapore Effect points to new roles for middle powers in developing international economic law. Consistent with it, several recommendations below are proposed for advancing digital economy integration in the Indo-Pacific region.

(i) Regulatory framework development. National governments should prioritise developing flexible regulatory frameworks that can accommodate technological change while maintaining adequate protections. These frameworks should establish clear baseline requirements for data protection and cybersecurity while allowing for innovation in implementation. The success of Singapore's Personal Data Privacy Act demonstrates how regulatory frameworks can balance protection with facilitation. Governments should also create mechanisms for regular review and updating of technical standards and implementation approaches to help ensure regulations remain relevant as technologies evolve. Finally, they should develop institutional capacity for cross-border regulatory cooperation, including establishing dedicated units for international coordination and building expertise in emerging technologies.

(ii) Technical infrastructure development. Successful digital economy integration requires sustained investment in technical infrastructure. Priority areas include the development of interoperable digital identity systems that can support cross-border transactions while protecting privacy. These systems should build on successful models like Singapore's

APEX initiative while accommodating different levels of technical readiness. Cross-border payment systems should also be implemented that enable efficient financial transactions while maintaining security. The success of initiatives like the PayNow–PromptPay linkage provides valuable lessons for broader implementation of such systems. Finally, secure data-sharing frameworks should be created that enable cross-border data flow while respecting different regulatory requirements. These frameworks should emphasise practical interoperability over strict harmonisation and avoid a *de facto* lock-in to any great power's vision for the global digital economy.

(iii) Capacity-building initiatives. Capacity building represents perhaps the most crucial element for successful digital economy integration. Regional training programmes should be developed that help build both the technical and regulatory capacity of countries and areas. They should leverage existing initiatives while expanding their scope and accessibility. Regulatory sandboxes should also be created that allow experimentation with new approaches to digital regulation, including collaborative sandboxes. The ASEAN Regulatory Policy Space programme provides a valuable model. Finally, knowledge-sharing networks should be developed that facilitate the transfer of implementation experience and best practices. These networks should emphasise practical learning and adaptation.

(iv) Regional coordination mechanisms. Effective implementation of these recommendations requires robust regional coordination mechanisms, including enhanced regional digital economy coordination under existing structures such as ASEAN or otherwise as appropriate. Further, the creation of technical working groups focussed on specific implementation challenges could bring together experts from different jurisdictions to develop practical solutions. Regular monitoring and evaluation mechanisms could, in turn, assess implementation progress and identify areas requiring additional support.

The Future of Digital Trade Governance and Implications for Further Research

The success of focused minilateral agreements in addressing complex regulatory challenges suggests that international economic law will increasingly evolve through networks of specialised agreements, rather than through comprehensive multilateral frameworks. This is, of course, not necessarily an unmitigated positive outcome; no one would celebrate the decline of the multilateral system, which was a major achievement of international rules-based coordination. The more complex, dynamic landscape may well become more fragmented and difficult for states and firms to navigate, raising transaction costs.

Yet the demonstrated value of technical standards and cooperation frameworks in bridging political differences is a potential path forward for international cooperation in other complex regulatory domains. Moreover, the evolution of how international economic law approaches regulatory cooperation – less focussed on harmonisation and more on creating frameworks for interoperability – may prove significant as the international community grapples with governing an increasingly digital global economy.

As DEAs and related trends grow, several questions emerge for further research. First, it is desirable to better theorise on regulatory influence regarding the role of technical capability and trusted facilitation in shaping international norms. This will help define the role that middle powers can play in a geoeconomic landscape marked by great power competition. This, in turn, invites further investigation into how international economic law can evolve to address an increasingly digitalised and technologically complex global economy. Secondly, quantitative analysis of the effect (and effectiveness) of DEAs over time would be useful to assess their impact, for example, on modular areas. Does the coordination of digital identities, cross-border data flow, or AI regulation between State A and State B have a demonstrable economic and social impact? Finally, as the international economic order becomes more complex, various dedicated digital tools will become essential to help firms navigate it. Could these efforts build on digital single windows and current efforts around the formal representation of treaty provisions and domestic regulations to facilitate cross-border trade?

Such investigations will help determine whether DEAs actually represent an innovation in trade agreements as well as a viable new model for international economic cooperation in an increasingly digitalised world.

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Chapter 4

The Indo-Pacific and Artificial Intelligence: Legal Challenges and Policy Recommendations

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1. Introduction

Against the background of an intense global debate on the governance of artificial intelligence (AI), the Indo-Pacific region has been identified as a future epicentre of the global digital economy (Chaisse, Dimitropoulos, Mosquera Valderrama, forthcoming). The Indo-Pacific region is home to close to three-quarters of the world's population and several of the world's most populous countries, including China, India, Indonesia, and Pakistan. To realise the goal of becoming a major global player in the global digital economy, the region must aim for sustainable and inclusive development of digital technologies, which also requires solutions to some of the most urgent regulatory challenges posed by the unique features that characterise AI and digital technologies.

So far, the regulatory responses to AI have been focussed on those of the current three major players – the United States (US), China, and the European Union (EU). Yet there is an emerging consensus that AI is an issue of global concern or should, at least, be managed in line with the global commons, such as the planet's shared resources 'over which no single nation has a generally recognized exclusive jurisdiction' (Wijkman, 1982). This argument is backed by the complex cross-boundary, cross-cultural, and cross-cutting nature of AI and related technologies.

In this chapter, Section 2 provides an overview of the global AI governance debate and regulatory initiatives taken at the national, regional, and global levels. Section 5.3 lists the main megaregional frameworks active in this region – such as the *Comprehensive and Progressive Agreement for Trans-Pacific Partnership* (CPTPP), *Regional Comprehensive*

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Economic Partnership (RCEP) agreement, and *Digital Economy Partnership Agreement* (DEPA) as well as the African Continental Free Trade Area (AfCFTA) – which are all likely to have a strong impact on future AI provisions. Section 5.4 outlines some unique features of AI, such as its qualification as an oxymoron – an apparent contradiction in terms – which also gives rise to several regulatory paradoxes of technology that need to be considered in every strategy. Section 5.5 then discusses the problem of AI regulation, which is rooted in the perception of the negative effect that regulation may have on innovation. Section 5.6 concludes with a short extract of policy recommendations for the successful regulation of AI in the Indo-Pacific region and the rest of the world.

2. Global AI Governance

In the past few years, there has been a growing interest in the regulation of AI. International and regional organisations, national governments and their subnational entities, numerous think-tanks and non-governmental organisations, and international conferences have dedicated their work to the challenges posed by the recent rise of AI and related digital technologies. By 2024, more than 40 United Nations (UN) agencies had become active in the field of AI – but more often separately than jointly (ITU, 2021). These organisations have addressed very different aspects of AI, such as its impact on health by the World Health Organization (WHO, 2024), future of work by the International Monetary Fund (Cazzaniga et al., 2024), and impact on global trade by the World Trade Organization (WTO, 2024). A UN final report (UN High-Level AI Advisory Body, 2024), a UN resolution (UN General Assembly, 2024), and outcome documents from the Summit of the Future held in September 2024 (UN, 2024) confirmed the global nature of AI and the overall need to 'enhance international governance of artificial intelligence for the benefit of humanity' (UN, 2024).

Regionally, the EU's proposal for a comprehensive EU law governing AI – the EU AI Act – entered into force on 1 August 2024.[1] In addition, the Council of Europe recently adopted the Framework Convention on Artificial Intelligence, Human Rights, Democracy and the Rule of Law, which is now open for signature by any interested party worldwide (COE CAI, 2024).

At the national level, China adopted three binding regulations on specific issues related to AI systems (CAC, 2022; 2023a; 2023b). The US, which is often described as preferring self-regulation, issued an executive order on AI (Government of the US, 2023), which was instantly repealed by newly elected President Donald Trump (Government of the US, 2025). Regulatory activity regarding AI in the US has also occurred at the state level (Dotan,

[1] Regulation (EU) 2024/1689 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act), OJ L 2024/1689 (12 July 2024).

2024). Yet regulation at the state level also faces hurdles; notably, California's rejected bill, Senate Bill 1047, would have 'focused exclusively on long-term AI safety issues' (Erman, Furendal, 2025). A global index published in 2024 revealed that there were regulatory activities concerning AI in many jurisdictions worldwide but concluded that 'there is still a long way to achieve adequate levels of responsible AI worldwide' (Adams et al., 2024).

The overall dynamic has been referred to as a 'global race from the development to the regulation of AI' (Smuha, 2021). The global race towards the regulation of AI itself was preceded by a 'rush to the ethics of AI' (Koniakou, 2023). In this regard, the UN Educational, Scientific and Cultural Organization (UNESCO) Recommendation on the Ethics of AI, adopted in November 2021, played an important role in turning the tide from enthusiasm about the potential benefits of AI to concerns about serious harms and risks associated with it. The recommendation summarised the dilemmas posed by AI as:

The profound and dynamic positive and negative impacts of [AI] on societies, environment, ecosystems and human lives, including the human mind, in part because of the new ways in which its use influences human thinking, interaction and decision-making and affects education, human, social and natural sciences, culture, and communication and information (UNESCO, 2022).

All the 193 member states of UNESCO confirmed this comprehensive text on AI, which also noted the global perception of the all-pervasive nature of AI. This notion was also recognised by a related recommendation formulated by the Organisation for Economic Co-operation and Development (OECD) in 2019, which was not binding but nonetheless recommended that governments 'review and adapt, as appropriate, their policy and regulatory frameworks and assessment mechanisms as they apply to AI systems to encourage innovation and competition for trustworthy AI' (OECD, 2019). Individual governments have additionally recognised the uncertain nature of AI and called for related actions, such as China issuing the Global AI Governance Initiative and the United Kingdom (UK) adopting the Bletchley Declaration resulting from the AI Safety Summit (Government of China, 2023; Government of the UK, 2023).

Later, the limitations inherent in non-binding instruments, such as these ethical recommendations, were noted, which led to the race to regulate AI (Mittelstadt, 2019; Munn, 2022). In this regard, criticism was voiced regarding the terminology chosen for the global debate. The metaphorical references to 'battles' or 'arms races' regarding AI – reminiscent of former debates about international peace and security – were first critiqued, as these have not proven to be constructive nor conducive to the realisation of the objectives pursued (Armstrong, Bostrom, Shulman, 2016; Ulnicane, 2023). The terms 'rush' or 'race' were also found to be counterproductive as the primary goal associated with the regulation of AI is not who will be first but who will do the best job overall (Neuwirth, 2024b).

2.1. The Indo-Pacific as a Powerhouse of the Future Global Digital Economy

There are several notable national regulatory initiatives in the region towards AI. AI is a clear matter of concern and activity in India; for instance, the National Institution for Transforming India published the *National Strategy for Artificial Intelligence: #AIForAll* (NITI Aayog, 2018). In 2023, India also adopted the Digital Personal Data Protection Act and is now preparing a draft AI law, which can either be 'an independent legislation or part of the Digital India Bill, which is set to replace the 24-year-old Information Technology Act, 2000' (Agarwal and Aryan, 2024). Moreover, Australia has recently circulated a proposals paper and voluntary AI standards to make the regulatory system 'fit for purpose to respond to the distinct risks that AI poses' and to give 'practical guidance to all Australian organisations on how to safely and responsibly use and innovate with artificial intelligence' (Government of Australia, 2024a; 2024b).

The trend amongst national governments to formulate AI strategies and binding regulations is positive and necessary. Special attention, however, should be paid to similar activities at the regional level. The Indo-Pacific region has witnessed the emergence of several megaregional trade agreements, including the Asia-Pacific Economic Cooperation (APEC) forum, which was established in 1989 with a total of 21 members.[2] APEC is primarily a communications and cooperation platform; it does not include binding commitments nor treaty obligations, which means that commitments are undertaken on a voluntary basis. In the most recent leader's statement, APEC members expressed their goal to work for 'an open dynamic, resilient and peaceful Asia-Pacific community by 2040' and a commitment 'to advancing digital transformation across the APEC region' (APEC, 2024).

A second notable example is the CPTPP, which evolved from the Trans-Pacific Partnership following the US's withdrawal. The CPTPP became effective on 30 December 2018 for 11 countries (Government of Australia et al., 2018).[3] It is a free trade agreement designed to liberalise trade and to address several trade issues relevant to the digital economy (Wu and Chadee, 2022). The CPTPP has a wide range of deep trade chapters, such as those on electronic commerce, technical barriers to trade, intellectual property rights and regulatory coherence, as well as investment policies. While it helps pave the way for progress in the field of digital trade, it was adopted too early to contain specific provisions on AI.

Another notable megaregional trade agreement is the RCEP, which counts 15 members including several CPTTP members plus China (Government of Australia et al., 2020). The RCEP entered into force on 1 January 2022 and includes provisions on investment, economic and technical cooperation, intellectual property, competition, dispute settlement, e-commerce, and small- and medium-sized enterprises in addition to the

[2] APEC, https://www.apec.org/.

[3] Australia, Brunei Darussalam, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Viet Nam.

traditional fields of trade in goods and services. This illustrates the importance of continuously driving the discussions on new issues forwards, such as those on AI and the digital economy (Isono and Prilladi, 2023). ASEAN also plays a crucial role in the region but has not yet devised a regional governance framework for AI (Putra, 2024).

While there is a significant amount of overlap between the CPTPP and RCEP, there are also important differences (Liu, 2024). Yet, given that they both contain several chapters on digital trade matters – and provided that they can overcome their differences – they are likely to play important roles in defragmenting digital trade rules in the region and beyond. This is crucial at a time in which trade in digitally delivered services and trade in digital products are growing (Honey, 2023). Both the CPTPP and RCEP are joined by other initiatives, such as the DEPA signed by Chile, New Zealand, and Singapore in 2020, which also recently welcomed the Republic of Korea. In addition, Canada, China, Costa Rica, El Salvador, Peru, and the United Arab Emirates (UAE) are planning to join.[4] The DEPA is progressive, as it aims to facilitate end-to-end digital trade, enable trusted data flow, and enhance trust in digital systems, including the promotion of cooperation between fintech industries and adoption of ethical and governance frameworks that support the trusted, safe, and responsible use of AI.

Another broad initiative for the Indo-Pacific region is the Indo-Pacific Economic Framework for Prosperity (IPEF), which is a policy initiative launched by the US with Australia, Brunei Darussalam, Fiji, India, Indonesia, Japan, Malaysia, New Zealand, the Philippines, Singapore, the Republic of Korea, Thailand, and Viet Nam. The intended framework aims to strengthen cooperation amongst the partners, which represent 40% of global gross domestic product and 28% of the global goods and services trade.[5] So far, no binding text has been produced, but negotiations are reported to be underway, which aim to 'pursue high-standard rules of the road in the digital economy, including standards on cross-border data flows and data localization' (The White House, 2023).

A possible counterpart to the US-driven IPEF is the Belt and Road Initiative (BRI) launched by China in 2013 as a global infrastructure development strategy.[6] In particular, its maritime branch covers much of the Indo-Pacific region. The BRI pursues a wide range of ambitious goals, from trade and investment to infrastructure and global development (Zhao, 2018). China also launched the Global AI Initiative in 2023, which calls on all countries 'to enhance information exchange and technological cooperation on the governance of AI' and to 'work together to prevent risks, and develop AI governance frameworks, norms and standards based on broad consensus, so as to make AI technologies more secure, reliable, controllable, and equitable' (Government of China,

[4] Government of Singapore, Ministry of Trade and Industry, Digital Economy Partnership Agreement (DEPA), https://www.mti.gov.sg/Trade/Digital-Economy-Agreements/The-Digital-Economy-Partnership-Agreement

[5] USTR, Indo-Pacific Economic Framework for Prosperity (IPEF), https://ustr.gov/trade-agreements/agreements-under-negotiation/indo-pacific-economic-framework-prosperity-ipef

[6] Belt and Road Portal, https://eng.yidaiyilu.gov.cn/.

2023). Thus, compared to the earlier focus of the BRI on traditional infrastructure, the new wave of the country's investment is more directed 'towards the construction of digital infrastructures, characterized by 5G networks, AI and the Internet of Things' (Smart, Zhao, Curran, 2023; Wang, Gao, Wang, 2024). This trend is covered by the notion of the Digital Silk Road, which marks the adaptation of the BRI to the rising importance of the digital economy (Hussain, Hussain, Imran, 2024).

The AfCFTA, which was created on 30 May 2019, brings together 55 countries of the African Union and 8 regional economic communities into another megaregional free trade agreement.[7] The AfCFTA is being progressively developed through ongoing negotiations, which also include a protocol on digital trade, a draft of which was adopted in early 2024. The digital trade protocol is designed to create a framework that facilitates digital trade in Africa. It contains provisions on market access for digital products, facilitation of digital trade, data governance and cross-border data transfer, as well as some institutional arrangements (Kugler, 2024). However, the protocol is still subject to ongoing negotiations on eight annexes covering various digital trade matters – rules of origin, cross-border digital payments, cross-border data transfer, legitimate public reasons for disclosure of source code, digital identities, financial technology, emerging and advanced technologies, and online safety and security (Kugler, 2024). Its dominant regulatory approach has been compared to that of the CPTPP but is not as detailed as the DEPA (Kugler, 2024).

On the neighbouring Arabian Peninsula, AI is on the agendas of most of these countries, with some having already adopted national AI strategies or guidelines, such as Qatar and Saudi Arabia (Al-Barakati, 2021; Government of Qatar, n.d.; 2024; Saudi Data and AI Authority, 2024). With several of these countries engaging in AI-related matters, the laws related to AI and digital trade may soon be harmonised in the context of existing regional trade agreements, such as the Gulf Cooperation Council (Azar and Haddad, 2021).

Indeed, there are numerous national AI initiatives happening in the Indo-Pacific region and around the world – a good sign in view of the emerging global digital economy. However, to fully realise the potential of the new technologies and to contain some of their associated risks, it is necessary to also coordinate national regulations regionally. The Indo-Pacific region is in a good position to achieve this objective, but it needs to proceed carefully to avoid problems with overlapping or inconsistent laws and regulations – a phenomenon known as the 'spaghetti bowl' (Gantz, 2017). This is of particular relevance in the context of AI. It is also important that the region avoid becoming enmeshed in the current climate of geopolitical tensions that are largely caused by difficulties in US–China bilateral relations. Governments in the Indo-Pacific region should follow the 'ASEAN Outlook on the Indo-Pacific', which warns of divisive forces and urges the avoidance of 'the deepening of mistrust, miscalculation, and patterns of behavior based on a zero-sum game' (ASEAN, 2019). If this can be achieved – and if cooperation in the Indo-Pacific region can also be enhanced in the field of digital trade – the potential gains derived from

[7] AfCFTA, https://au-afcfta.org/

improved trade facilitation through regulatory cooperation will be realised, and the benefits of global AI regulation and multilateral trade governance will be obtained (Rahman, Kim, De, 2020).

2.2. The Paradoxes in the Development and Regulation of AI

The focus now shifts to when and how binding AI regulation should be successfully drafted, implemented, and enforced. The first pressing issue relates to the principal objective that AI regulation should pursue. Yet AI cannot simply be classified into 'good' or 'bad' AI. Certainly 'AI is a double-edged sword, and that a lot of use cases demonstrating positive impacts simultaneously provide examples of how to use AI for bad' (Sætra, 2021).

AI's complex, cross-cutting, cross-boundary, and rapidly converging nature defies traditional modes of binary thinking and poses numerous fundamental problems – which have been repeatedly identified in a vast number of fields as paradoxes and oxymorons (Neuwirth, 2013; 2018). It is a trend and common feature of numerous novel and potentially disruptive technologies, including virtual reality, heuristic algorithms, big data, and synthetic biology (Neuwirth, 2020). This is most obvious with the example of AI itself, which has repeatedly been qualified as an oxymoron (Chrisley, 2000; Gidley, 2017; Svensson, 2023).

The main reasons that so many concepts describing new and potentially disruptive technologies are characterised as oxymorons are as follows. One of the main drivers of these technologies is their rapidly evolving nature and trend towards convergence with other industries. The consequence of their qualification as oxymoronic is that they defy traditional modes of binary thinking and render the common use of the law of dichotomies inefficient and worthless. This is also reflected in the debate about technology neutrality – that is, asking whether a technology is good or bad – which can be rephrased as, 'Technology is neither good nor bad; nor is it neutral' (Kranzberg, 1986). As a result of the defiance of binary logic, there are other regulatory options than dichotomies, likely taking the orm of new cognitive modes of thinking that effective regulations will have to pursue.

The same dilemma also surfaces in the qualification of AI as a cross-cutting phenomenon. This is a concept used for the cultural and creative industries, which – in the wake of digitisation – poses similar challenges for regulators. In this context, it was defined as an issue that defies existing governmental structures and, therefore, requires more 'innovative, multidisciplinary policy responses and interministerial action' (UNCTAD, 2010). Indeed, AI is a technology that cannot be easily defined, as it is rapidly evolving and tends to converge and to escape from existing classifications or categories of industries, technologies, and products (Neuwirth, 2024a; forthcoming).

The cross-cutting nature of AI and related industries is further reinforced by their cross-boundary or cross-border elements. The effects of cross-boundary technologies cannot be limited by territorial borders, which means that these issues cannot be regulated at

the national level alone but require complementary regulatory actions at the regional and/or global level. Technically, the cross-boundary nature of AI and many related technologies is premised on functioning that is dependent upon interoperability to secure interconnectedness, which is broadly understood as the 'ability of a system, product or service to communicate and function with other (technically different) systems, products or services' (Kerber and Schweitzer, 2017). Legally, the cross-boundary nature of AI manifests itself in the debate about the extraterritorial effect of AI laws as described by the Brussels Effect or Beijing Effect (Wang, 2024).

Another regulatory dilemma exists in the choice between sectoral or horizontal AI regulations as an initial regulatory approach. While China has so far opted for the former, the EU has adopted the latter with its AI Act. However, this is only an apparent dilemma, as there is evidence that the EU will have to complement the act with specific regulations, such as rules on AI liability or by amending its existing laws as with the Product Liability Directive.[8] China can be expected to adopt further sectoral laws and to eventually codify them into a more comprehensive AI law, as proposed by scholars in different versions of a model AI law.

Related to the sectoral or horizontal dilemma, there are also questions about which legal field should be prioritised for various AI regulation. Parallel and not sufficiently coordinated AI regulatory initiatives have been undertaken in several legal fields, including product safety or the common market (e.g. trustworthy and safe AI), intellectual property rights (e.g. generative AI), human rights (e.g. neurorights), and constitutional law (e.g. digital rights). Any effort to regulate AI must carefully identify the most appropriate field of law for action and, ideally, also coordinate them when more than one approach is simultaneously undertaken. In an increasingly complex, global regulatory environment, this also entails a careful balancing of domestic regulations with international obligations.

Overall, the current regulatory environment for AI has been described as:

A complex network of top-down measures and bottom-up initiatives, binding and non-binding rules, hard and soft laws, horizontal and sectoral rules, supranational, international, national and industry-based regulations (Harasimiuk and Braun, 2021).

In addition to questions regarding the horizontal or vertical substantive regulation of AI, it is important to consider institutional aspects plus matters of enforcement (Neuwirth, 2023). The EU has recently established the European AI Office in support of the AI Act. China also provides an interesting example for the institutional governance of digital technologies, once described as a 'fuzzy logic regulatory practice' (Parasol, 2021). 'Fuzzy logic' is a term borrowed from computer science applied to try 'to deal with "degrees of truth" rather than a binary "true or false" logic', which has been used to describe China's agile mode of tech governance (Parasol, 2021). Elements of fuzzy logic have also been

[8] European Commission, Proposal for a Directive of the European Parliament and of the Council on adapting non-contractual civil liability rules to artificial intelligence (AI Liability Directive), COM (2022) 496 final.

used for suggestions regarding the reform of the system of the institutional governance of AI matters at the global level (Neuwirth, 2024b).

There are some additional dilemmas or paradoxes to consider. First, in line with the cross-border and cross-cultural nature of AI, the diversity of the world's legal systems and cultures must be duly considered (Glenn, 2007). AI has a wide range of repercussions in the cultural field, which is the reason its impact must be considered at all stages in all fields of regulation (Migliorini and Neuwirth, 2023). This issue notably surfaces in the debate about AI sovereignty following the known cultural biases of AI in the form of trained large language models (Yogarajan et al., 2024; Liu, 2024). This has prompted calls for greater AI sovereignty, which has been broadly defined as the 'capacity of a given country to understand, develop, and regulate AI systems' (Belli, Gaspar, Jaswant, 2024). AI sovereignty, however, also struggles with multiple tensions, such as those 'between national interests and global cooperation, technological protectionism, human rights and privacy issues, and the risk of exacerbating global inequalities' (Yu, 2024).

There are three more interrelated regulatory paradoxes that are relevant for the regulation of new technologies and AI. The first relates to the question of when to intervene with binding regulations. This has been framed by way of the Collingridge Dilemma, which holds that it is difficult to predict the consequences of a technology in its early phase, but that once undesirable consequences have been discovered, it is difficult to change the initially chosen regulatory path (Collingridge, 1980). Similarly, the fundamental problem of law posed by the omnipresence of change throughout all human experience demands how law can preserve its integrity over time while addressing the newly emerging circumstances that continually arise (Johnson, 2007). The temporal dimension of regulatory intervention extends far into the future by virtue of the 'pacing problem' or the need to 'future-proof' laws as a way to address possible gaps between emerging technologies and their regulation (Marchant, Allenby, Herkert, 2011; Chander, 2017).

The second paradox is of the regulatory state – the problem of self-defeating regulatory strategies – which means that specific strategies pursued to a particular end may eventually 'achieve an end precisely opposite to the one intended' (Sunstein, 1990). Applied to AI, the fear is that the regulation of AI will not be able to ensure a trustworthy AI for good, but instead stifle innovation (Chang, 2023). The third paradox also has several expressions but was best characterised by Gordon W. Allport in 1954 by his finding of a disparity in humans' modern 'mastery over energy, matter, and inanimate nature' as compared to the 'handling of human relationships', the latter appearing medieval in comparison to the former (Allport, 1954). This disparity has devastating effects, as Allport found that the surplus in wealth accumulated by humans from new technologies is often cancelled out by the costs of armaments and war (Allport, 1954). Today, this observation has indeed been confirmed by current conflicts. It also surfaces in attempts to tie the regulation of AI to the realisation of wider societal global goals, such as the Sustainable Development Goals.

2.3. The Development of AI: Between Innovation and Regulation

Another dominant paradox concerns the effects of regulation on the innovative development of AI. This problem is often portrayed as a binary choice. Against the backdrop of the observation that AI will reshape the global economy, it is also assumed that the regulation of AI will generally hamper the development of AI and put the economy of a country on the back foot in the global competition of AI development. This point also influences the current debates about AI regulation in the US, China, and the EU.

Some note that the different efforts to regulate AI have been reduced to a market-driven regulatory model pursued by the US, a state-driven regulatory model by China, and a rights-driven regulatory model by the EU (e.g. Bradford, 2023). However, this is too simplistic, and it is better to focus on specific principles formulated by the different jurisdictions, such as human oversight throughout the AI life cycle promoted by China, transparency by the US, and a risk-based approach by the EU (Dixon, 2023; Parisini, 2022). UNESCO has tried to summarise different regulatory approaches and has issued a consultation paper that categorises different emerging models of AI regulation, including principles-based, risk-based, rights-based, and standards-based approaches; experimentalist or enabling approaches; and other approaches that aim to adapt existing laws or to deploy transparency instruments (UNESCO, 2024).

This question on innovation and regulation also cannot be properly addressed by way of binary thinking, that is, by simply stating that regulation is not conducive to the development of AI. This applies to many other detailed regulatory questions surrounding the impact on innovation and AI development in different fields, such as cybersecurity, global trade law, intellectual property, or privacy protection. New cognitive solutions based on outside-the-box thinking and greater reliance on polyvalent thinking must be sought.

The EU experience can serve as an example for the Indo-Pacific region. The EU is often praised as a global regulatory power, notably in the field of digital technologies (Hadjiyianni, 2021). It has been described as 'Europe's unilateral power to regulate global markets', known as the Brussels Effect (Bradford, 2012). The ability to regulate important issues is linked to its vast common market and regulatory lessons learned in the process of its establishment, which has helped cement it as a global economic giant. However, in 1991, the EU was described as 'an economic giant, a political dwarf and a military worm' (Chappell, Mawdsley, Petrov, 2016); 35 years later, several important objectives still have not yet been achieved (Neuwirth, 2019), including the EU Constitutional Treaty or the Lisbon Agenda to become 'the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion by 2010' (EC Lisbon European Council, 2000). More recently, Brexit failed to positively contribute to either the development of the UK or the EU. The war in Ukraine further seems to confirm Allport's analysis of wars as not only cancelling out the

surplus of wealth created by innovation but also obstructing future development and prosperity – not to mention creating tremendous human suffering.

In summary, there has been a shameful turn of events in the history of European integration. The EU began as a project to preserve and to strengthen peace and liberty, receiving the Nobel Prize for Peace in 2012 'for over six decades [of] contribut[ing] to the advancement of peace and reconciliation, democracy and human rights in Europe'.[9] Yet today, the EU is an emerging 'European war economy' (Żuk, 2023). These developments testify not only to the complex interplay between economic and political as well as military aspects but also the significant role of law. At present, the EU truly risks turning into a regulatory giant, an economic and political worm, and a military dwarf.

The overall lesson to be learned from the EU is that all different competences, powers, and policy fields are intrinsically connected. To fully serve their purpose, a sound equilibrium must be established. This is particularly relevant in the age of digitisation and convergence of technologies and industries, which causes tensions between the different power and policy fields. For the EU, a particular disparity between its considerable economic and regulatory power in digital matters and its limited mandate and capabilities in foreign policy undeniably exists (Broeders, Cristiano, Kaminska, 2023).

A recent report on EU competitiveness found that Europe does not lack ideas or ambition, but innovation is blocked by 'failing to translate innovation into commercialisation, and innovative companies that want to scale up in Europe are hindered at every stage by inconsistent and restrictive regulations' (EC, 2024). Thus, regulatory power needs to be based on regulatory expertise, which usually comes from experiences in the development of underlying technologies and industries. In this respect, it is noticeable that the EU does not have major technology companies or platforms like the US and China, which poses not only serious systemic risks for the EU but also to its long-term competitiveness in the global digital economy.

Another factor negatively contributing to the EU can be linked to the continuous use of obsolete terminology, such as the 'developing/developed country' separation (Neuwirth, 2016). This terminology is a false dichotomy; it opposes an adjective and a verb and compares an activity with a state. It creates an untrue impression that being developed at one stage means to remain developed forever and perpetuates colonial and hegemonial thinking on the side of 'developed countries', which often leads to a form of ignorant arrogance expressed in a lack of interest in other legal systems' efforts and lessons learned (Neuwirth, 2010). Moreover, it often results in a lack of responsibility on the part of 'developing countries', as there is always an available excuse for failure. In short, it is a terminology that should have been abandoned long ago; it is also in violation of the principle of the sovereign equality of all members of the global community as noted in the UN Charter.

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[9] The Nobel Prize, The Nobel Peace Prize 2012, https://www.nobelprize.org/prizes/peace/2012/summary/

A new form of dynamic thinking, including important oxymoronic elements, is needed. For all dichotomies and, notably, the relationship between innovation and regulation, it is important to think of apparent opposites not merely as contradictory but also as complementary. For the regulation of AI, this means to perceive efforts to develop AI and to regulate AI to ensure its safety and security as not in direct conflict. Parallel efforts must be undertaken with the goal to simultaneously develop and regulate AI. In this process, neither an ex-ante nor an ex-post approach alone is a guaranteed success. Innovation and security are not opposed to each other; they should be regarded as a creative and dynamic process, one guided by a sense of 'flexicurity' – the underlying idea that 'flexibility and security are not contradictory to one another, but in many situations can be mutually supportive' (Madsen, 2007). The same kind of thinking should be applied to the relationship between regulation and innovation in the context of AI.

2.4. Law and Policy Recommendations for AI

In the many intense debates about AI, it is often forgotten that AI is not just a technology, a simple tool to be used; it also marks a chance for human intelligence to evolve and to revisit the values and objectives of every society and to formulate a vision for the path that will take it into the future. During the past few years, a consensus has emerged that the potential benefits and possible harms and risks related to AI cannot solely be tackled by ethical recommendations without the benefit of binding legal regulations and laws. Now that many AI regulations have been or are being adopted at the national level, the following points should be duly considered.

First, the regulation of AI requires sound planning that considers the specific needs and expectations of each country. Although the challenges posed by AI are universal, the responses must be adjusted to the respective needs of each society and economy. The impact on culture and cultural diversity must be duly considered. Given the cross-border effects of AI, national lawmakers must also coordinate further regulatory actions at the regional and global level. Particular attention should be paid to the establishment of a consistent legal framework and set of coherent policies, which is warranted by the complex cross-cutting nature of AI and other digital technologies.

Rich experiences gained from the regulation of technologies in the past have also given rise to several regulatory paradoxes that should be respected while aiming to resolve each. They also point to the need to develop a new cognitive mind-set or outside-the-box thinking that is beyond the traditional modes of binary thinking. This need can be deduced from the qualification of AI and many related disruptive technologies as oxymorons, which also gives rise to a new understanding of dichotomies that does not perceive them as contradictory but as complementary, leading towards a more profound understanding of their mutual dynamics and potential synergies. It is also crucial to remember that the development of technologies should be in the service of humans and not the other way around, as derived from the Allport paradox. As witnessed in past and present conflicts,

it is essential to maintain peace and stability to avoid a situation in which the wealth accumulated through technological gains is cancelled out by the costs of armaments, wars, and human suffering.

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Chapter 5

Ensuring Resilient, Trustworthy, and Inclusive Supply Chains for the Digital Economy in the Indo-Pacific – A Case Study of Japan

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1. Introduction

The concept of the Indo-Pacific comprises a modern model of regional integration. In 2007, Japan's then-Prime Minister Shinzo Abe introduced the idea, noting that '[t]he Pacific and the Indian Oceans are now bringing about a dynamic coupling as seas of freedom and of prosperity', describing it as a 'broader Asia' that was 'beginning to take on a distinct form' (MOFA, 2007). In 2016, Abe further advanced the concept by launching the Free and Open Indo-Pacific initiative, which aimed to align strategies of countries with similar interests in the region.

The geopolitical environment surrounding the Indo-Pacific region has been marked by significant fluctuations. As an example, the impact of the return of the Donald Trump administration in the United States (US) remains uncertain. It may abandon the Indo-Pacific Economic Framework for Prosperity (IPEF) that was launched by the Joseph Biden administration, as it did with the Trans-Pacific Partnership in 2017 (Beeman, 2024). Yet strong plans remain to develop resilient supply chains in the Indo-Pacific region, as the region is experiencing a robust recovery in trade in goods, positioning Asia as the fastest-recovering region globally from the COVID-19 pandemic and its aftereffects.

Given the absence of region-wide integration and significant economic heterogeneity, no single country can represent the entire Indo-Pacific, nor can any legal framework provide universally applicable solutions to ensure region-wide, sustainable, inclusive growth. Developing the region's digital economy together requires resilient, diversified, and trustworthy supply chains, given its vast geographical scope and internal diversity. This development must also ensure that the region's rich diversity and vulnerabilities are holistically recognised and addressed. This chapter examines the significance of various initiatives undertaken by the G7 and G20 in addressing the digital economy in the Indo-Pacific region.

Against this background, the table below outlines seven key global and regional frameworks that hold significant implications for the digital economy in the Indo-Pacific region.

Table 5.1 International Regimes Related to the Indo-Pacific

	G7	APEC	Quad	G20	CPTPP	RCEP	IPEF
Year of establishment	1975	1989	2006	2008	2018	2022	2022
Number of members	7	21	4	21	12	15	14
Argentina				X			
Australia		X	X	X	X	X	X
Brazil				X			
Brunei Darussalam		X			X	X	X
Cambodia						X	
Canada	X	X		X	X		
Chile		X			X		
China		X		X		X	
Fiji							X
France	X			X			
Germany	X			X			
Hong Kong, China		X					
India			X	X			X
Indonesia		X		X		X	X
Italy	X			X			
Japan	X	X	X	X	X	X	X
Lao People's Democratic Republic						X	
Malaysia		X			X	X	X
Mexico		X		X	X		
Myanmar						[X]	
New Zealand		X			X	X	X

	G7	APEC	Quad	G20	CPTPP	RCEP	IPEF
Papua New Guinea		X					
Peru		X			X		
Philippines		X				X	X
Russia		X		X			
Saudi Arabia				X			
Singapore		X			X	X	X
Taiwan		X					
South Africa				X			
Republic of Korea		X		X		X	X
Thailand		X				X	X
Türkiye				X			
United Kingdom	X			X	X		
United States	X	X	X	X			X
Viet Nam		X			X	X	X
African Union				X			
European Union	X			X			

APEC = Asia-Pacific Economic Cooperation, CPTPP = Comprehensive and Progressive Agreement for Trans-Pacific Partnership, IPEF = Indo-Pacific Economic Framework for Prosperity, RCEP = Regional Comprehensive Economic Partnership.

Notes:

1. X = ratified, [X] = signed but not yet ratified.
2. This table includes the Quadrilateral Security Dialogue (i.e. the Quad), formed by Australia, India, Japan, and the United States partly because it launched the Indo-Pacific Partnership for Maritime Domain Awareness in 2022, an initiative to enhance maritime domain awareness in the Indo-Pacific region and to bring increased transparency to its waterways.

Source: Author.

It is noteworthy that Japan is the only country participating in all seven frameworks, followed by Australia, which holds membership in six, and the US, which participates in five.

2. Inclusivity in Building Supply Chains in the Digital Economy

There are encouraging signs for a positive trajectory regarding global trade in services (WTO, 2024), thanks to the rapid growth of digitally delivered services. This underscores the necessity for affordable and reliable infrastructure, both digital and physical, as well as enhanced digital skills, particularly in developing countries (Ossa, 2023). Although over 75% of the world's adult population lacks access to e-commerce (Signé, 2024), trade in digital services has become prevalent in Indo-Pacific region. For example, digital services trade was identified as a major topic in trade negotiations between the US and Nepal (USTR, 2024b).

In this context, the Indo-Pacific region's diversity – in terms of the level of development, politics, and geography – must again be noted. Yet these countries are continuing to connect and to become interdependent within the region. Developing resilient supply chains for the digital economy thus needs multilayer, transnational coordination amongst diverse – and sometimes conflicting – values, including those related to data connectivity and data localisation, government access and cybersecurity, artificial intelligence (AI) technology development, and intellectual property protection. The role of digital technologies in supply chain management is indispensable, especially with advancements in AI and blockchain technologies, as they enhance supply chain efficiency and security.

Digital trade holds significant potential in alleviating the energy poverty seen throughout the region, but its success depends on sufficient investment and technological advancement within the region. Investment in broadband connectivity must thus be a focus, including submarine cables and advanced broadband networks (i.e. 5G/6G and beyond). In addition, initiatives aimed at improving the population's digital skills and decentralising energy sources are critical to fully realising the benefits of digital trade in addressing energy poverty (Xinxin et al., 2024). The rise of digital trade will present complex implications for labour income inequality, inclusivity, and environmental protection, however.

The expansion of digital trade may lead to widening wage gaps, characterised by a reduction in between-group disparities while exacerbating within-group wage inequality. This phenomenon can be understood through the concept of the Digital Kuznets Curve, which suggests non-linear dynamics in the relationship between economic development and inequality (Huang, Sun, Yang, 2023). According to this curve, as digital trade evolves, it can create opportunities for higher wages amongst certain groups while leaving others behind, thus complicating efforts to achieve equitable income distribution.

Secondly, inclusivity remains a significant concern, particularly for vulnerable populations, including women; micro, small, and medium-sized enterprises (MSMEs); indigenous peoples; and persons with disabilities (WTO, 2021). The World Trade Organization (WTO) Informal Working Group on MSMEs has acknowledged 'the importance of digital solutions to expedite processing and ensure that trade is as

frictionless as possible' for MSMEs (WTO, 2021). Digitalisation is one of the means, along with the global legal identification of companies, that can facilitate their access to finance. In the Indo-Pacific region, financial mechanisms, like M-PESA in Bangladesh and Pakistan, have made strides in expanding financial services, thereby promoting economic participation amongst marginalised communities. Yet the increasing demand of electricity and internet can also make vulnerable populations more vulnerable due to their limited access to such digital infrastructure and/or restricted opportunities for digital skills development. Thus, ensuring ubiquitous and reliable broadband connectivity, which was already called for by the G20 in 2016 (G20, 2016), remains a priority in this region.

The environmental implications of increased digital trade additionally warrant careful consideration. For example, although AI technologies have the potential to optimise grid power networks, thereby enhancing energy efficiency and reducing waste, the increased deployment of such technologies is likely to lead to higher electrical consumption, raising concerns about the overall environmental footprint. Balancing these competing effects is essential for ensuring that digital trade contributes positively to sustainability goals. Ensuring a circular economy – including the recycling of critical minerals from used electronic appliances, for instance – is also vital.

Finally, while the growth of digital trade offers opportunities to enhance sustainability, it also presents challenges for vulnerable groups, who make up the majority of the population in the region. Addressing this challenge requires thoughtful international policy coordination to establish equitable, accessible, and resilient supply chains.

3. Initiatives under the G7 and G20 for Supply Chain Development for the Digital Economy

3.1. Technological and Industrial Development

The IPEF is the first binding international agreement that uses the term 'Indo-Pacific'. The initiative primarily aims to strengthen economic ties and resilient supply chains with its allies while countering China's Belt and Road Initiative. So far, however, the absence of a meaningful agreement on the trade pillar has limited the IPEF's impact on developing digital global value chains. As the Trump administration may further heighten tensions between China and the US, Japan and China announced in 2024 their intention to promote a 'mutually beneficial relationship based on common strategic interests' and to build 'constructive and stable Japan–China relations' (MOFA, 2024). As a result, the future of the IPEF is likely to remain uncertain for several years.

In comparison, the G7 and G20 are regarded as relatively stable international fora. The G7 is a group of advanced industrialised economies, established in 1975.[1] The G20, established in 2008, includes all G7 members as well as the Brazil-Russia–India–China–

[1] The G7 includes Canada, France, Germany, Italy, Japan, the United Kingdom, and the US.

South Africa (BRICS) nations, thereby representing both developed and emerging economies and reflecting a broader spectrum of global economic powers.[2] Although the G7 and G20 have traditionally adopted distinct approaches to various topics, in recent years, the G7 has begun engaging major G20 member states, such as Brazil, India, and the Republic of Korea, as observers. This trend reflects a growing interconnection, even if not conversion, between the two fora, both in terms of participation and substantive agendas.

The G7 and G20 concurrently deal with impending issues for the digital economy. First, investment facilitation plays a critical role in establishing region-wide digital public infrastructure. Recent G7 meetings have highlighted the importance of resilient supply chains in key sectors, including semiconductors, critical minerals, and pharmaceuticals. Although the WTO *Investment Facilitation for Development Agreement* faces significant challenges, the 2024 G7 Partnership for Global Infrastructure and Investment provides a potential pathway forward. Yet the G7's proposal to compartmentalise supply chains for strategic goods – particularly semiconductors – by leveraging investment regulations could heighten tensions with certain G20 members. At the same time, the G20 has underscored the importance of skilling, upskilling, and reskilling to ensure that the global workforce remains adaptable to the continuous modernisation of digital technologies (G20, 2023b). It noted that investments in education would yield broader and more sustained benefits for the entire region.

The issue of supply chain resilience has become increasingly politicised, exemplified by G7 members' shared concerns over Chinese dominance in digital industries, and their commitment towards 'cooperative efforts' to 'promote sustainable, reliable and trustworthy sources for strategic goods' (G7, 2024). The US has also signed memoranda of understanding with several G20 members that aim to foster resilient, secure, and sustainable semiconductor supply chains as well as to secure critical minerals, such as that with India in October 2024.

Along with investment facilitation and providing subsidies to develop physical network infrastructure, digitalising government systems is essential (Mangla, 2024). The G7 and G20 are working in concert to develop digital public infrastructure (G7, 2024). To alleviate policy fluctuations, such international schemes are needed. A more region-focused initiative is the Blue Dot Network, a multilateral organisation that promotes a certification framework for high-quality infrastructure projects, launched in 2019. The G7 also plans to launch a G7 Compendium of Digital Government Services to complement the existing work produced by G20 (G7, 2024) and in line with the United Nations Compendium of Digital Government Initiatives.[3] The G7 and G20 also share basic approaches to

[2] The G20 includes Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, Republic of Korea, Turkey, the United Kingdom, and the US, as well as the European Union.

[3] UN, Compendium of Digital Government Initiatives, https://publicadministration.desa.un.org/good-practices-for-digital-government/compendium

harnessing the development of AI as of 2024, but agile regulatory frameworks are necessary to support and to sustain this progress (G20, 2024; G7, 2024).

Data Free Flow with Trust (DFFT), a concept first introduced by Japan at the 2019 G20 Osaka Summit, has been advanced within the G7 framework. A 2022 action plan promoted DFFT and emphasised aspects such as interoperability and privacy-enhancing technologies (G7, 2022). Recently, the *2023 Vision for Operationalizing DFFT and Its Priorities* advanced the establishment of an Institutional Arrangement for Partnership (G7, 2023c), an international mechanism for operationalising DFFT hosted by the Organisation for Economic Co-operation and Development. For the G7, building trust entails promoting liberal and democratic values 'to counter the influence of authoritarian approaches' (G7, 2023b). This involves efforts to combat data localisation; restrict unwarranted government access; and foster regulatory cooperation, data connectivity, and sharing. Although its relevance within the G20 has been relatively limited, DFFT is still part of the G20 agenda, as it was mentioned in the 2023 New Delhi Leaders' Declaration and 2024 Maceió Declaration on Digital Inclusion (G20, 2023a; 2024).

3.2. Sustainability and Inclusiveness

The circular economy has long been a priority on the G7 agenda. In 2015, the G7 Alliance on Resource Efficiency was established as a multistakeholder forum to explore policy and business strategies for achieving a circular economy. It has driven further initiatives, including the adoption of the G7 Toyama Framework on Material Cycles (2016), G7 Bologna Roadmap (2017), and G7 Berlin Roadmap on Resource Efficiency and Circular Economy (2022–2025). As part of the Berlin Roadmap, Circular Economy and Resource Efficiency Principles were introduced to encourage corporate initiatives, enhance public and financial sector engagement, and promote voluntary actions towards circularity and resource efficiency (G7, 2023a). The 2023 G7 Ministerial Declaration on Digital and Technology outlined ongoing efforts, such as improving hardware circularity and energy efficiency in data centres and next-generation computing, promoting life-cycle approaches in digital technology development (including recyclability and the right to repair), and exchanging best practices to advance sustainable-by-design principles for digital equipment (G7, 2023b). Similarly, the G20 recognised the importance of fostering a circular economy, launching the Resource Efficiency and Circular Economy Industry Coalition in 2023 (G20, 2023a). These can be seen as examples of how the G7 and G20, while separate frameworks, function in a multifaceted and complementary manner towards the realisation of a digital economy that is acceptable to countries with diverse interests.

Inclusiveness is also key to developing sustainable supply chains for the digital economy. The G20 launched the W20 engagement group in 2014, committing to ensuring digital inclusivity as early as 2016 (G20, 2016), and has continued to prioritise this objective in subsequent years. MSMEs, which constitute most companies worldwide, have been

frequently highlighted in this context (G20, 2021). The digital inclusion of persons with disabilities was also part of the agenda at the G20 in 2022 (ILO, 2022). Although less frequently, the G7 has similarly emphasised the importance of inclusivity on several occasions.

4. Case Study of Japan's Support for the Semiconductor Industry

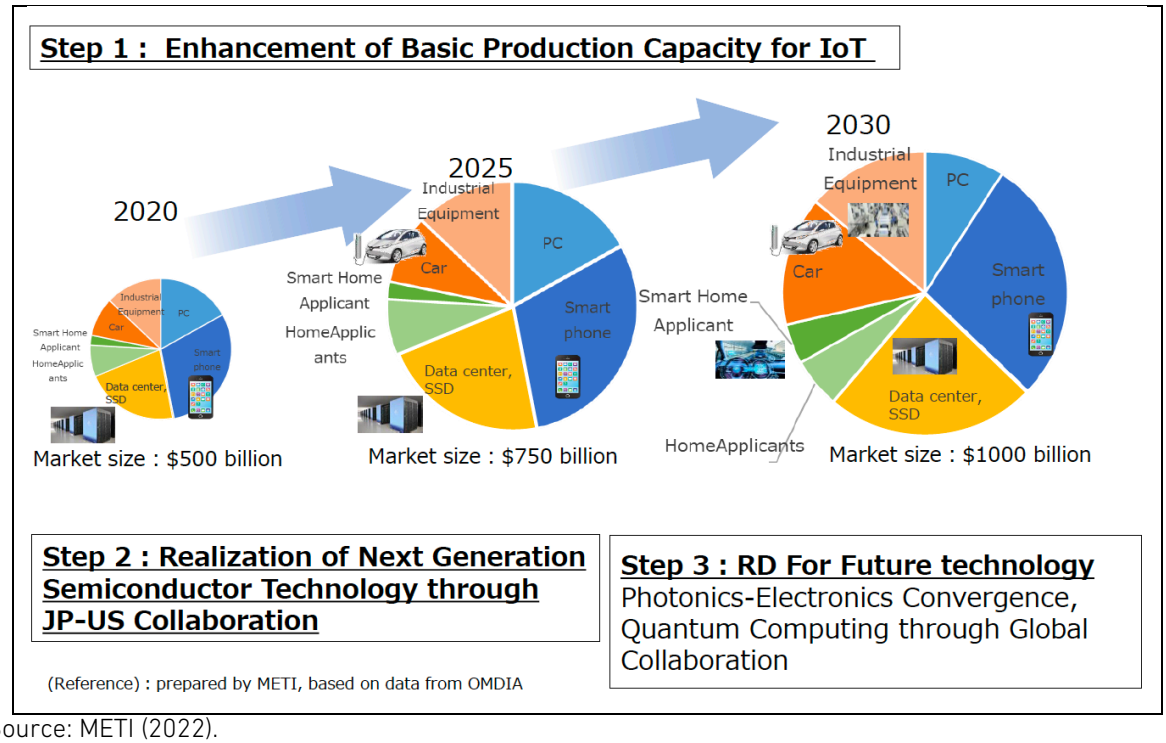
4.1. Policy to Develop Resilient and Trustworthy Supply Chains in Semiconductors

As is shown in the previous sections, development of the digital economy in the Indo-Pacific region is facing multiple challenges, such as US–China tensions, considerable disparities in development levels, and uncertainties in US policy under the second Trump administration. This section focusses on Japan's strategic support for its semiconductor industry, aiming for a revival with secure and resilient supply chains, as a case study.

The semiconductor industry is an indispensable sector for the digital economy. World semiconductor trade dynamically expanded after the COVID-19 pandemic and due to the high demand for AI and various information and communications technologies. It is forecast to increase on a market-wide basis in 2025. Japan was a global leader in semiconductor production in the 1980s; however, today, its companies' presence in the industry has diminished compared to that of other countries, such as Taiwan's TSMC, the Republic of Korea's Samsung Electronics, and US-based Intel. Not surprisingly, Japan recognises that 'there continues to be a need to procure critical goods and products (strategic goods and products) within one's own country and within like-minded countries' (ISC, 2024). Thus, Japan's Act on Promotion of Developing/Supplying and Introducing Systems Making Use of Specified Advanced Information Communication Technologies (Act No. 37 of 2020), passed in 2020, is working towards the development of the country's semiconductor industry.

The Government of Japan now places the semiconductor industry as a key strategic sector for digitalisation. Fostering its domestic production was indicated in the *Action Plan of the Growth Strategy*, which was approved by the Cabinet on 18 June 2021. Active governmental involvement is also noted in the *Basic Semiconductor Revitalization Strategy* in 2021 led by the Ministry of Economy, Trade, and Industry (METI, 2022). As is shown in the figure below, the strategy consists of three stages: (i) securing domestic manufacturing infrastructure to meet recent demand; (ii) establishing next-generation technologies through a collaboration between the US and Japan; and (iii) research and development for future technologies through collaboration with like-minded countries and regions like the European Union, the Republic of Korea, Taiwan, and the United Kingdom. This approach aligns with that taken by the G7.

Figure 5.1: Design of Japan's Semiconductor Revitalisation Basic Strategy



Source: METI (2022).

The strategy includes education programmes aimed at securing human resources through region-based initiatives that foster collaboration amongst industry, academia, and the government in cooperation with the Ministry of Education, Culture, Sports, Science, and Technology. This approach reflects the reskilling programmes advocated by the G20, although Japan's strategy principally assumes expanding collaboration with companies in like-minded nations, including the US, and does not include region-wide collaborations with countries like China.

Japan is not the only country attempting to incentivise domestic production in the semiconductor and related industries. In the US, an executive order issued under the first Trump administration in 2019 asserted that 'foreign adversaries are increasingly creating and exploiting vulnerabilities in information and communications technology and services, which store and communicate vast amounts of sensitive information, facilitate the digital economy, and support critical infrastructure and vital emergency services' (Government of the US, 2019). This order, which has served as the foundation of US information and communications technology supply chain policy, persisted through the Biden administration and is likely to continue under the second Trump administration.

The US and Japan announced in July 2024 that they would continue coordinating their efforts to 'respond to several third-party regulations that present concerns' for the digital economy (USTR, 2024a). Similarly, a US–Japan joint statement in November 2023 emphasised that the two countries 'intend to work together to formulate transparent, resilient, and sustainable supply chain strategies that promote reliable and trustworthy

sources for strategic goods' and to advance environmental protections (Japan–US Economic Policy Consultative Committee, 2023). In the section on Strengthening the Rules-based Economic Order in the Indo-Pacific Region, the statement noted that the two countries 'aim to promote a level playing field and counter non-market policies and practices' (Japan–US Economic Policy Consultative Committee, 2023). In this context, the development of supply chains for the digital economy continues to be significantly shaped by ongoing political tensions between the US and China. While this is unlikely to generate tensions among G7 countries, it may provoke some within the G20.

Since 2022, Japan has heavily subsidised its semiconductor industry, with support totalling slightly less than 1% of the country's gross domestic product (Negrine, 2024; Solís and Duchâtel, 2024). The largest support is organised by the New Energy and Industrial Technology Development Organization (NEDO), a quasi-governmental agency under the supervision of the Ministry of Economy, Trade and Industry, through the 2020 Research and Development Project of the Enhanced Infrastructures for Post-5G Information and Communication Systems and the 2022 Specified Semiconductor Funding Program, which amounts to US$20 billion in total. Furthermore, on 22 November 2024, the government promised an additional US$65 billion of governmental support to the semiconductor and AI industries by 2030, with the aim of attracting more public and private investment towards a total of US$325 billion (Government of Japan, 2024). Notable projects include TSMC's facilities in Kumamoto Prefecture, Micron Technology's operations in Hiroshima Prefecture, a joint venture between Kioxia and Western Digital in Aichi Prefecture, and most recently Rapidus in Hokkaido Prefecture.

Rapidus is a startup with no established track record or expertise in semiconductor production. Despite this, it has received funding from eight major Japanese companies, including Kioxia, SoftBank, Sony, and Toyota, amounting to US$50 million.[4] The government has also provided significant research and development support to Rapidus, allocating US$6 billion to it during 2021–2024. A similar type and amount of public funds was allocated to the public–private consortium Leading-edge Semiconductor Technology Center, of which Rapidus is a member. In contrast to the investment facilitation measures provided to Micron Technology, TSMC, and other foreign manufacturers in Japan, all governmental support to Rapidus has been through research and development outsourcing projects funded by NEDO and the Ministry of Education, Culture, Sports, Science, and Technology. Thus, under this scheme, the factories and semiconductor manufacturing equipment built with such governmental support are national assets.

4.2. Legal and Policy Implications

Subsidies and governmental procurement are supposed to work in a complementary manner to foster new technologies; subsidies can reduce initial investment risks for

[4] Rapidus, Company Info, https://www.rapidus.inc/en/about/

producers to launch efficient production facilities, while governmental procurement provides longer-term stable demand (IRENA and WTO, 2024). The massive subsidies provided by Japan to Japanese semiconductor companies – with a substantial portion allocated to Rapidus – are generating concerns about compatibility with various WTO agreements, including the *Agreement on Subsidies and Countervailing Measures*. Just as the Government of Japan and government-affiliated research institutions' substantial subsidies for the Mitsubishi Regional Jet project led to harsh criticism from countries such as Brazil a decade ago, China and the Republic of Korea may likewise see the recent Japanese semiconductor subsidies as a threat.

In addition, technical specifications can create trade barriers if manipulated for protectionist purposes, raising questions about compatibility with the WTO *Technical Barriers to Trade Agreement*. Although not specifically limited to semiconductor revitalisation, the Government of Japan hinted at the use of technical standards, including security conformity assessment schemes, as requirements to obtain governmental contracts (ISC, 2024). Governmental procurement is also a key area of WTO law and will be a prominent discussion during the second US Trump administration.

Developing public facilities in strategic sectors requires increased transparency and openness in procurement processes, especially in the Indo-Pacific where public entities play a significant role. In this context, all G7 members are signatories to the WTO *Agreement on Government Procurement*, which was revised in 2012 and provides a framework for advancing these objectives. While it may be more challenging for G20 members to adopt similar measures, opening their tender markets could significantly accelerate the development of digital infrastructure in the Indo-Pacific. However, a strategy to enhance domestic supply chains in collaboration with *Agreement on Government Procurement* members and through bilateral trade agreements may ultimately increase costs and impose additional burdens on efforts to streamline supply chains in the region.

Setting aside the legal issues, one striking concern in Japan's strategic support for resilient supply chains is the lack of inclusiveness. Japan has taken conscious measures to address sustainability issues, such as the protection of water resources, the use of renewable energy, and recycling and waste management. Income inequality and labour standards are also actively addressed within the country. However, measures to facilitate the participation of vulnerable groups, such as women, MSMEs, indigenous peoples, and persons with disabilities, in accessing jobs, benefits, and finance are barely mentioned. Given that inclusivity – alongside sustainability – is essential for developing resilient supply chains for the digital economy, Japan should give this issue more serious consideration. If an advanced economy like Japan cannot adequately address this concern in a meaningful way, it will be much more difficult for other countries in the Indo-Pacific region to do so.

4.3. Conclusion

Global initiatives by the G20 and G7 seem to complement each another in promoting the sustainable development of the digital economy in the Indo-Pacific. The G7's efforts aim to create a harmonised approach to regulation within developed nations, ensuring that digital advancements are secure, well-governed, and conducive to economic growth without leaving this issue solely to the market. The G20's initiatives take a broader approach, reflecting the diverse economic conditions of both developed and developing countries. Although there are tensions amongst G20 members – Russia versus many members, the US versus China, India versus Canada, and the Republic of Korea versus Japan – it maintains momentum to serve as an international forum for discussing substantive issues. More importantly, a significant amount of commonality, coordination, and collaboration can be found between G7 and G20 initiatives related to the digital economy.

As a case study, this chapter examined Japan's recent efforts to develop robust supply chains in the semiconductor sector. Along with other major trading powers that are reasserting strategic industrial policies for critical materials and technologies, Japan's short-term objective appears to be the domestic establishment of semiconductor production facilities. However, it is noteworthy that Japan's recent policy does not prioritise domestic industries alone, as Japan's mid-term objective explicitly calls for bilateral cooperation with the US. Furthermore, Japan's long-term goal is to foster region-wide and global development of secure and resilient supply chains. In this context, Japan's recent semiconductor policy should be distinguished from classical mercantilist industrial policies and can be characterised as pursuing larger international collaborations on a step-by-step basis. This approach generally aligns with initiatives undertaken by the G7 and G20. However, it has so far lacked consideration for inclusivity, which is especially emphasised by the G20.

Building resilient supply chains for the digital economy requires a multidimensional balancing of diverse socio-economic conditions and the strategic coordination of governments and non-governmental stakeholders. This involves harmonising hard law and soft law, aligning governmental interventions with private sector initiatives, and integrating global and regional projects. For this purpose, initiatives run by the G7 and G20 should complement one another. Crucially, effective collaboration across nations, both in the G7 and G20, tailored to their specific contexts, is key to ensuring the efficient implementation of policies that advance both digital inclusion and sustainable economic development. How digital economy integration can enhance the efficiency and sustainability of supply chains in the region is another issue to be addressed later.

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